

Fine Art Materials in Vigani's Cabinet, 1704, of Queens' College, Cambridge

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**Fine Art Materials in Vigani's Cabinet, 1704,
of Queens' College, Cambridge**

dissertation

in four volumes

submitted by Lisa Wagner

Volume 1



Vigani's cabinet in the Long Gallery of the President's Lodge
Queens' College, Cambridge, UK

I think it will be agreed that Queens' is singularly fortunate in the possession of this cabinet, and is to be congratulated upon having preserved it and its contents in such excellent condition for the past two centuries.¹

E. Saville Peck, 1934

first examiner of Vigani's cabinet

Still in excellent condition in 2007,
having been preserved for the past three centuries

¹ PECK 1934, p. 49.

Vigani's cabinet was first introduced to me at an evening reception for new graduate students of Queens' College in October 2000. After a warm welcome by the President, The Rt. Hon. Lord Eatwell, he opened the doors of a rather unspectacular looking cabinet and presented it as the *materia medica* cabinet, dating from 1704, of Cambridge's first professor of chemistry who taught at Queens', John Francis Vigani. He then pulled open a drawer that was filled with a rainbow-coloured set of pigment samples, that inevitably drew me closer. I saw the pigments as a treasure, which had been locked in time. Immediately, I was hooked.

A phone call to Queens' President the following day and another detailed look at the cabinet prompted the inception of the research project which eventually led to this Ph.D. dissertation.

This project saw the continuous support from:

The President The Rt. Hon. Lord John Eatwell and the Governing Body of Queens' College Cambridge

Brian A. Callingham Ph.D., F.R.Pharm.S., F.I.Biol., a Life Fellow of Queens' College and my supervisor in Cambridge

Prof. Dipl.-Rest. Dr. Ulrich Schießl of Academy of Fine Arts Dresden and my supervisor

Gerda Henkel Stiftung, Düsseldorf, who generously funded a 2-year research grant.

I would like to express my deepest gratitude for your creation of the environment and allowing me the opportunity to research Vigani's outstanding collection, and for accompanying this research project throughout the years.

I greatly appreciate all the support I received and would like to thank everyone who has been involved from the bottom of my heart.

With your contributions I hope to provide a dissertation which does justice to Vigani's collection, the pigment samples in particular, and is a valuable resource in the study of painting materials as well as a contribution to the history of Queens' College, Cambridge.

Notes to the Reader

Literature is cited throughout the text with the name of the author in capital letters followed by the edition's publication year. The addition of the year was essential to indicate the time period in which the statement was valid. In order to improve the flow of the text the year was dropped where the same literature is repeatedly referenced in close proximity. If an author's name appears outside a literature reference it is presented in plain text.

All quotes are presented in italics and longer quotes are provided in indented paragraphs. The extensive use of quotes was deliberately chosen to provide the reader with the most accurate and authentic information available regarding the painting materials. It was imperative not to lose information by paraphrasing quotes or translating them into modern English, because the author found that clues and explanations are most commonly revealed when paying attention to the detailed wording of the time and the exact phrasing.

In addition to quotes, the names of painting materials are presented in italics when referring to a defined passage from a literary source. The exact spelling used by the original writer was kept to provide the reader with the variations of spelling and terminology of the time and because the exact name of a painting material mentioned in a literary source is unique to the understanding and knowledge that its author had on the material in question. For instance, the author may have identified with his term the same material that we understand by this term today. However, he could also have mistaken materials or terms or based his statement on a specific type or quality of a painting material for which he used the specific term. Therefore, the italic script is a sign of caution as to the interpretation of historic sources.

In Vigani's time England used the Julian calendar, which marked the beginning of each New Year on 25 March. This is important to note for the correct dating of written sources issued between 1 January and 25 March of each year. For example Vigani's appointment to the professorship at the University of Cambridge was dated *10. Feb: 1702*¹, in the Julian calendar. Translated to today's calendar, this is 10 February 1703.

The same date considerations must be applied to a number of invoices and letters relating to Vigani's cabinet that were issued between January and 25 March. The

¹ Cambridge University Grace Book *θ*, p. 490.

issuers of these documents sometimes indicated dates that fell in this period 'between the years' by writing down both years, separated by a slash, as in the following notation: *March. 14th. 1703/4.*²

England adopted the Gregorian calendar in 1752, with the year beginning on 1 January. Therefore, throughout this thesis the dates have been converted to our modern calendar, unless stated otherwise or included within the italic citations, which are provided exactly as they appear in the original source.

Finally, historic weights and monetary units are written out in full text.

Abbreviations used in the text are as follows:

BL British Library

BM British Museum

CUL Cambridge University Library

SLUB Sächsische Landes- und Universitätsbibliothek Dresden

Quns Queens' College, Cambridge

MS manuscript

Vig. Vigani

The author referenced manuscripts found in the cabinet as MS Quns Vig. 1 ... 18. Their transcriptions are included in the Appendix, Vol. 4 of this dissertation, where original line breaks are indicated using forward slash.

If not stated otherwise, all illustrations and photographs are by Brian Callingham and Lisa Wagner. The author is indebted to Dr Callingham for providing the equipment and spending much of his free time collaborating in the long process of documenting the cabinet and its contents using digital imaging.

Please note that Volumes 2 – 4 run without page numbers. Volumes 2 and 3 are lined up as expandable database using drawer, compartment number, and sample name as a sorting key. References can be made as follows: Vol. 2, Drawer E/24 Cerussa. Entries in Volume 4 are either by alphabet or follow the original page numbers of the transcribed manuscripts.

² MS Quns Vig. 3, see Appendix, Vol. 4 of this dissertation.

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Introduction

Aug^t. 8th. 1704. Rec^d. there of Mr Clopton Tenn pounds for a Cabinet for the use of Queen's College in Cambridge

By mr John Austin¹

This cabinet was filled with items at the direction and expertise of the College's lecturer in materia medica, John Francis Vigani, who later became the first professor of chemistry at the University of Cambridge. Referred to as the 'materia medica collection'², this cabinet contains nearly 700 samples from the then known world of natural sciences. Vigani took great care in labelling each item and arranging them in a systematic fashion within the cabinet's 29 drawers. The College's bursar, Mr Clopton, then dutifully filed the invoices and other relevant financial documents for the majority of Vigani's purchases. In addition, several of Vigani's handwritten letters and three volumes of lecture notes for his materia medica courses have been preserved, which make the sources surrounding Vigani and his cabinet quite comprehensive. This carefully referenced collection has survived as an intact entity to the present day, and thus presents as a beautiful rarity of profound scientific and historical importance.

Historical Perspective

Vigani's Cabinet was compiled during a time of great transformation in which the European colonial empires were expanding and major changes and advances were taking place in the many fields of the sciences and art.

For example specialties in the natural sciences were being subdivided and defined. Alchemy had evolved into the modern disciplines of chemistry and physics. There was also a development in the classification of materia medica and its related professions such as druggists, chemists, and grocers. The growing sea trade under the dominance of the East India Company modified the range of available products, reflecting the changes in political constellations. In England art developed from court art and portraiture to landscape painting, providing the techniques and inspiration for the outstanding artists of the 18th Century.

The world beyond Europe's ever-expanding borders which was a mystery to most seemed to be getting smaller as trade routes opened, more foreign goods and

¹ MS Quns Vig. 6, see Appendix in Vol. 4 of the dissertation for full transcription.

² PECK 1934.

curiosities were being introduced and reports from correspondents abroad became more frequent. Many of the new items of interest were added to various collections where they were analysed and classified by either scientists, tradesmen, or amateurs. These compilations were put together by many curious individuals for different reasons, but most of them with the underlying interest of systematising their world. Geological collections, for example, dealt with the formation and occurrence of minerals and fossils, botanical collections prepared the systematic nomenclature of flora, trade collections categorised the goods available and their respective qualities, collections of amateurs joined artistic works with antiques and curiosities.

At the time there was a very close connection between medicine, chemistry, and the arts: especially art technology and painting technique. Societies and academies were founded that assumed joint research in all these fields and publicly communicated their results. Under these circumstances it seems no surprise that many physicians and chemists became interested in painting techniques for works of art, and contributed theoretically and practically to these subjects as amateurs. A famous exponent was Théodore Turquet de Mayerne, an influential physician to the court of England, who wrote a painting treatise³ based on his contacts with Rubens, van Dyck, and other artists.

Vigani's cabinet reveals his professional interest in medicine, chemistry, and art. His collection covers all these disciplines with nearly 700 specimens from materia medica, chemistry, botany, geology, metallurgy, and zoology. Within the collection is a wide array of fine art materials such as pigments, gums, resins, oils, and chemical additives used to manufacture painting materials.

Research potential

Vigani left Queens' College soon after having completed his materia medica collection. However, the cabinet, and its methodically arranged and labelled contents remained at Queens' undisturbed and is currently situated in the President's Lodge. Within the cabinet there are approximately 80 organic and 90 inorganic fine art material samples, which for over 300 years have survived virtually untouched and hardly ever exposed to light. These conditions have therefore been unusually stable, static, and non-interventionist and thus provide a rare opportunity to study exactly dated fine art materials in their raw condition.

³ VAN DE GRAAF 1958.

The cabinet provided an outstandingly rare combination of detailed acquisition documents and the preservation of Vigani's extensive collection in such a dense setting. This proved to be an extremely valuable asset for investigating fine art materials in England from around 1700. The collection is characterised by:

- precise acquisition date (1704) of the materials
- use of the terminology of the time
- attribution of prices via the original invoices
- occasional attribution of provenance
- the samples have been stored in exactly the condition at purchase, without further processing or adulteration
- close to stable climate conditions over 300 years
- no exposure to sunlight
- virtually untouched with very little manual interference over 300 years
- collection at the centre of Vigani's teaching with rich documentation preserved

Vigani's collection is as important to the history of materia medica, pharmacology and the natural sciences as it is to the history of art technology. The evaluation and interpretation of the collection as an assembly of pigments, colorants, and binding media is particularly important, as there are only few material collections of this kind preserved. Vigani's cabinet is outstanding amongst these for its accurate documentation of the provenance of the samples.

Furthermore, until now mainly two methods have been available in order to characterise painting materials used in many historic art works from the 1700's. These include:

1. Analysis of micro-samples from the art works themselves
2. via literary art technological sources

Most often it has proved impossible for investigators to directly link the results of micro-sample analyses to literary sources, unless the studied text referred to a particular work of art, naming the materials used, which very rarely was the case.⁴ Also it is evident, that the materials and products in their raw condition, before they were turned into paint, have hardly ever been available for study, particularly from such an early time and in such a comprehensive range as Vigani's cabinet offers.⁵ At this stage the extraordinary importance of Vigani's cabinet as a reference collection becomes

⁴ This was the case in HALLER 2005.

⁵ One of the few early examples is RÖNNERSTAM and HÄLLDAHL 2006.

obvious. Indeed, there have been investigations⁶ into paint collections, but those only date back to the first half of the 19th Century, and deal predominantly with pigments.

Vigani's collection is outstanding for a variety of reasons including the well-planned, methodical choice of material samples. They provide an excellent overview of the typical range of materials used from around 1700 and the preserved invoices provide historical significance by including the date and price of the materials and naming druggists and tradesmen in London as the supply source. Also, the majority of the samples were labelled by Vigani himself. In doing so, the materials are very well and concisely documented and their careful storage in a controlled environment over the past 300 years has contributed considerably towards the exceptional condition of the samples.

Aim

The aim of the research was to provide a reference work for the fine art materials in Vigani's cabinet by compiling an annotated inventory of the collection. Special emphasis is placed on the pigments, which are described with reference to their provenance, trade, manufacture, significance, and use in relation to painting technique in England during the 17th and early 18th Centuries.

Also, due to the nature of the collection's origin the fine art materials and their relation to the natural sciences in the 1700's were investigated. Their connection to *materia medica* as noted after examining the invoices from druggists suggested that the manufacturing, adulteration, and trade of drugs should be further investigated. This would provide additional information regarding the quality and properties of painting materials and add to the limited information obtained by reading various painting treatises.

An important aspect in examining the connection between painting materials and the natural sciences was to expose the various contemporary sources available in *materia medica* and other scientific disciplines as well as related trades, and examine how they can be used for the description of the painting materials of the time.

In addition to the detailed description and significance of the art materials, two further major topics were considered: First, to highlight the biography of the man who put the

⁶ RICHTER and HÄRLIN 1974a, RICHTER and HÄRLIN 1974b, HARLEY 1975, HARLEY 1979, PEY 1987, PEY 1998, MÖLLER 1999, SCHRAMM and SCHRAMM 1999.

collection together and then to join all manuscripts related to Vigani and his cabinet as transcriptions in the thesis to provide a complete reference for future scholars and underscore the importance of this piece in the history of Queens' College.

The reference work is designed to allow for augmentation and implementation of future research results. This will eventually lead to an online virtual cabinet and create an easily accessible resource for the multi-disciplinary study of the entire Vigani collection.

Methodology

First and foremost, it was noted that the handling of the samples could adulterate the material. Therefore, minimally invasive techniques were employed to maintain the integrity of the collection. Samples were not removed from their storage compartments and the items, which appeared in their original parcels, were not opened. The cabinet and its contents remained in the Long Gallery of the President's Lodge of Queens' College throughout the duration of the study. The drawers were only removed and kept apart from the cabinet for a brief time to take digital images and visually examine the items. The samples were not weighed nor were they manipulated in any other way. Weight and physical assessment will be appropriate with the incorporation of more technical research.

In addition, with this being a collection of natural scientific focus the original raw painting materials were characterised using three criteria:

- Photographic documentation and inventory of the 700 samples in the cabinet, the painting materials within the collection were then isolated.
- Evaluation of (al)chemical, pharmaceutical, and botanical writings, including those by Vigani and close contemporaries
- Analysis of painting treatises of the period

A promising impetus for interpretation seemed to be the integration of the historic natural scientific sources and pharmacopoeias, which so far have been neglected in the field of history of painting technology and conservation. Adherence to the primary text was emphasized when referencing original treatises, manuscripts, and editions of printed books published around the turn of the 18th Century in order to avoid the subjective interpretations and translation errors of later editions. Modern publications

on the topic were also consulted but because Vigani's cabinet provided a very precise example, the information was often not specific enough or considered the material outside its original context.

Furthering the knowledge of these painting materials was more likely to be achieved by looking at a carefully chosen selection of pigments, dyestuffs, and other colorants in detail. The author deemed it more valuable to reduce the number of samples being reviewed to 121 items in order to provide a more in-depth study rather than a general overview of all the fine art materials. The choice for pigments rather than binding media was supported by the fact that chemical analyses, although highly desirable, were not part of this study. Therefore the exact proof of congruence between sample and label could not be established. However, visual examination of pigments allows for a good estimation of the likelihood that Vigani's label was correct and hence the investigations undertaken for that pigment were valuable. Visual assessment is far more difficult regarding gums, oils, and resins.

The description of the samples was standardised using a repeating set of sub-categories in order to allow for easy comparison between the different items. These categories include:

- Terminology
- Composition
- Provenance
- Trade
- Quality/Adulteration
- Properties
- Manufacture
- Preparation
- Use in art and medicine/pharmacology

Structure of the dissertation

The dissertation comprises four parts. It begins with Vigani's biography and includes the reception of his work in contemporary and posthumous sources. A short description of his profile as a collector is also given. Reflecting on the fact that painting materials occur in a cabinet of mainly *materia medica* led to the second part, a brief overview of the development of pharmacology in Vigani's time. This contains an outline of what type of drugs were available in England during that period and examines briefly the preparation, storage, trade, and adulteration of pharmacological agents.

To provide a clear understanding of the relationship between painting materials and the natural sciences the dissertation's third part looks at the development of various scientific disciplines and examines the collecting and systematising trend of the time. This section also includes a resource review from the sciences, related trades, and connoisseurship regarding the types of material and literary sources available from that period, which have an implication on furthering the knowledge concerning painting materials.

The final and most detailed part of the thesis is the inventory section where the contents of each cabinet drawer are documented followed by a systematic description of the selected pigments, dyes, and other colorants provided in order of the sample's respective drawer. This section is prefaced by a history of Vigani's cabinet and the evaluation of the invoices relating to it with special emphasis regarding price and quality comparison of the painting materials.

The dissertation concludes with a summary of the thesis and results of the research as well as an outlook concerning future research possibilities. Finally, an appendix is provided which contains the transcriptions of both lecture notes that are kept in Cambridge⁷, as well as a glossary of (al)chemical terms tailored to the vocabulary and symbols used in these lecture notes. This is followed by a transcription of all financial documents from the time relating to the cabinet as well as a transcription of later correspondence concerning the cabinet or Vigani.⁸

⁷ LECTURE-NOTES undated and LECTURE-NOTES 1707.

⁸ MS Quns Vig. 1 to MS Quns Vig. 18.

1. John Francis Vigani (1650? – 1713)

1.1. Sketch of Vigani's life

John Ferguson, Viganis's first biographer writing in 1894, had very little to go on apart from a few scant dates, a scattering of facts taken from incidental references in portraying a man who was not only to become the first ever professor of Chemistry at the University of Cambridge but also to leave with us a meticulously assembled and well referenced collection of natural scientific specimens found in his cabinet.

Neither growing interest in Vigani nor exhaustive archival work as part of the exploration of the local history of pharmacy in the first half of the 20th Century was able to take these facts much further, let alone dramatically change the story of Vigani's life. To the present day we must acknowledge that the many facets, which shaped the life and character of this man, remain obscured and can only be subject to speculation. Even a glance at his face is denied, since the sitter in the baroque portrait of an honourable middle aged man in a red robe, and white damask scuff, recently investigated at Christie's auction house, London, ascribed to be of Vigani is not authenticated.¹

Vigani was probably born in Verona or the Veronese territory since he calls himself 'veronens' (lat. 'from Verona'). His year of birth is unknown, but FERGUSON 1894 conjectured that it must have been around 1650, *or within ten years of that date*.² This is mainly based on assuming that a treatise like his *Medulla Chymiae*³, first published in 1682, could only have been written by an experienced chemist of some maturity. How exactly Vigani acquired this experience remains uncertain. There is no reference as to where he might have studied, if he had ever studied at a university at all. It is more likely that his knowledge is derived from careful observations, which he made during his extensive travels, of which recorded places include Parma, Seville, Paris, and Holland⁴. Paris certainly was at that time one of the most important and influential centres for vivid discourse on medical and pharmaceutical issues, not to be overlooked by the authorities in other European countries. Both in Paris and Holland collecting was

¹ Personal correspondence with Mrs Maria Georgiadis, Christie's auction house, London, October 2003.

² FERGUSON 1894, pp. 3-5.

³ For discussion of the work see 1.2.2. *Medulla Chymiae*.

⁴ FERGUSON 1894, p. 6. All these places are mentioned in VIGANI 1682.

at the height of fashion⁵, and Vigani might have had the opportunity to visit some of those collections of natural history or materia medica. Vigani himself evidently visited mines and other places of interest to the natural sciences and gathered information on natural phenomena and scientific experiments, for instance in the case of the dog's-grotto in the Kingdom of Naples⁶. Along his way he collected minerals and plants.⁷

The first precise date in his life is the publication of *Medulla Chymiae* from Gdansk in 1682. In or most likely some time before September of that year⁸ Vigani settled at Newark on Trent, Nottinghamshire, where he lived until his death. Newark lay just under 120 km away from Cambridge where he lectured for about 30 years. He must have travelled frequently the long distance between Cambridge and Newark where his wife Elizabeth and two daughters⁹ lived, and where he maintained a pharmacy¹⁰ and kept a laboratory¹¹.

It was around this time that Vigani began to give chemistry lectures at Cambridge, without affiliation to the University or any of the colleges¹². During the course of these years and definitely after 1692 he was working on a new book on chemistry, which remained unfinished and never got into print.¹³ The same or another book, which he wanted to write in Italian and have translated into English, is mentioned in his letters to

⁵ POMIAN 1990 and BERGVELT and KISTEMAKER 1992. Visiting private collections used to be part of a gentleman's travel program. Guest books of collectors as well as travel reports testify to this.

⁶ LECTURE-NOTES 1707, pp. 112-114.

⁷ FERGUSON 1894, p. 6.

⁸ This is evident from the letter of T.R. to Vigani at Newark on Trent from 10 September 1682, printed in VIGANI 1683.

⁹ Frances, baptised on 22 January 1683, and Jane, baptised on 7 March 1685 (FERGUSON 1894, pp. 9, 10). It appears from a footnote in FERGUSON 1894, p. 17 that he also had a son, who died in July 1705, a few months after his birth. The date of the marriage of Vigani and his wife Elizabeth is unknown. Elizabeth died in Newark at the close of 1711, just over a year before Vigani (FERGUSON 1899, p. 306).

¹⁰ HALEY 2002, p. 3; Vigani conveniently advertised for his pharmacy through Cambridge University Press (HALEY 2002, p. 5). Dr. John Yarborough, another pharmacist in Newark, was a good friend of Vigani. He is mentioned as a friend as early as the first English edition of *Medulla Chymiae* (VIGANI 1683).

¹¹ This is evident from Vigani's will made on 19 July 1712 of which a copy is contained with Ferguson's documents at Glasgow University library. In the inventory, which is part of the will, appears the item: *Goods belonging to the Laboratory, value £20* (PECK 1934, p. 38).

¹² From letters and lecture notes the following Colleges are recorded: 1696: Catharine Hall; 1705: Queens'; 1707: Trinity. Vigani corresponded with Dr Covell, Master of Christ's College, and was a friend of Isaac Newton, then at Trinity.

It was also suggested that Vigani might not only have lectured to members of the University, but also to local physicians, pharmacists, and amateurs (COLEBY 1952, p. 47). It was customary to pay for attendance at such lectures, which would have provided a source of income for Vigani.

¹³ Vigani makes reference to this undertaking in some letters, for example BL Add. 22910, ff. 410-411 verso, of the correspondence of Dr Covell.

the publisher Newborough in London.¹⁴ He continued teaching chemistry as well as materia medica and seems to have been affiliated to Queens' College and Catharine Hall¹⁵.

From February 1704 Vigani started to buy samples of materia medica, geological and other specimens, which he arranged as a study collection in an oak cabinet, which was paid for by Queens' College in 1704. This cabinet, Vigani's cabinet as we call it, remained at Queens' College up to the present day. FERGUSON'S note that Vigani finally bequeathed 'his' pharmaceutical and chemical collections to Queens' College, *keeping a friendly remembrance of Queens'*¹⁶ must be questioned, since it was the College, which paid for the bills for both cabinet and samples. Notes of the lectures he gave at his laboratory¹⁷ at Queens' College on and after 19 November 1705 are contained as a copy among Ferguson's documents in Glasgow University Library.¹⁸

The core of Vigani's surviving lecture notes, which contained detailed instructions for medical preparations, suggest that he used such detailed notes to demonstrate them practically in the laboratory based on his extensive knowledge and experience. As the opportunity arose he would explain for example the principle of distillation and different distillation methods, the rectification of alcohol, or general observations on the formation of salts. Although he grouped products with similar preparation methods there was no methodological approach, which would provide the student with a profound, systematic, and structured body of theory of chemistry. Neither would the student have learned how scientifically to design and carry out experiments in order to explore material properties or reaction patterns methodologically.¹⁹ Vigani seems to

¹⁴ Vigani's letters to Newborough between February 1696 and June 1697, BL Birch MS 4276, ff. 171-175.

¹⁵ PECK 1934, p. 36, footnote 1 with reference to the tutor's account book of the said college for the year 1696 with two entrances under the name 'Signior Vigani'.

¹⁶ FERGUSON 1894, p. 17.

¹⁷ That Vigani had his own laboratory at Queens' in this year is evident from the diary notes of his student William Stukeley (STUKELEY 1880-5).

¹⁸ LECTURE-NOTES 1705.

¹⁹ FERGUSON produced a very poor picture of Vigani's professional abilities: *When however he (Vigani) came to the practical problems to be solved he was not prepared even with empirical explanations of comparatively simple phenomena. He was at a great loss to understand the combination of acid and alkali and the general features of salts. In seeing his way through such changes I should consider him to have been less apt than several of his contemporaries* (FERGUSON 1894, pp. 28-29). On other occasion, however, FERGUSON spoke more favourably of Vigani's skills and diligence: *I have no hesitation in saying that Vigani must have been a good experimenter and demonstrator and one of those who liked to gain his ends by the very simplest apparatus and with the least possible trouble* (FERGUSON 1894, pp. 30-31) He added: *His lectures in the Materia Medica are very well done and show no small amount of knowledge* (FERGUSON 1894, p. 32). Another factor, which might have imposed problems on the students,

have observed the structure of crystals under the microscope, coming to the conclusion that: *the crystals will be lesser or greater according to the quantity of moisture, and yet the crystals never alter their proper colour because the crystals of different bodies always keep their different configuration/position of parts.*²⁰ Here we may find Newton's influence and that of his works on colour.²¹ Vigani had utmost respect for Boyle's work and was impressed by Tachenius's theory of acid and alkali.²²

The diary of Abraham DE LA PRYME, an antiquary of Yorkshire, and one of Vigani's students in 1692, has frequently been cited, where we read that Vigani was not only a *very learned chemist, and a great traveller* but also a *drunken fellow*.²³ FERGUSON 1894 was inclined to doubt the accuracy of the latter statement.²⁴ Other students spoke more favourably of him, for instance the medical student William Stukeley, with whom Vigani held a friendship over several years.²⁵

Vigani had friends and contacts among his peers of the medical and chemical professions, for example Dr. Thomas Robson, who most likely wrote the laudatory letter in the introduction of Vigani's *Medulla Chymiae*; Dr J. Troutbeck²⁶, whose designs of chemical apparatuses were included in the London edition of *Medulla Chymiae* in 1683; and the previously mentioned Dr Yarborough.

Vigani was also one of the few regular guests invited to Sir Isaac Newton's rooms at Trinity College. Newton kept a copy of Vigani's *Medulla Chymiae* in his library and enjoyed discussing chemistry with the author.²⁷ *Unfortunately Vigani was tactless*

could have been Vigani's sometimes unintelligible pronunciation of English. Ferguson deduces this weakness from the erroneous spelling of English in Vigani's letters (FERGUSON 1894, p. 12).

²⁰ LECTURE-NOTES 1707, pp. 97-98.

²¹ Newton's *Opticks*, first published in 1704, set forth his experiments, first reported in 1672, on dispersion, or the separation of light into a spectrum of its components. It is a study of the nature of light and colour and the various phenomena of diffraction, displaying the way to make experiments and draw proper conclusions from them.

²² For a fairly detailed account of Vigani's chemistry beyond the scope of this paper the reader may be referred to COLEBY 1952, pp. 52-60, where Vigani's framework of beliefs, his opinions and chemical theories are exposed in front of the chemico-historical knowledge of the time. Vigani's ideas, when relevant in relation to materials used in fine arts, will be discussed in the Inventory of the Cabinet, Vols. 2 and 3 of the dissertation.

²³ FERGUSON 1894, p. 12.

²⁴ FERGUSON 1894, pp. 25-28.

²⁵ STUKELEY 1880-5, p. 49.

²⁶ Troutbeck of Cambridge, who in 1631 was sizar of Trinity College, and later sergeant and surgeon to his Majesty in the Northern Parts. He died in 1684. COLEBY 1952, p. 50.

²⁷ VIGANI 1683 with annotations by Newton in margins of pp. 8 and 9; a few signs of dog-earing. Copy kept in Memorial Library, University of Wisconsin, Madison; see HARRISON 1978, H1685.

*enough on one occasion to tell Newton an improper story about a nun, after which Newton would not speak to him again.*²⁸

Overall, however, as we may judge from Vigani's correspondence and personal contacts he was a person of high esteem and merit as well as considerable social standing. His good reputation was underlined and confirmed when he was invested with a professorship to the University of Cambridge.

This appointment to the professorship in chemistry at the University of Cambridge passed the Senate on 10 February 1703. The award was a purely honorary one in recognition of successfully teaching chemistry in Cambridge for twenty years.²⁹ However honorary it was, it remained an outstanding achievement to hold the first chair in chemistry at Cambridge. Since then the position has continued to grow in stature and importance and is known as the '1702 Chair in Chemistry'.

After 1706, when Bentley, then Master of Trinity College, had completed the erection of a chemical laboratory³⁰ in Trinity College with the aim of concentrating the science subjects in that college, he managed to convince Professor Vigani to use this laboratory and lecture there, which he did in November and December 1707.³¹ Prior to this Vigani apparently lectured for some time in the room, which had been Sir Isaac Newton's laboratory.³²

PECK 1934³³ suspected that some years after delivering the lectures at Trinity, Vigani returned to Newark and kept working in his laboratory there. He made his will on 19 July, 1712.³⁴ Vigani's burial was held at Newark Parish Church on 26 February, 1713.³⁵

²⁸ STUKELEY 1880-5, p. 49 and BREWSTER 1855, vol. 2, p. 408.

²⁹ *Cum Johannes Franciscus Vigani Veronensis Artem Chymicam multa cum laude (non sine magno Studiosorum emolumento) per annos viginti hic apud Nos exercuerit; Placeat Vobis ut dictus Johannes Franciscus Vigani titulo Professoris Chymiae in Academia Cantabrigiensi cohonestetur. Placeat etiam ut super hoc concessione vestra, literas habeat vestras Testimoniales mu(...)neris sui, Professorii, sigillo vestro communi sigillatus. Ad Lect et Concess. 10. Feb: 1702* (Cambridge University Grace Book 8, p. 490). See also DEEKS 1993 on the scientific and socio-political environment that stimulated this move.

³⁰ Bentley earned heavy criticism for this and other expenses he made without seeking consent from the senior fellows of his College. This dispute stretched over several years until 1711. The lectures given in this laboratory by 'a Professor' were also disregarded, as well as the study of sciences as such as there was doubt that they contained anything of value. In connection with all this Vigani's name is not mentioned a single time. The laboratory in question was installed *on the ground floor in the old west range of King's Hall* (WILLIS and CLARK 1886, vol. 2, p. 650).

³¹ Evidence of this is given with the LECTURE-NOTES 1707 of lectures taught by Vigani at Trinity College in November and December 1707. A room in Trinity College is named after Vigani.

³² STUKELEY and WHITE 1935, p. 56.

³³ PECK 1934, p. 38.

³⁴ A copy of Vigani's will is kept with Ferguson's documents at Glasgow University library; see PECK 1934, p. 38 for reference.

Table**Vigani's biography from ascertained dates**

This table lists all dates for Vigani's biography that can be ascertained from existing sources that are referenced in this dissertation or were studied and referenced by FERGUSON 1894.

Year	Event	Reference
(1658)	first London edition of <i>Medulla Chymiae</i> according to some authorities, but might be misprint for 1685	FERGUSON 1894, p. 4
1663	Jan de Waal, Herr van Aukeveen died (suspected dedication to him, <i>Joannes de Waal</i> , in 1682 edition of <i>Medulla Chymiae</i>)	FERGUSON 1894, p. 4 and VIGANI 1682
1671	snake poison swallowing at Parma	FERGUSON 1894, p. 4 and VIGANI 1683
1682	Gdansk edition of <i>Medulla Chemiae</i>	FERGUSON 1894, p. 3 and VIGANI 1682
1682	September, Vigani at Newark on Trent	FERGUSON 1894, pp. 8, 9
1682	10 September, Letter of T.R.	FERGUSON 1894, p. 10
1682	possibly start of teaching at Cambridge	
1683	could be January of either 1682/3 or 1683/4, daughter baptised	FERGUSON 1894, p. 9
1683	London edition of <i>Medulla Chymiae</i>	FERGUSON 1894, p. 9 and VIGANI 1683
1684	March 1684/5, daughter baptised	FERGUSON 1894, p. 10
1684	summary of London edition of <i>Medulla Chymiae</i> appears in <i>Acta Eruditorum</i> , Leipzig	FERGUSON 1894, p. 9 and ANONYMOUS 1684
1685	Reprint of London edition of <i>Medulla Chymiae</i>	FERGUSON 1894, p. 11 and VIGANI 1685
1687	Doubted reprint of London edition, but confirmed with copy at SLUB	FERGUSON 1894, p. 11 and VIGANI 1687
1688	Edition of <i>Medulla Chymiae</i>	FERGUSON 1894, p. 11
1692	Vigani's Italian letter to Dr J. Covell, Master of Christ's College	FERGUSON 1894, p. 11 and BL Add. 22910 ff. 410-411v
1692	De la Pryme Diary entry on Vigani	FERGUSON 1894, p. 12
1693	Leyden edition of <i>Medulla Chymiae</i>	FERGUSON 1894, p. 13 and VIGANI 1693

³⁵ Entry in Newark Parish Church Register.

Year	Event	Reference
1695	10 February 1695/6 Letter to T. Newborough	FERGUSON 1894, p. 14 and BL Add. 4276 ff. 171-173
1696	9 November, letter to Newborough	FERGUSON 1894, p. 14 and BL Add. 4276 ff. 171-173
1697	8 June, letter to Newborough	FERGUSON 1894, p. 14 and BL Add. 4276 ff. 171-173
1698	March 13, letter to unknown (on elixir proprietatis)	FERGUSON 1894, p. 14 and BL Add. 4276 ff. 174, 175
1698	27 September, letter written from Newark to Henry Giles	BL Add. 4276 f. 174
1703	Professorship	FERGUSON 1894, p.3 and Cambridge Grace Book
1705	lecture script Queens' ('Dr Sherrington's MS')	FERGUSON 1894, p. 17
1707	teaching at Trinity College	FERGUSON 1894, pp. 17, 18 and LECTURE-NOTES 1707
1707	letter to R. Cotes (from Trinity?)	FERGUSON 1894, p. 25 and BL Add. 22911 f. 68
1708	letter to R. Cotes (from Trinity?)	FERGUSON 1894, p. 25 and BL Add. 22911 f. 74
1711	Vigani's wife Elizabeth died	FERGUSON 1899, p. 306
1712	Vigani died	Newark Parish Church Register

1.2. Vigani's Works and Writings

Among Vigani's written work three groups can easily be identified:

- Vigani's autograph letters in Italian and English
- the printed chemical treatise *Medulla chymiae* in various editions
- three sets of lecture notes of courses of chemistry and materia medica, which are most likely not in Vigani's hand, but are so closely related, that they are conveniently treated in this chapter

The latter two comprise much of Vigani's way of experimenting and his observations and are thus a source for exploring his first hand experience in chemistry, but also his attitude towards the subjects he taught.

Where these sources do not relate to operations, which involve painting materials, it is not the scope of this research and not the place to extrapolate Vigani's understanding, method, and design in chemistry compared to the standards of knowledge of his time. Neither is a "translation" of his chemistry into modern terms and conditions desirable. Studies of this nature should be left to a chemist and historian of chemistry. However, the appendix provides a glossary of (al)chemical terms and symbols used by Vigani.³⁶

In order to gain a better understanding of the items in the cabinet and why and how they got there, it is of interest to throw light on some aspects of Vigani's chemical work, which underline his character as a scientist and introduce his understanding of material properties. Particular references to painting materials will be treated in the inventory of the cabinet³⁷.

1.2.1. Vigani's correspondence

Vigani's English correspondence, of which letters written between 1696 and 1708 are preserved, is [...] *distinguished by good feeling and bad English and show(s) that he was a person of considerable standing if of feeble linguistic powers.*³⁸

³⁶ See Glossary of Chemical Terms in the Appendix, Vol. 4 of the dissertation.

³⁷ See Inventory of the Cabinet, Part 1 and Part 2, Vols. 2 and 3 of the dissertation.

³⁸ FERGUSON 1894, p. 27.

Vigani's letters are:

Date	From...to	Library Classmark
1692, Aug 2	Vigani from Newark, in Italian, to Dr J. Covell, then Master of Christ's College, Cambridge. Vigani mentions that he was invited to write a treatise on chemistry	BL Add. 22910, ff. 410-411 verso
1696, Feb 10	to T. Newborough ³⁹ , the printer	BL Add. 4276 f. 171
1696, Nov 9	from Catharine Hall, Cambridge to T. Newborough	BL Add. 4276 f. 172
1697, June 8	From Newark to T. Newborough	BL Add. 4276 f. 173
1698, Mar 13	to unknown on elixir proprietatis	BL Add. 4276 f. 175
1698, Sep 27	from Newark to Henry Giles at York about stained glass windows for Thomas Wolloughbi's house	BL Add. 4276 f. 174
1707	from Newark to Roger Cotes, Fellow of Trinity College, and Plumian Professor of Astronomy	BL Add. 22911 f. 68
1708	from Newark to R. Cotes	BL Add. 22911 f. 74

In the preface to the first London edition of *Medulla Chymia*, 1683⁴⁰, there is a letter to Vigani, which is written in Latin by a certain T.R, dated London 10 September 1682. This letter is full of praise for Vigani and his *Medulla*. Troutbeck and Dr Yarborough are mentioned as Vigani's friends. FERGUSON suspected a certain T. Robson as the sender of this letter, who is mentioned in Vigani's correspondence with the publisher Newborough.⁴¹

Vigani's correspondence with London druggists to order specimens for the cabinet survived through the invoices sent by the druggists upon delivery of goods. These invoices receive special attention later on in the dissertation.⁴²

³⁹ Ferguson spells „Newborough“, which is incorrect.

⁴⁰ This letter is known to have been reprinted in the 1685 and 1693 editions of *Medulla Chymiae*. Other copies have not been checked for reference.

⁴¹ FERGUSON 1894, pp. 9, 10, 16, and British Library Add. 4276 ff. 171-173.

⁴² See Vol 1, 4.1. Invoices and financial correspondence, and MS Quns Vig. 1 – MS Quns Vig. 11 in Vol. 4, Appendix.

1.2.2. Medulla Chymiae

According to its preface, *Medulla Chymiae*⁴³ comprises Vigani's discoveries and improved production methods for standard preparations. Vigani aimed at keeping it as short as possible. Therefore *Medulla Chymiae* was clearly not intended to be an entire method of chemistry, but a brief listing of experiment guidelines and observations. It embodies the results of Vigani's own observations without copying from other authors, which is quite remarkable for an author at a time, when such doing was customary.

In the world of science of Vigani's time the *Medulla* found wide, even international distribution. However, it was received with ambiguity, praising it for its brevity, but also testifying a great deal of confusion to it.

FERGUSON 1894 summed up that *his book, [...], was intended to facilitate the learning and remembering of the processes and products, but in no way to supersede the practical treatment of the bodies themselves.*⁴⁴

The Gdansk edition of 1682 (a booklet of 19 pages in volume) was most probably the first edition of this work. Vigani dedicated this edition to *Joannes de Waal Toparcha in Aukeveen*, Holland, whom FERGUSON 1894 identified with Jan de Waal, Herr van Aukveen who had died much earlier, in 1663. However, this identification remains unsubstantiated.⁴⁵ The dedication is neither dated nor is it possible to determine whether the dedication was composed for this edition and printed for the first time in 1682. From the letter of T.R.⁴⁶, printed in the 1683 edition of *Medulla Chymiae*, we may have a hint that *Medulla Chymiae* was indeed composed in Holland. T.R. said that the work was *generated* in Italy, Spain, France, and Germany, and *born* in Holland.

Why *Medulla Chymiae* was first printed at Gdansk remains an unresolved problem, given that Vigani settled in Newark on Trent in that year. It is unknown through which

⁴³ Only the Gdansk edition of 1682 occurs with the spelling *Medulla chemia*. All subsequent editions appear as *Medulla chymiae*, the spelling which is used throughout the thesis.

⁴⁴ FERGUSON 1894, pp. 10-11.

⁴⁵ FERGUSON 1894, pp. 7-8 on the life of Jan de Waal, Herr van Aukveen, with some gaps in the text for names and places. Ferguson considered whether *Medulla Chymiae* and the dedication to de Waal might have been ready by 1663, but the publication delayed until 1682. The dedication is written as if it were to a man who was still alive. Ferguson wondered why Vigani would not have added a mention of the death of de Waal. Ferguson was unable to find a namesake for a de Waal of such great distinction alive in 1682.

⁴⁶ VIGANI 1683, preface.

channels the manuscript of the book reached the publisher at Gdansk or whether Vigani's travels lead him to this town.⁴⁷

A 1658 edition, which would be considerably prior to the Gdansk edition, at a time when Joannes de Waal was still alive, is listed in the works of BAUMER 1782⁴⁸ and ERXLEBEN 1784⁴⁹. However this would only have been between 8 to 18 years after Vigani's assumed date of birth. FERGUSON 1894 wanted to believe that 1658 was most likely a misprint for 1685, the year of the second London edition.

1683 was the year, when the first London edition of *Medulla Chymiae* appeared. It was an enlarged version of the Gdansk edition with 71 pages, dedicated to Wilhelm Count of Devon, Philip Count of Chesterfield, and Thomas Viscount Fauconberg. The dedication to Jan de Waal was not included in this edition. An abstract appeared in *Acta Eruditorum*, Leipzig 1684.⁵⁰ At the request of T.R., Vigani had prints of furnaces included.⁵¹

In 1685 the London edition was already reprinted in London, and, according to some sources, again reprinted in 1687. FERGUSON 1894 doubted, whether the 1687 edition existed for want of a real copy.⁵² However, an example at Sächsische Landes- und Universitätsbibliothek Dresden proves him wrong.⁵³

References to a London edition of 1688 are almost certainly misprints for 1683.⁵⁴

The year 1693 saw an edition of *Medulla Chymiae* at Leyden (Lugdunum Batavorum), edited by David STAM, who augmented the 1683 London edition by inserting a commentary.⁵⁵ This edition is quite carelessly printed.

In 1718 and 1719 posthumous editions appeared in Nuremberg and Jena.⁵⁶

⁴⁷ Within the research towards this thesis no copy of the Gdansk edition could be made available, but it is mentioned in the greeting words to the reader of Vigani's London edition of *Medulla Chymiae* in 1683 (VIGANI 1683), which should be sufficient proof for its existence.

⁴⁸ BAUMER 1782, p. 21.

⁴⁹ ERXLEBEN 1784, p. 12.

⁵⁰ FERGUSON 1894, p. 9, ANONYMOUS 1684.

⁵¹ VIGANI 1683, preface.

⁵² FERGUSON 1894, p. 11.

⁵³ VIGANI 1687, SLUB, classmark RSN 1191103.

⁵⁴ COLEBY 1952, p. 49. It is listed in ERXLEBEN 1784, p. 12.

⁵⁵ Ferguson misprinted the editor as David Olam (sic!) and regarded the commentary as of very little value; FERGUSON 1894, p. 13.

⁵⁶ PECK 1934, p. 35.

146 recipes from *Medulla Chymiae* were included in abbreviated form in KÖNIG'S *Keras amaltheias* in 1693.⁵⁷

The treatise on chemistry in Latin, which Vigani was asked to write⁵⁸, probably remained unfinished and certainly never got into print. PECK 1934 stated that *among Professor Ferguson's papers, however, there are several pages of notes presumably copied from a manuscript book, which would appear to be opening chapters of this book.*⁵⁹ It seems surprising that Ferguson did not mention these notes at all. But COLEBY 1952 referred to two sets of notes, which were lent to Ferguson by Sir Charles Sherrington: A course of chemistry lectures delivered in 1705, which turned out to be lectures given by Vigani at Queens' College, and a course of materia medica.⁶⁰ In his essay COLEBY 1952 treated these latter notes together with the Queens' lectures, which makes it difficult to establish their contents. But it seems they were not in Latin, the intended primary language of the new treatise.

1.2.3. The lecture notes

Three sets of courses on chemistry, taught by Vigani, are known to us:

- *Cours De Chymie. Joan : Francis : Vigani Veronens.*⁶¹ (not dated) at Cambridge University Library, Dd. 12.53.
- *Seignior Vigani's Course of Chymistry at CAMBRIDGE, Coll. Regin. die Novembr 19 1705.*⁶² kept as a copy with Ferguson's documents at Glasgow University Library, MS Ferguson 62
- *Course of Chemistry under Signior Vigani Professor of Chemistry in the University of Cambridge at the Laboratory of Trinity College. November & December 1707.*⁶³ kept at Queens' College, Old Library

A further manuscript⁶⁴, which was believed to consist of notes of Vigani's lectures taken down by John Yardley of Trinity College, turned out to be in the main based on Lémery's *Cours de Chymie*.⁶⁵

⁵⁷ KÖNIG 1693, pp. 135-148.

⁵⁸ Vigani in his letter to Dr Covell, BL Add. 22910 f. 410, and letters to Newborough, BL Add. 4276 ff. 171-173.

⁵⁹ PECK 1934, p. 36.

⁶⁰ COLEBY 1952, p. 51.

⁶¹ LECTURE-NOTES undated.

⁶² LECTURE-NOTES 1705.

⁶³ LECTURE-NOTES 1707.

The notes in the three courses are very similar. They contain straightforward instructions for the preparations of chemical compounds and pharmaceutical recipes, followed by *Observations* with notes on the product, explanations on the methods, and practical hints, mostly without theories and speculations.

The undated and the 1705-courses contain alchemical symbols whereas the 1707-manuscript spells all ingredients and vessels out in full, which might be an indicator for grouping the undated manuscript closer to the 1705-course rather than associating it with the 1707-version. The texts in the undated and 1705-course, however, are not identical. The undated version contains 48 chapters, whereas the 1705-course is a record of 25 lectures. The manuscript from 1707 comprises 39 headings.

FERGUSON 1894 speculated that, *it must have been in the (sixteen) nineties that the small manuscript of Vigani's lectures now in the University Library, Cambridge, was written. [...] presumably the demonstrations were given at Catherine Hall or at Queens'*.⁶⁶ To PECK 1934 these notes appeared to have been written by someone who attended Vigani's lectures.⁶⁷

The authorship of all three volumes is anonymous. In view of Vigani's limited English writing abilities it is almost certain that Vigani himself was not the writer, but that in itself would not entirely exclude his authorship. FERGUSON 1894 believed that, *[...] the extant notes of lectures which he delivered [...] must have been put into ordinary intelligible English by the listener and writer*.⁶⁸ Yet it seems also possible that Vigani drafted a rough version, which was then edited and copied by another hand. The style and order of the text are so coherent that it would be surprising if these notes were actually taken during a lecture.⁶⁹

The manuscript *Seignior Vigani's Course of Chymistry at CAMBRIDGE, Coll. Regin. die Novembr 19 1705* is kept among the Ferguson documents at Glasgow University Library. This compendium is commonly known as 'Dr. Sherrington's manuscript'⁷⁰.

⁶⁴ Caius College MS. No. 631/460 red.

⁶⁵ COLEBY 1952, p. 51.

⁶⁶ FERGUSON 1894, p. 16.

⁶⁷ PECK 1934, p. 40.

⁶⁸ FERGUSON 1894, p. 13.

⁶⁹ Further indicators for a text basis rather than a verbal one (as during a lecture) are given in the introductions to the full transcriptions of the undated lecture notes at Cambridge University Library and to the manuscript from 1707 at Queens' College, see Vol. 4, Appendix.

⁷⁰ Sir Charles Sherrington, F.R.S., lent this manuscript together with others to Ferguson, who produced a copy of them. Among these manuscripts was also a course on materia medica,

Without further investigation it would be very speculative to assume that these notes might be the ones Stukeley took when he attended Vigani's chemistry lectures at Queens' College in the winter of 1705.⁷¹

The book on the course of chemistry taught by Vigani at Trinity in 1707 was discovered in Stockton-on-Tees in 1935 and later acquired by E.S. PECK, who presented it to Queens' College in 1938.⁷²

The three volumes tell us that rather than heavily theorising Vigani was clearly in favour of experimenting, observing and thereby deducing explanations for reaction processes and material compositions. He was well aware of his contemporaries' positions and did not hesitate to raise his voice against authorities such as Lémery⁷³, if he had good reason to believe that the result of his experiments contradicted and therefore corrected their theories. He even challenged the opinion of *all authours* in the case of the discussion on how much common salt counts as a *neutrum*, i.e. containing an equal proportion of acid and alkali.⁷⁴

The focus of his experiments was the formation of salts from metals and acid-alkali reaction patterns, including the definition of a neutral salt or dissolution. Furthermore the proper distillation process of various rectified alcoholic spirits, essential oils, and 'spirits of salts' received a considerable amount of attention.

Despite the use of alchemical symbols and a few remains of the alchemical belief system Vigani should be counted as a chemist who was up to date with the issues of his science even though his was not a very inventive mind that would shape and foster the latest ideas and theories. Still, as we will see in the next chapter, Vigani was to remain highly regarded and important.

FERGUSON 1894 however thought that when Vigani *came to the practical problems to be solved he was not prepared even with empirical explanations of comparatively simple phenomena. He was at a great loss to understand the combination of acid and*

which neither Ferguson nor Coleby directly attributed to originate from Vigani (COLEBY 1952, p. 51).

⁷¹ STUKELEY 1880-5, entry for the year 1705; It would be interesting to investigate whether the Sherrington Manuscript (LECTURE-NOTES 1705) contains drawings of furnaces, which Stukeley apparently had in his book.

⁷² According to a note kept in the bottom drawer of the cabinet; see Vol. 4, Appendix, MS Quns Vig. 15 for transcription.

⁷³ for instance in LECTURE-NOTES 1707, p. 92.

⁷⁴ LECTURE-NOTES 1707, pp. 74-75.

*alkali and the general features of salts. [... and that he had] been less apt than several of his contemporaries.*⁷⁵

PECK, on the other hand, stressed the fact that Vigani, together with Lémery, was one of the first to deny that when antimony was used to make wine emetic, it did not lose weight.⁷⁶ Here again, Peck confirmed Vigani's reputation and success as an able experimenter.

Apart from being knowledgeable about the work of major predecessors in his subject and the scientific discoveries of his European contemporaries, Vigani might also have had regular updates on the scientific development through the Philosophical Transactions of the Royal Society, since Queens' College continually subscribed to their issues since their first appearance.⁷⁷

1.2.4. Reception of Vigani and his Work

1.2.4.1. Contemporary Literature and Eyewitnesses

Among Vigani's students Abraham de la Pryme became the most famous in respect to adding facts to Vigani's biography. In a diary note from 1692, when he was an undergraduate at St John's, he wrote that his chemistry professor was a *drunken fellow*⁷⁸, a reproach that would be intensively discussed by biographers of the late 19th and 20th Centuries. In 1701/2 de la Pryme addressed a letter to Hans Sloane, mentioning that Vigani discussed the virtues of *nostock* (starshot jelly) in a lecture, which de la Pryme attended as a student.⁷⁹

One student who apparently showed considerable interest in the chemical sciences was William Stukeley who attended Vigani's lectures over the course of at least two years. He must have become acquainted with him on more personal terms, since in 1708 he visited Vigani at his home in Newark.

From STUKELEY we have the following record: *This winter, 1705, I went again to Chymical lectures with Signor Vigani at his laboratory at Queens' College. I took down all his readings in writing and have them in a book with drawings of his manner of*

⁷⁵ FERGUSON 1894, pp. 28-29.

⁷⁶ PECK 1934, p. 39. Bradley, who lectured later about Vigani's cabinet, still argued that antimony would not lose weight! (BRADLEY 1730, pp. 28-29).

⁷⁷ The complete set of volumes is kept in the President's Lodge, Queens' College, Cambridge.

⁷⁸ FERGUSON 1894, p. 12, letter from 2 February 1701/2.

⁷⁹ FERGUSON 1894, p. 16.

*building furnaces. He went on in 1707 to state: I continued to be present at Signor Vigani's chymical lectures and this time went through a course of Materia Medica with him. [...] At this time Dr Bentley made a new chemical laboratory at Trinity College and Signor Vigani directed it and was chosen Professor of Chemistry by the University and was the first.*⁸⁰

Further evidence of Vigani's teaching at Cambridge are the materia medica lectures which the botany Professor at Cambridge University, Richard Bradley, delivered based on the specimens in Vigani's and Dr Addenbrooke's⁸¹ collections and brought to print in London in 1730. BRADLEY 1730 may have even lectured in front of these cabinets, since he wrote that there were some specimens of maracassite of gold *in the collection of Materia Medica, by Signore Vigani, which are now in Queens' College, under the care of the Reverend Dr. Davis, the present Master, to whom my self, and the gentlemen here present, are oblig'd for the Sight and Perusal of them.*⁸²

Vigani's chemical work and publication, *Medulla Chymiae*, has been reviewed abroad and was included in a bibliography of the time.

The *Acta Eruditorum*⁸³, edited in Leipzig, reviewed the first London edition⁸⁴ of *Medulla Chymiae* from 1683 already in 1684. This is a good example of the active international exchange of knowledge and rapid transfer of books and their reception within the scientific community.

STAHL 1723 placed Vigani on the side of those chemists who did not fear the hassle of practical experiments and who knew that a theory can only be sustained if it adhered to practical conditions, thus avoiding speculation.⁸⁵

GEORGI 1739 included *Medulla Chymiae* in his list of European Books between 1600 and 1739.⁸⁶

⁸⁰ STUKELEY 1880-5, entrances for the years 1705 and 1707.

⁸¹ Addenbrooke's cabinet is preserved in St. Catharine's College, Cambridge

⁸² BRADLEY 1730, p. 15.

⁸³ ANONYMOUS 1684, pp. 394-5.

⁸⁴ VIGANI 1683.

⁸⁵ STAHL 1723.

⁸⁶ GEORGI 1739.

1.2.4.2. Posthumous Studies

Throughout the 18th and 19th Centuries Vigani's name occurred in major works on the history of chemistry and it was said that students of that subject must have heard of him.⁸⁷ We may conceivably be right in assuming that Vigani's work had a certain lasting impact within his field.

As stated earlier, an evaluation of Vigani's life and work was first properly attempted towards the end of the 19th Century with FERGUSON'S study⁸⁸. The rediscovery of Vigani's cabinet at the beginning of the 20th Century propelled further investigations, predominantly by PECK 1934⁸⁹ and COLEBY 1952⁹⁰. The lecture scripts were at the centre of attention in DEEKS' dissertation⁹¹ in 1993.

With the celebration of the tercentenary 2002 of the '1702-Chair in Chemistry', Vigani's chair at the Department of Chemistry, University of Cambridge, Vigani and his cabinet for a short while received much public attention without, however, casting new light on historical facts.⁹²

Among 18th Century publications Vigani's *Medulla Chymiae* received comments in the chemical treatises of the chemists BAUMER 1782, ERXLEBEN 1784, and BOERHAAVE 1751.⁹³ Albrecht VON HALLER, in 1751, judged *Medulla Chymiae* as confused but praised it for its brevity and ease.⁹⁴

Ferdinand HOEFER⁹⁵, in 1843, judged Vigani in his *Histoire de la Chymie* as a follower of the famous school of Boyle, and as an adversary to the obscure theories of the alchemists. He reiterated Stahl in saying that Vigani placed experiment and observation over theories.

Towards the end of the 19th Century enough time had elapsed to ask the question, "Who was the author of *Medulla Chymiae*?" To find the answer was a task taken on by John FERGUSON, a prominent professor of chemistry at Glasgow University. He was

⁸⁷ FERGUSON 1894, p. 1.

⁸⁸ FERGUSON 1894.

⁸⁹ PECK 1934.

⁹⁰ COLEBY 1952.

⁹¹ DEEKS 1993.

⁹² HALEY 2002, a short discourse on Vigani and his cabinet on pp. 3-6.

⁹³ BAUMER 1782, p. 21, ERXLEBEN 1784, p. 12, BOERHAAVE 1751, vol. 1, p. 136.

⁹⁴ after FERGUSON 1894, p. 30.

⁹⁵ HOEFER 1843.

Vigani's first comprehensive biographer. His short entry on Vigani⁹⁶ in the *Dictionary of National Biography* refers to the same sources as his later and longer Vigani biography lined out in the paper⁹⁷ given to the Cambridge Antiquarian Society in 1894.

Ferguson's study drew mainly on *Medulla Chymiae*, of which he acquired a copy⁹⁸ in 1874, the lecture script⁹⁹ at Cambridge University Library, and the text of the appointment to the professorship in the University Senate Grace book. Further investigation led him to Vigani's letters, his will, some diary notes, and correspondence from contemporaries. From these scattered and often incidental references FERGUSON concluded that *there is nothing for the construction of what might be called a biography of Vigani*.¹⁰⁰

Hence, Ferguson's studies can be acknowledged as the first extensive biography of Vigani. Emphasis lies with the discussion of Vigani's estimated date of birth, his educational background, the character of his teaching and the state of knowledge of his subject. In Ferguson's opinion Vigani only had a very limited understanding of chemical reaction processes. As a teacher his alleged bad pronunciation of English was most certainly a cause for difficulties in following his mainly practical instructions and demonstrations in the laboratory. Despite the often-reiterated statement on Vigani as a *drunken fellow*, Ferguson was keen to clear him of such reproach and draw instead the portrait of a well respected, sincere, and honourable man of good character.¹⁰¹

The editions of *Medulla Chymiae* were discussed with their respective publication dates and places. Particularly the Gdansk and the first London edition were considered. Later

⁹⁶ FERGUSON 1899. The publication date of the *Dictionary of National Biography* is later than the paper to the Cambridge Antiquarian Society. However, from FERGUSON 1894, p. 2 we know that the article in the Dictionary was composed earlier.

⁹⁷ FERGUSON 1894. The typescript of this lecture is contained among the documents in the lowest drawer of the cabinet. The typescript was undoubtedly Ferguson's own script or a carbon copy thereof, which he produced for the lecture. Most likely it came into the possession of Queens' through E.S. Peck after 1933 (see below).

⁹⁸ This may have been the 1685 edition, since he quotes from it on p. 9 of FERGUSON 1894. Ferguson asked here whether a certain statement on Dr Yarborough also appeared in the 1682 and 1683 editions. He must have overlooked that D. Yarbough (sic!) is mentioned as sending his greetings to Vigani via T.R., whose letter is printed in the preface to the 1683 edition of *Medulla Chymiae* (VIGANI 1683); see also 1.2.1. Vigani's correspondence. Ferguson did not have a copy of *Medulla Chymiae* 1682 at hand.

⁹⁹ LECTURE-NOTES undated.

¹⁰⁰ FERGUSON 1894, p. 2.

¹⁰¹ FERGUSON 1894, pp. 25-28. Ferguson took the *drunken fellow* from a diary note of Vigani's student Abraham de la Pryme.

editions were promised to be considered in a bibliography¹⁰², which eventually was not fully explored in Ferguson's paper.

Taking that Ferguson was an extremely able scholar in the field of history of chemistry we may infer that, following Ferguson's study, not much would be revealed beyond his finds and interpretation. None the less, a few points need attention:

A source which was not at hand for interpretation by Ferguson was the volume of Vigani's lectures¹⁰³, given at Trinity College in November and December 1707. They were bequeathed to Queens' College by a later Vigani enthusiast, E.S. Peck. Ferguson's lengthy conjectures on whether or not Vigani was involved in the dispute over the erection of a new laboratory in Trinity College or if Vigani subsequently delivered his lectures there would have been settled by this invaluable source.

Most importantly, with regard to the cabinet, Ferguson's neglect to deal with it must be pointed out.

FERGUSON knew that Vigani had *pharmaceutical and chemical Collections*¹⁰⁴, but it must be doubted whether he had actually inspected them or had the opportunity to access the invoices and other documents relating to the cabinet. The fact that he wrote that Vigani bequeathed these *Collections* – it is noteworthy he only uses the term 'collections' without further specification as to the shape or size of them - to Queens' College¹⁰⁵ would suggest that he had not read the invoices and the cabinet maker's bill. In the same context Ferguson referred to 1730 as the date when the cabinet was still in use in Queens'. It is likely that all Ferguson knew about the cabinet was from Richard BRADLEY'S treatise on Vigani's and Addenbrooke's cabinets of materia medica¹⁰⁶ of that year. Its title alone provides sufficient evidence to be able to say that Vigani had a collection, that this collection was still in Queens' College after Vigani's death and that it was still used in 1730.

E. Saville Peck was a pharmacist and a member of the Cambridge Antiquarian Society¹⁰⁷ who owned a chemist's shop (pharmacy) in Cambridge. He owned and was the donor of the manuscript that is now kept in Queens' College Library. PECK 1934

¹⁰² FERGUSON 1894, p. 11.

¹⁰³ LECTURE-NOTES 1707.

¹⁰⁴ FERGUSON 1894, p. 17.

¹⁰⁵ FERGUSON 1894, p. 17.

¹⁰⁶ BRADLEY 1730.

¹⁰⁷ Which becomes evident from the introduction to PECK 1934, p33.

could not evaluate this manuscript in his paper on Vigani and the cabinet, because the notebook came into his hands after publication of the article.

When Ferguson's paper on Vigani was forwarded from Glasgow University Library to Cambridge Antiquarian Society, the Society commissioned Peck to select passages of local interest and *embody these in a paper together with an account of the Materia Medica Cabinet in Queens' College Library, said to have belonged to Vigani*.¹⁰⁸ This, Peck's paper unfortunately gives no references as to the cited works used for arguments in his text. Peck basically relied on Ferguson's paper and his findings without carrying out further investigations by himself to add to Vigani's biography.

Peck did not read the so called 'Dr. Sherrington's Manuscript'¹⁰⁹, which consists of the notes of Vigani's chemical lectures at Queens' College on and after 19 November, 1705, nor any other of Ferguson's documents on Vigani at Glasgow University library.

Peck's merit is the first study and publication of an annotated list of parts of the contents of Vigani's cabinet and the invoices kept in it, which show the acquisition of material samples from London druggists. He was also aware of BRADLEY'S¹¹⁰ course of lectures on Vigani's and Addenbrooke's cabinets from 1730 but did not incorporate them into his studies.

Peck's attention was first drawn to the cabinet when together with the Cambridge Antiquarian Society he visited Queens' Library in 1922, where he noticed the cabinet under the staircase. The connection between the cabinet and Vigani was made when the President at the time, Dr Fitzpatrick, found several invoices and letters with Vigani's name on them. Using these findings, Peck produced a first inventory of the cabinet's contents, which is kept as an anonymous typescript copy in the lowest drawer of Vigani's cabinet.¹¹¹ This inventory was also published in the appendix of GUNTHER'S¹¹² work, 1937, on early science in Cambridge.

Probably out of curiosity Peck had three essential oils and one balsam from Vigani's collection analysed by Norman Evers. He found that in the majority of cases these substances still complied with the chemical and physical standards laid out in the

¹⁰⁸ PECK 1934, p. 33.

¹⁰⁹ LECTURE-NOTES 1705; See also Vol. 1, 1.2.3. The lecture notes.

¹¹⁰ BRADLEY 1730.

¹¹¹ The typescript copy of this first inventory will henceforth, and particularly in Vols. 2 and 3 of this dissertation, be referred to as the 'Old Inventory'.

¹¹² GUNTHER 1937.

British Pharmacopoeia of 1932.¹¹³ EVERS 1933 subsequently published the results of these analyses in a short article in *The Pharmaceutical Journal and Pharmacist*.¹¹⁴ Peck's lecture was referred to in Cambridge Daily News on 15 February 1933.¹¹⁵

L. J. M. COLEBY¹¹⁶, in 1952, clearly based his biographical information on Vigani on the studies by his two predecessors Ferguson and Peck. His main contribution however is in discussing Vigani's chemical know-how, which characterises Vigani as the skilled experimenter with aspirations of achieving results by the easiest and most direct manner. He particularly commended Vigani's expertise with furnaces. Even though they were very well designed and truly complied with Vigani's principles, Coleby found no confirmation for them being preferred to or more widely used than any other furnaces suggested for use within this period. Sources for his discussion naturally are *Medulla Chymiae* and the three volumes of lecture notes. A further manuscript kept at Caius College Library supposedly containing further lecture notes turned out to be mainly based on Lémery's Cours de Chymie.¹¹⁷

Gunther came across the Vigani cabinet as he helped to curate and scientifically support an exhibition of scientific instruments in the Old Schools in Cambridge, organised by the Cambridge Antiquarian Society in 1936. This exhibition showed Vigani's cabinet together with Addenbrooke's and Heberden's collections. As a result GUNTHER 1937 was able to print a list of the contents of all three cabinets in his book¹¹⁸ on early science in Cambridge, published soon after the opening of the exhibition. The section listing the samples in Vigani's cabinet derives from Peck's inventory.

After Gunther, Vigani had a minor appearance in a list of pharmacists in Nottinghamshire, published by POYNTER¹¹⁹ in 1965.

Vigani's lecture notes were evaluated by DEEKS 1993 with regard to the scientific spirit and socio-political environment at the University that influenced chemistry teaching and Vigani's promotion to the professorship.¹²⁰

¹¹³ EVERS 1933. Tests were carried out on oil of cinnamon, oil of aniseed, oil of cloves, and turpentine. There is no mention of balsam of Peru in the article.

¹¹⁴ EVERS 1933.

¹¹⁵ ANONYMOUS 1933.

¹¹⁶ COLEBY 1952.

¹¹⁷ COLEBY 1952.

¹¹⁸ GUNTHER 1937.

¹¹⁹ POYNTER 1965.

¹²⁰ DEEKS 1993

1.3. The Collector Vigani

PECK, having investigated Vigani's collection described it naturally as a *materia medica* collection with specimens *consisting in the main with substances used in medicine at that time*.¹²¹ He concluded that *these (drugs) are of absorbing interest, as they show in a very clear manner the trend and thought of medical knowledge and practice of those times*.¹²²

Some 200 years earlier BRADLEY 1730 grouped this collection as a *materia medica* collection and compared it with that of the physician Dr Addenbrooke.¹²³

How was this collection assembled and what were the motives for doing so? How did Vigani as a collector fit in with the notion of collecting at the turn of the 18th Century?

From *Medulla Chymiae* we know that Vigani, like many of his peers, collected specimens of natural scientific interest during his travels. However, these ventures did not find direct expression in the collection itself.¹²⁴ The invoices dating to 1703 and 1704 (old calendar system), kept in the lowest drawer of the cabinet, tell a different story.

Vigani acquired most of the pieces using a few orders with apothecaries and druggists in London over a period of just under two years. This contrasts with most other collectors for whom collecting became a lifetime passion. Here the collector is not the owner, but Queens' College, which paid for both, the cabinet and its contents. Although collections were held by institutions, such as certain collections held by the Royal Society in London, their origins were rooted in the interest of individual collectors. Unlike mainstream collections such as these, Vigani's cabinet collection neither had a record of auction, nor could it be linked to any correspondence with other collectors, or to official correspondence from overseas. Indeed, no inventory was made let alone published during Vigani's lifetime.

¹²¹ PECK 1934, p. 45.

¹²² PECK 1934, p. 49.

¹²³ BRADLEY 1730.

¹²⁴ Although some items in the cabinet might have been private contributions from Vigani, however this cannot be properly substantiated, except for Vigani's tartar *Tartar: Cremor J. Francisci Vigani* in cabinet drawer M, compartment 8, see Inventory Part 2, Vol. 3 of the dissertation.

Vigani's intention must be seen as very purpose oriented. He wished to assemble a study collection to illustrate his practical, experimental lectures and support further scientific investigation in these areas. His cabinet was certainly not designed for public exhibition as a museum showpiece or as a status symbol for his own public reputation, or indeed as an example of ethnographica, of which some items can be found in Addenbrooke's collection. Vigani's was focused on a specific scientific purpose linking in with the importance he placed on practical scientific experimentations.

With the same scrutiny, diligence, and precision, which Vigani showed in arranging and labelling his samples, he must have carried out his experiments, fully aware that chemical impurities could mar the experiment. He advised his students of the necessity of testing the reagents. Despite the limitations of knowledge at the time on the exact chemical composition of materials Vigani tried to work with high quality materials in the laboratory and showed ways of quality control and quality improvement through chemical treatment. At the same time he made very rational use of the materials considering economic aspects such as price and availability as well as simplicity and time effectiveness in the choice of materials and processes. All this is reflected in the quality of the samples he obtained for his study and teaching collection.

2. Pharmacy, the Nature of Drugs, and the Drug Trade

with regard to Fine Art Materials in 17th and early 18th Century England

Vigani's cabinet is primarily a collection of *materia medica*, and more than half of it is composed of substances that were ordered from druggists. Its contents cover painting materials, geological, botanical, chemical, and metallurgical specimens. It is worthwhile looking at the development and scientific output of these fields mentioned above in the 17th and early 18th Centuries in order to find out which sources of information relevant to painting materials they produced and how valuable they might be in the future interpretation of painting materials. Some of these sources will later be used to describe painting materials in Vigani's cabinet and will be looked at in more detail in the Inventory of the Cabinet¹.

In the case of Vigani's cabinet at first sight the grouping of painting materials next to drugs is most striking, which suggests that the study of drugs and the history of pharmacy may provide information relevant to the nature and application of fine art materials. Therefore the development of drugs and pharmacy will be treated in more depth compared to other scientific fields, by which the cabinet could be described: botany, chemistry, geology, or metallurgy. All these fields were linked and interwoven in 17th Century England, with the Royal Society heading them as the leading research and publishing institution that was devoted to all these sciences simultaneously.

2.1. Aspects of the Development of Pharmacy

The development of pharmacy in England differed from that on the continent because there were no stable structures within the professions delaying the formation of an educational system and therefore the development of research. Historic events like the Civil War (1642-1649), the Great Plague (1665/66) and the Great Fire (1669) in London, as well as the strong emphasis on trade and economic growth together with expansion in territory and the establishment of the colonial system, suggested different requirements in the trade and use of drugs.

¹ See Inventory of the Cabinet, Part 1 and Part 2, Vols. 2 and 3 of this dissertation.

A brief overview of the history of the pharmaceutical profession and pharmaceutical sciences illustrates the environment that was created around 1700 when Vigani acquired the samples for the cabinet from London based druggists.

Apothecaries, as well as pepperers and spicers, were all more or less involved in the trade and administration of drugs and medicine throughout the Middle Ages. They all belonged to the guild of 'The Company of Grocers', a name that the pepperers had adopted in the early 14th Century.²

In 1617 James I granted a charter to the apothecaries of London, which marked the separation of the apothecaries from the grocers. This charter, largely designed under the influence of Théodore Turquet de Mayerne, the physician to the Royal Court, ensured the formation of a 'body corporate' of apothecaries. This came to be known as the 'Master, Wardens, and Society of the Art and Mystery of the Apothecaries of the City of London' or 'Worshipful Society of Apothecaries of London'. The charter constituted that only freemen of the calling had the right to keep an apothecary's shop. It also set out which products were only to be sold by apothecaries. A regulation for a seven-year apprenticeship with a final exam was introduced. Together with stock surveillance, this system ought to have ensured the rights and duties of apothecaries at a controlled level of quality and expertise. A year later, the first London Pharmacopoeia was issued. These shifts towards legislation, standardisation, and distinction from similar professions resulted from a growing rivalry between grocers, spicers, druggists, and drug dispensing physicians. The rivalry was above all based on economic competition. The charter, however, did not help to solve problems in the long run.

The apothecaries got more and more involved in practical medicine, particularly during the Great Plague in London in 1665/66, when there was a shortage of physicians.³ Thus, where on continental Europe an apothecary's shop represented the wealth and influence of its owner and the respected status of the honoured profession, in England this institutionalised role had not been adopted until the 19th Century. A large number of apothecaries dealt with the prescription and dispensing of drugs, and at the same time acted as physicians or surgeons. Physicians in turn opened up their own dispensing pharmacies.

² KREMERS and URDANG 1951, p136.

³ MATTHEWS 1962, p. 112.

The gap in supply with drugs was compensated by increased activity of druggists in this trade, and as will be shown, it was druggists, from whom Vigani would order the specimens for his collection in 1704/05.

With development of chemistry and the introduction of 'chemicals' as remedies the chemist emerged and by the end of the 17th Century we can observe that *the merchants and druggists, being a section of the grocers' company, merely sold articles in the raw or unprepared state, and the chemists (who were not incorporated) took upon themselves the duty of preparing those medicines which required the aid of the fire and which were chiefly, if not entirely, minerals, earths, or preparations of the metals.*⁴

A slightly different view on this development is that the wider spread of chemicals and the influx of new, unfamiliar drugs from distant countries added so much complexity to the trade, and so prompted some wholesalers to specialise in the trade of drugs alone. Such ventures promised great profit when concentrating on the apothecaries' demands. Towards the end of the 18th Century these salesmen became known as druggists.⁵ In this model or chain of supply the apothecaries were ultimately responsible for the mixing of medical compositions from the drugs, which they obtained from druggists. England was different from Europe in that apothecaries in Europe continued to purchase their drugs from wholesale grocers for much longer.⁶

Looking at the level of knowledge of pharmaceutical science it was very much in the tradition of Greek, Roman, and Arab knowledge on materia medica and alchemy and was passed on over the Centuries via medieval writers building strong resources still in the 17th Century. The antique writings were quite frequently copied and translated up to the first half of the 18th Century. Minds were split over the humoral pathology of the Galenists and the Paracelsian System. The latter led to the introduction of 'chemicals' as internal therapy and iatrochemistry was to become the branch of chemistry, which had its roots in the Paracelsian model of medication.

New scientific discoveries were often not put into medical practice or found very delayed acceptance, even by their own advocates.

⁴ KREMERS and URDANG 1951, p140, a quote taken from: BELL and REDWOOD 1880: *Historical Sketch of the Progress of Pharmacy in Great Britain*. London, p. 11.

⁵ MATTHEWS 1962, p. 67.

⁶ MATTHEWS 1962, p. 67.

Up until the 20th Century none of the great universities in England provided pharmaceutical education as a subject on its own.⁷ Private courses in materia medica were held in London in the 17th Century. The Society of Apothecaries offered some herb-gathering expeditions as a supplement to the seven years apprenticeship⁸, which led to the foundation of the 'Physic Garden' at Chelsea in 1673, as well as lectures in materia medica after 1753⁹. Gresham College, The Royal Society, and the College of Physicians mainly provided medical education and Vigani, who taught materia medica and pharmaceutical chemistry, was granted the first Chair in Chemistry at the Cambridge University and not a chair in pharmacy.¹⁰

The Society of Apothecaries had no interest in the promotion of research. It concentrated on the restoration of the apothecaries' rights, particularly their commercial interest and upkeep of their right to practice medicine. It held a laboratory for the preparation of medicines after 1671, which became a commercial enterprise on its own.¹¹

The next chapter will be dedicated to the drugs themselves, giving a brief overview on the types of drugs available at Vigani's time, their material properties, and interpretational models of their effects on the body. Light will also be shed on acquisition and trade of drugs. Particularly important in respect to the dual application of a substance as a drug and a painting material is the aspect of adulteration.

2.2. Drugs

This chapter is looking more closely at drugs, what materials they were composed of, how they were traded and whether they were adulterated along the way. This might have implications on painting materials, products that often went along that same route as part of drug manufacture and distribution.

⁷ TREASE 1965, p15; whereas in Montpellier and Paris, for example, colleges and faculties of pharmacy were established towards the end of the 16th Century. These should remain highly influential schools of thought within the pharmaceutical and medical profession and provoke disputes amongst the learned throughout Europe.

⁸ TREASE 1965, p14.

⁹ KREMERS and URDANG 1951, p150.

¹⁰ TREASE 1965, p14.

¹¹ MATTHEWS 1962, p191.

2.2.1. Terminology

The word *drug* has been used to designate so-called 'crude' drugs of mineral, vegetable or animal origin, in contrast with galenical preparations or chemicals. In its wider sense, as defined in state and national laws, the term has been made to include all of these and more¹². Within the scope of this research the word *drug* is used in its wider sense.

Interestingly, already ancient terminology linked drugs and painting materials. The word *pharmacy* developed from the greek 'pharmakon'¹³, meaning remedy in a broader sense, and more specifically purgatives in a real as well in a figurative sense. However the word also stood for dyestuff.¹⁴ In Roman times the 'pigmentarii' advanced from being makers of coloured cosmetics' to *rather high-class preparers of drugs and dealers in them*¹⁵. The 'armarium pigmentariorum' became in the Middle Ages the room in a monastery for storing and preparing drugs.¹⁶

Systematic scientific classification of drug names was in the process of being put in place at around Vigani's time, particularly with the advances of botany. Yet there were systems in place that divided drugs by their origin in nature: seeds, barks, roots, gums, balsams, or stones. We can find plentiful such names in Vigani's cabinet, the distinction being made using the Latin equivalents: 'semen', 'cortex', 'radix', 'gumma', 'balsamum', 'lapis' or their respective abbreviations, followed by the name of the substance, in Latin. But also English names were used, which followed a more widely acknowledged colloquial name that can be found in pharmacopoeias. Such names sometimes referred to the person who was said to have invented a certain formula. Most of the names found in Vigani's cabinet were commonly known and can, in the majority, be traced in a pharmacopoeia, or a herbal of the time, sometimes with the application of some variations. Scientific classification of plant names and therefore for the natural origin of crude drugs was introduced towards the middle of the 18th Century with works like *Genera Plantarum* or *Species Plantarum*, published in 1753 by the botanist Carl VON LINNÉ (LINNEAUS).¹⁷

¹² KREMERS and URDANG 1951, p. 542.

¹³ The word had its roots in the Egyptian 'Ph-ar-maki', pilot or conveyor of security (against disease), KREMERS and URDANG 1951, p. 567.

¹⁴ KREMERS and URDANG 1951, pp. 567, 568.

¹⁵ KREMERS and URDANG 1951, p. 568.

¹⁶ KREMERS and URDANG 1951, p. 40, for example: The monastery of St. Gall, Switzerland.

¹⁷ JACKSON 1965, p. 158.

2.2.2. The physical Nature of Drugs

Organic drugs were gained from the plant and animal kingdom, and very rarely from human matter, as in the case of 'mummy. Organic drugs were complemented by naturally occurring inorganic materials and by synthesized inorganic drugs. The following overview is certainly not complete, but gives an idea of the kind of materials contained in Vigani's cabinet and other collections or manuals on drugs:

parts used from plants:

- root
- wood, bark, peel
- leaves
- flowers, petals
- seeds, berries, nuts
- gums, resins, essential oils

parts used from animals:

- bone, horn, teeth
- intestine, bladder
- oil, fat
- poison
- excrement

among inorganic materials:

- various types of earths
- minerals
- mineral waters¹⁸
- metals (e.g. mercury)
- precious stones

synthetic drugs:

- mainly derived from the formation of salts with a metal (containing) component



Fig. 1 (i-iv) *Sanguis Draconis in calamis brevioribus* H/12, *Spanish flies* R/17, *Terra Sigill. rubr.* M/11, *Praecipitatus* E/19

¹⁸ In the early 18th Century it became popular to travel to places with mineral springs. Spa resorts like Bath and Epsom were developed.

During the preparation process further substances could be added to regulate various properties of the remedy, such as: its effectiveness as a medicament, handling properties (size, shape, consistency), durability, as well as preservation and flavour.

Depending on their preservation properties, the drug dealer stocked the medicines ready-made or in a suitable form, which would allow for preparation on demand. The invoices related to Vigani's cabinet give testimony to the extent of stock material and the qualities available to the customer.



medicaments could be given as:

- pills, pastilles, lozenges
- powders
- ointments, creams, plasters
- liquids of different consistency
- and many others

Fig. 2 shows pills and an unguent in earthenware cups and powdered myrrh of Carlisle wrapped in paper, Y/13, Y/14

Drugs were administered externally (for example creams, poultices) or internally (for example orally, inhalation of fumes, vapours). William Harvey (1578 – 1657) suggested that drugs taken by mouth were absorbed into the blood stream. Johann Sigmund Elscholz (1623 – 1688) experimented with intravenous drug injection.¹⁹ The dosages varied a lot because it was not yet possible to quantify the active ingredient in a drug and were mainly based on empirical observations. Some guidelines were given in books on materia medica, as for example in Richard BRADLEY'S *Course of Lectures upon the Materia Medica*, 1730²⁰, which draws on Vigani's and Dr Addenbrooke's material medica cabinets.

In the case that a certain drug was not at hand replacements could be found, which was very common practice. This is because many of the recipes consisted of a large number of ingredients. Some may have had to be substituted by constituents that were

¹⁹ LEAKE 1975, p. 108.

²⁰ BRADLEY 1730.

more easily obtainable. Guidelines for the substitution of drugs could be looked up in manuals²¹.

2.2.3. Believed Effects of Drugs

The concepts behind the uses of drugs depend very much on the perception of the human body and on accepted theory, what the bodily functions are, and how they interact with each other. Also the diagnosis of the illness and how it affects the patient plays a role in the choice of therapy and medicine to cure. These ideas be briefly explored for the 17th Century as they may render a better understanding of the choice of substances in the cabinet as well as the contents and language found in the scripts of Vigani's lectures.

Broadly speaking, in the 17th Century, the Galenical and the Paracelsan concept still influenced the medical professions.

The roots reached back to Galen (131 Pergamon – 201 Rome), who strictly applied the theory of the four humours. Curing was meant to restore the balance of the four humours by drugs, which were ascribed the qualities warm, cold, moist, and dry. Drugs with one quality were called 'simples' and those with more than one quality 'composites'. Drugs which could not be placed within this system but which were efficient by their 'whole substance' had the name 'entities'.²²

Paracelsus (1493 – 1541) opposed this schematic humoral pathology by saying that own experience and experimentation in the process of medical treatment were essential. He saw the body as a chemical apparatus and sickness was produced by a morbid mood of the 'archaeus', or vital force. His concept behind medication involved the four Aristotelian elements, the theory of signatures, and the establishment of the 'tria prima'. The theory of the signatures meant that the outer appearance of, for example, a plant revealed its therapeutic use as a sign given to it by God. The 'tria prima' stood for sulphur, mercury, and salt as equivalents to combustibility, liquidity, and stability. Unlike our present day apprehension Paracelsus held that *all that fumes and disappears in vapours is mercury, all that burns and is consumed is sulphur, all*

²¹ For instance an example of Vigani's time: SCHREIBER 1702.

²² KREMERS and URDANG 1951, p. 23.

*that is ashes is also salt*²³. Analogies like these should be born in mind when reading chemical literature of the 17th and early 18th Centuries. The application of modern chemical understanding to terms like vapours, mercury, burning, ashes, spirits, and salts will cause confusion and can be misleading.

In contrast to so-called 'galenicals', which were drug combinations prepared by mixing individual ingredients, Paracelsus used 'chemicals' for internal therapy. These were products of processes that were believed to be chemical, like distillation, maceration, evaporation, and incineration. Alcoholic tinctures, and 'quintessences' (that is, the most essential product) were extracted from the inert substances of a drug. Something entirely new was supposed to be created by alchemical methods, which could specifically be used for a particular disease.

The understanding of the body as a chemical apparatus prepared the ground for the development of iatrochemistry. Mechanistic and materialistic explanations, which saw the body as an engine working according to physical laws, lead to iatrophysics. Both directions reflect the increase in research in the field of natural sciences of the time. The impact of chemical and physical experimentation led on one hand towards a deeper understanding of the bodily functions (e.g., blood circulation, nervous system, metabolism, respiratory system) and on the other hand towards the search for the active component in a drug and the desire to design specific (artificial) drugs, defined in quality and quantity, on a chemical basis. Where research of this type is reflected in the literature of the time it equally offers the opportunity to study the understanding of what was thought to be the composition of painting materials, as long as they also fell into the category of being used as a drug.

Despite all the discoveries and advances in medicine, the daily practice remained galenic. Bloodletting, starving, and purging were popular. Even physicians who approved of the Paracelsan theory, like Théodore Turquet de Mayerne, resorted to traditional medicines, as in his case can be seen in the records concerning the treatment of the Royal Family.²⁴

Towards the middle of the eighteenth Century we can observe a new trend towards simple medication. Henry PEMBERTON wrote in the foreword of the fifth edition of the London Pharmacopoeia (1746): *It were certainly a disgrace, and just reproach, if*

²³ KREMERS and URDANG 1951, p. 58.

²⁴ MATTHEWS 1962, pp. 47, 76.

*pharmacy should longer be bound with those artificial and irregular mixtures, which the ignorance of the first ages introduced [...] the simplicity of physic was lost (by massing together many drugs) [...] we have here endeavoured [...] to retrench this excess (and) to furnish the shops with a sufficient number of elegant and simple medicines [...] efficacious, well tried.*²⁵

Further theories, which had influence on the choice of drugs, were the animistic school and the theory of vitalism.

It should not be underestimated that apart from such theories, religious belief and superstition played a role in the choice of medicine, particularly in self-medication. Also very practical factors have to be taken into consideration for the choice of a medicament: its popularity, the power of advertising, a famous name, the price, and the persistence of old habits and customs.

2.2.4. Cultivation, Collection, Preparation, and Preservation

Cultivation of drugs was introduced into England fairly late. Cultivation abroad was largely based on gaining economical advantages and ecological independence over middlemen. Due to territorial expansion of some European countries and colonialism many sources for the supply of drugs (amongst other commodities) to other countries were cut off. A way of securing the supply to these countries was to cultivate plants indigenous to a foreign territory on one's own turf.

Another reason for cultivating plants was to obtain the most effective species. Even though differing results led to arguments about the effectiveness of certain drugs, in the long run the scientific observations made on the way led to the establishment of standards for a controlled and reliable dosage of drugs.

Other benefits from cultivation were:

- Out of the entire trade in cargo, drugs only made up a very small percentage. Cultivation helped to cover high demand for certain drugs.

²⁵ Cited after MATTHEWS 1962, p. 79.

- Cultivation of plants used to produce drugs contributed to the establishment and growth of horticulture, such as the Chelsea Physic Garden and the Royal Kew Gardens.

The collection of natural drugs depends predominately on the season of the year and its effect on the growth of plants. Biological factors account for the quality and efficacy of the drug in medical terms. But collecting herbs and plants has always been surrounded by religious belief, cultic ceremonies, myths, legends, and superstition. These patterns go partly in accordance with biologically beneficial factors, for example in some cases of day- or night-time collection. But it has also been suggested that certain rites were established to keep the “uninitiated” or non-professionals from meddling in the business.

Important for the preservation of the ‘virtues’ of drugs was their correct storage. The Greek ‘apothek’ originally meant storeroom. A special storeroom for drugs also used to be called an ‘armarium pigmentariorum’²⁶.

Good preservation strategies became increasingly important with the growing overseas trade. WOODWARD 1696 suggested a universal, standardised method for sampling new plants, recording them and shipping them for cultivation in England to be re-grown from the seeds or roots. He specified how they should carefully be dried and prepared for shipment:

*And there are many Sorts of them [Roots of Plants] that, with very little trouble, might be so ordered that they would grow again when brought over, and set here, tho after a long Voyage. Particularly those which are Bulbous, Tuberous, and Fleshy; [...] These, I say, and all like Roots, may be sent as easily and safely as Seeds, if taken up out of the Ground, and laid out to dry till the Ships come away, and then only put in very dry Moss, Coton, or Sand.*²⁷

On one hand drugs from overseas needed to be carried home in good condition, and on the other hand the fleet had to be supplied with a sufficient supply of drugs for their journeys, their purpose being trade, exploration, or warfare. Stock keeping of drugs for the army was another sector where long-lasting drugs were required.

²⁶ For example so labelled in the map of the monastery of St. Gall, Switzerland; KREMERS and URDANG 1951, p. 40.

²⁷ WOODWARD 1696, p. 27.

Very early on emphasis was laid on adequate storage containers to preserve drugs.²⁸ Several can be found in Vigani's cabinet: various standard size glass bottles with glass or cork stoppers, sealed with parchment or hide and a red seal over the ribbon, glazed earthenware pots with hide tops, as well as paper wraps.



Fig. 3 Small glass bottles opened (left) and originally sealed (right), from Drawer 2/25, and 2/26

It is unclear which profession took on which step in the preparation of drugs, and how reliable they were. Generally speaking, though, around 1700 the druggists sold drugs in their raw state as well as a few preparations. For example Vigani's supplier Porter, a druggist in London, sold *Succus kermes*²⁹, a syrup. Chemists prepared drugs that required chemical operations, and apothecaries as well as physicians eventually prepared the actual medicines from these drugs.

In the case of the drugs bought from Porter and Colchester for Vigani's cabinet, they were in the majority not prepared by the druggist, and most likely not even modified by them. Gums, resins, dried plants, etc. were bought in exactly the way they are displayed in the cabinet. The druggists had the function of getting in the quality that their customers required, which can be seen from the invoices³⁰. Hence we must assume that cleaning and preparation of resins, expression and distillation of oils, as well as the shaping and packing in leaves for transport was carried out in their respective countries of origin.

²⁸ JACKSON 1965, p. 155.

²⁹ MS Quns. Vig. 2.

³⁰ For example MS Quns Vig. 8, introductory letter by Porter.

Preparation methods for drugs were manifold, some purely mechanical, that involved bringing the drug or mixtures of drugs into a manageable and applicable form, others involving so-called “chemical” processes like distillation, maceration, evaporation, incineration, or lixivation.

With the edition of the first London pharmacopoeia in 1618 an attempt was made to take the guessing out of the preparation of medicines by replacing the common expression ‘quantum sufficiat’ (abbreviated ‘q.s.’, for Latin: (add of a substance) as much as shall be sufficient) with exact quantities for a good preparation.³¹ Such weight or volume based measurements however were still not able to tackle the variability of medically relevant ingredients in a drug, dependent among others on quality and level of adulteration of the ingredient.

With the development of analytical chemistry towards the turn of the 18th Century and in the first half of the 18th Century some active ingredients in crude drugs could be separated and defined to a certain degree. For instance, some acids and sugars could be isolated and essential oils separated by distillation.³² This opened the door for a much more accurate quantification of active ingredients in a medical composition.

2.2.5. Adulterations and their Detection

Examining the extent of adulterations of drugs around 1700 and the level at which such adulterations could and by law were detected, can be an important indicator of the extent of contamination and adulteration to be expected in painting materials of the period, and in particular in fine art materials in Vigani’s cabinet.

2.2.5.1. Tests for the Detection of Adulterations

Up to the middle of the 19th Century tests to detect adulteration in drugs were mainly sense-perceptive.

In order to get an idea, whether a drug was adulterated or not, it was helpful to gather precise information on the geographical origin of the plant, its age and the method of collection as well as storage and preservation along the trade route.

³¹ MATTHEWS 1962, p. 76.

³² JACKSON 1965, p. 157.

Taste, smell, and colour were among the main criteria for the assessment of drugs. What to look out for in order to select good quality material was described for example in herbals. Again, descriptions by the classic authors were copied, like John GOODYER did it in his translation of Dioscorides in 1655.³³

Physical properties like density, viscosity, solubility (mainly in water or alcohol) and volatility could be tested at some relatively basic level, where again empirical impressions determined the judgement rather than any comparable quantifying standards. Staining tests were carried out and the reaction of the material to heat, its flammability and the flame itself were observed. We also find acid-reactions amongst the very ancient testing methods³⁴.

The microscope, though improved for up to 200 times magnification by the textile merchant Antonius van Leeuwenhoek³⁵ (1632-1723), did not find its application in the detection of adulterations nor in any other field of chemistry of the time, but was used in anatomical studies of plants, animals, and man.³⁶

BOYLE 1690 showed in *Medicina Hydrostatica or Hydrostatics applied to the Materia Medica* how differences in specific gravity could be used to detect adulteration of drugs.³⁷ His method found wide application only about a century later. Boyle thought that this method could also be useful in distinguishing between samples of the same substance but from different geographical origin.³⁸

POMET 1694 in *Histoire générale des drogues. Or: le Marchand sincère*³⁹ emphasised adulteration and its detection, but did not include Boyle's method. The tests for animal and vegetable drugs were mainly sensory, whereas those for minerals and chemicals reflect the advances in analytical chemistry, although often in a very empirical way.⁴⁰

³³ JACKSON 1965, p. 154, referring to: GUNTHER, R. W. T. 1655. *The Greek Herbal of Dioscorides, illustrated by a Byzantine A.D. 512*, English by John Goodyer A.D., Oxford, privately printed.

³⁴ Pliny was the first to record the tannin – iron reaction as a test whether verdigris had been adulterated with ferrous sulphate (KREMERS and URDANG 1951, p. 22).

³⁵ Van Leeuwenhoek was a draper and first used the microscope in his business to count threads of fabrics; UDWADIA 2000, p. 211.

³⁶ JACKSON 1965, p. 159 and UDWADIA 2000, p. 211.

³⁷ MATTHEWS 1962, p. 68.

³⁸ STIEB 1966, p. 13, 14.

³⁹ The English edition appeared in 1712 as *A Compleat History of Drugs, 2 Volumes in 1*, augmented by material from Nicholas Lémeray and Tournefort. This edition was dedicated to Hans Sloane, who was at the time physician to Queen Anne and secretary to the Royal Society (STIEB 1966, p. 15).

⁴⁰ STIEB 1966, p. 15.

We can observe that recommendations of the ancient authors still bore some authority, as exemplified in John HILL's translation of Theophrastus' *History of Stones* (published in London as late as 1746), which includes a chapter on the quality control of minerals. Lémery introduced the use of ash values in the evaluation of crude drugs.⁴¹

According to STIEB⁴², the first work which wholly and exclusively deals with adulteration of drugs is Adolph Gottlieb RICHTER'S *De Corruptelis Medicamentorum cognoscendis Tractatus medico-chymicae*, which appeared in Dresden and Leipzig in 1732, nearly 30 years after Vigani had completed his collection and at around the time when Richard Bradley must have made use of the cabinet.

Methods of detecting adulterations in art materials were first substantially and more methodically a subject of chemical scientists. DOSSIE edited a standard work on this subject, *The elaboratory laid open,; or, the secrets of modern chemistry and pharmacy revealed*:⁴³ in 1758, the same year in which he published the first edition of the *Handmaid to the arts*⁴⁴. *The Handmaid* contains abstracts of extended versions in *The elaboratory* dealing with adulterations of painting materials and their methods of detection.

2.2.5.2. Quality Control - Regulations for the Detection of Adulterations

In England, regulations to prevent drug adulteration and other ways of deceiving the customer with regard to the quality or quantity of drugs reach centuries back. The pepperers of London, for example, were condemned in 1316 for mixing wares by adding weight to spices and drugs by wetting the sacks or by dressing up bales of goods in order to deceive.⁴⁵

In 1456, the grocers were given the exclusive right to 'garble' – that is to sift and select – all drugs, spices, and other imported merchandise, a right they retained until 1687, when the last City Garbeller paid a fine to hold his office for life.⁴⁶ Each consignment had to be inspected and classified. Contaminated goods were confiscated or the

⁴¹ JACKSON 1965, p. 156.

⁴² STIEB 1966, p. 17.

⁴³ DOSSIE 1758a.

⁴⁴ DOSSIE 1758b and DOSSIE 1758c.

⁴⁵ MATTHEWS 1962, p. 33.

⁴⁶ JACKSON 1965, p. 156.

importer would have been fined.⁴⁷ But the integrity of the garbellers and the methods they applied in order to survey the traders seem to have been doubted.⁴⁸

As far as drugs were concerned, the permission to search apothecaries' wares was transferred to the College of Physicians in 1518.⁴⁹

In the 17th Century the call for good quality drugs was also linked to the battle for recognition of the profession of apothecaries and the accreditation of the rights they claimed. Thus, DE MAYERNE and ATKINS formulated in a letter to James I:

*In these latter Years very many Empirics and unskilful and ignorant Men [...] not well instructed in the Art and Mystery of the Apothecaries [...] do make and compound many unwholesome, hurtful, deceitful, corrupt, and dangerous Medicines [...] to the abuse and scandal [...] of the learned Physicians [...] and of the Apothecaries of our City of London, being educated and expert [...] but also the great peril and daily hazard of the lives of our Subjects.*⁵⁰

The 1617-Charter granted the Society of Apothecaries

*[...] the right of survey, search and correction of all who exercised the art of apothecary, whether they were freemen of the Society or not, within the City or seven miles round, to go into any shop, house or cellar, to test the wares offered for sale – besides testing the skills of the person concerned.*⁵¹

To which extent such rules were obeyed and whether it effectively helped to improve the quality and purity of drugs remains obscure. We should bear in mind that the trade in drugs was a profitable business with possibly many stages involved from the collector or manufacturer to the consumer of the medicine. As a consequence, drugs were quite likely subject to adulteration. Furthermore, lacking precise testing methods and *in the absence of reliable standards [...] the garblers had to depend on the appearance, taste and smell of the commodity and it is not surprising that a number of*

⁴⁷ MATTHEWS 1962, p. 35.

⁴⁸ Publications like the following point to this fact: *A profitable and necessaire Discourse for the meeting with the bad Garbelling of Spices used in these daies*, printed in London by R. B. for Thomas Man, 1591/92 in which proposals are made for remedying defects in the methods then current (MATTHEWS 1962, p. 35).

⁴⁹ KREMERS and URDANG 1951.

⁵⁰ MATTHEWS 1962, p. 42.

⁵¹ Text of the Charter cited after MATTHEWS 1962, p. 43.

*adulterated materials escaped detection, particularly among powdered drugs.*⁵² In this context it is interesting to note that none of the above-cited regulations states the exact methods and procedures by which the control of the quality of the goods should be carried out.

Adulteration of pigments, usually sold at druggist's shops, was frequently mentioned in painting treatises. NORGATE addressed the cleaning of pigments in the first paragraph of his treatises relating to painting as such, even before he gives an overview on the pigments used in limning. This preliminary warning reads:

*(...) there is nothing more requisite in this excellent Art (...) Then is the true order and manner of the Colours, the meanes to prepare them ready for the pencill and to cleanse them from those grosse and corrupt mixtures and faeces, where with by the Art and avarice of those that sell them or the carelesnes of those that make them, they commonly are sophisticated.*⁵³

The analysis of fine art materials in Vigani's cabinet presents an opportunity to look into the level of purity of these materials with reference to their source: the druggists Colchester and Porter in London.

Naturally, nobody wanted to be liable for deceptions. Therefore a common feature was to blame foreigners, in particular the "Levantines", disbelievers, as well as small retail dealers for adulterating drugs.⁵⁴

2.2.6. Trade and Distribution of Drugs

By the latter third of the 17th Century up to 70% of drugs imported into England came from outside Europe.⁵⁵ A proportion of these were re-exported to Scandinavia and the North American colonies. It was estimated that the import of drugs into England was at least two times greater at the end of the 17th Century than at its beginning. 95% of imported drugs came through the Port of London. The trade, which was mainly in the hands of the East India traders, only comprised 1 or 2 % of all imported trade goods

⁵² JACKSON 1965, p. 156; detecting adulteration in drugs with the aid of the microscope where other analytical methods failed was not introduced before the second half of the nineteenth Century (JACKSON 1965, p. 160).

⁵³ MULLER 1997, p. 58-59.

⁵⁴ Pommet for example in POMET 1694, see also STIEB 1966, p. 16; Dossie blamed the *sordidness and ignorance of the Jews, and other low people* (DOSSIE 1764, p. xiii-ix of introduction).

⁵⁵ ROBERTS 1965, p. 170.

and therefore only formed sidelines to make up cargoes. Upon arrival the drugs were bought by druggists who sold them to provincial apothecaries. Orders were sent to London by couriers who returned with the parcel a few days later.⁵⁶ This procedure can be seen in the financial documents relating to Vigani's cabinet.

Generally speaking, by the beginning of the 18th Century regional wholesaler middlemen were established. Processing of the samples was then carried out by the local apothecary. Only minerals and 'chemical medicines' were processed by so called chemists, however with time they became more and more involved with drug processing and retail, as apothecaries took on more aspects of practical medicine.⁵⁷

A problem posed by the customs, was the disruption of goods when they were handled for inspection. WOODWARD 1696 described how to take care of the goods and avoid interference upon arrival in the port:

*[...] for the natural things, that are thus sent over, great Caution ought to be used that the Boxes wherein they are, be not turned topsy-turvy, or much tumbled and shaken in carrying to and from the Ship. And above all, that the things be not broken, or rifled and confounded by the Custom-house Officers and Searchers; which may be prevented by giving timely notice to your Correspondents here to get a Warrant, from the Honourable the Commissioners of the Customs, that the Cases and Boxes may not be searched on Shipboard, but brought into the Customhouse Ware-house, and that some careful person attend there at their opening, to see that no Inconvenience or Damage befall them.*⁵⁸

This passage specifically refers to samples of natural things being collected, preserved, and sent over to England to advance the knowledge of the environment in other continents. However it can be imagined that after the shipment of drugs the same care might have been taken occasionally by diligent tradesmen to carefully process the cargo upon arrival in the London port for quality's sake.

Many professions took on dispensing of drugs: apothecaries, druggists, grocers, physicians, surgeons, or whoever believed to be fit for doing so. There was a huge rivalry for profits. The Society of Apothecaries started setting up a laboratory for the preparation of chemicals and galenicals in 1671 with contributions from participating

⁵⁶ ROBERTS 1965, p. 171.

⁵⁷ ROBERTS 1965, p. 172.

⁵⁸ WOODWARD 1696, p. 37.

members and sharing of the profits.⁵⁹ The establishment of the dispensary physicians as a branch of the Royal College of Physicians in 1698 was an attempt to regulate the amount of drugs and ingredients in them as well as to offer a moderate price. The situation of drug provision in London around 1700 was controversial, an example of which is a merchant's letter⁶⁰ in favour of the dispensary, which sold medicines at a third of the customary prescription price⁶¹ to undermine the apothecaries' business. One of his accusations was that there were too many shops selling drugs, so that the turnover of the goods, and particularly of mixtures was too slow, so that the active ingredient in a drug may already have evaporated or the mixture gone bad by the time of selling, whereas the dispensary physicians allegedly made all mixtures upon request, and discarded leftovers instead of keeping them.⁶²

Profits were increased by forming partnerships⁶³ and through advertising. Vigani for example used the strategy of 'friendship prices' for old customers in 1709 for drugs from his Newark pharmacy, the flyer conveniently printed at Cambridge University Press.⁶⁴ Patents for drug formulations started to be set up, with 'Epsom Salts' (magnesium sulphate) being the first in 1698.⁶⁵ These efforts might have contributed to fluctuating prices as observed by an anonymous author of a painting treatise:

*Dragon's blood may be had, as the others (resins and gums and isinglass, the author), at the Druggists, but the Prices I set not down, because they generally rise and fall.*⁶⁶

There was also a reverse trade in drugs going on: not only were drugs imported from foreign countries, but in the opposite direction the fleet had to be provided with drugs and an increasing demand was to be covered in India, Indonesia, and other destinations of the growing Empire.⁶⁷

⁵⁹ MATTHEWS 1962, p. 191.

⁶⁰ ANONYMOUS 1701b. This was opposed with ANONYMOUS 1701a or ANONYMOUS 1702, talking of a 'medical war', and indeed, the dispute can be followed in numerous pamphlets published in those years.

⁶¹ TOMSKI 1976, p. 41.

⁶² ANONYMOUS 1701b, without page number.

⁶³ MATTHEWS 1962, pp. 54-55.

⁶⁴ VIGANI 1709.

⁶⁵ TOMSKI 1976, p. 46.

⁶⁶ K., p. 26.

⁶⁷ MATTHEWS 1962, p. 190.

BRADLEY 1730 observed a tendency towards narrowing the range of drugs and compounds in apothecaries *in order not to trouble memory*⁶⁸. The College of Physicians decided to discard some of these materials, with the consequence that they could not always be had in the shops. *It may be, that a Physician will not in six years call or write an order for many scarce Things till they have lost their Virtue. For this Reason, they (the College of Physicians) have appointed proper Substitutes to those which were esteem'd difficult to be had, and were not of long Duration, as one may see in the College Dispensatory, lately published.*⁶⁹

Around 1700 painters could, if their desired pigment was not to be found at a druggist's shop, resort to specialised colour shops. Here pigments were available ready ground, as SMITH 1705 mentioned:

*Those that lift (or list) not to be at the trouble of grinding colours themselves, may have of any sort, ready ground, at the colour-shops, at reasonable rates, either in smaller or larger quantities as they have occasion, from an ounce to any weight they desire.*⁷⁰

He added that *unless you intend to bestow some cost, you need not be at the trouble to wash your colours, but use them for coarse ordinary work, as you buy them at the shops.*⁷¹

This indicates that the pigments in the shop were of good but not very good quality and needed refinement when used for fine art painting purposes. Smith's book on oil painting, however, is tailored particularly to the coarse, ordinary work: the decorative painting of timber. SALMON mentioned specialist colour shops as early as 1701.⁷²

⁶⁸ BRADLEY 1730, p. 11.

⁶⁹ BRADLEY 1730, p. 12.

⁷⁰ SMITH 1705, p. 35.

⁷¹ SMITH 1705, p. 32.

⁷² For example *ceruse* could be bought at the colour-shops; SALMON 1701, p. 100.

3. Collecting and systematising – Sources for Painting Materials circa 1700

The discussion of literary and material sources that are available for research into historical painting materials clearly focusses on England and is strictly tailored to publications with close proximity to the time frame within 50 years before or after Vigani's cabinet. This was deemed essential to be able to provide data that could be estimated to have the most valuable authentic information. However, it must always be taken into consideration that older works were incorporated, copied, and misleadingly edited as new material. On the whole it must be said that extracting from foreign or English books and editing copies under other names or pseudonyms happened to be very popular. Therefore it is often difficult to trace the source of a book and establish whether its contents were really up to date with contemporary knowledge or reflected traditional or even old-fashioned belief.

The 17th Century saw strong emphasis on categorising and systematising in nearly every discipline. This search for international standards is very well expressed in WOODWARD'S *Brief Instructions For Making Observations In All Parts of the World*¹, 1695, in terms of methodology of observation, logging of observations, ways of sampling, and even calibration of equipment.

3.1. The natural sciences and pharmacology

The development of the natural sciences was characterised by an ambition for diligent observation without prejudice or dogmas. Experiments were carried out to verify hypothesis and quantitative measurements replaced qualitative impressions. It was aimed to condense scientific observations into mathematical formulae.² With the formation of the Royal Society in 1662 these ambitions were taken to an international level, and for the first time there was a wide acceptance for publicising research.

¹ WOODWARD 1696.

² UDWADIA 2000, pp. 192-193.

The Royal Society achieved this with their *Philosophical Transactions*, one of Europe's oldest scientific journals that continues to be published to the present day, an important mirror of the research of the time. The *Philosophical Transactions* are an invaluable archive for study of painting materials, which has certainly not been explored to its full potential. An example lies in the communications of scientists on journeys abroad as well as on research by well known scientists of the international community who published their latest observations on manufacturing techniques, for instance in the case of smalt, or anatomical structures, as in the case of cochineal, or on a suggestion for an internationally acknowledged colour scheme to present drawings of plants.³ This last even contained labelled colour samples. Already this small list of articles shows the wide range of disciplines from which information can be gained.

The Royal Society also entertained the acquisition and foundation of collections, so for example one on Chinese inks and varnishes.⁴ They were also bequeathed with compilations of herbals.⁵

It was the merit of the Society of Physicians with strong influence of DE MAYERNE that in 1618 the first London Pharmacopoeia went into print.⁶ It appeared later than most of the pharmacopoeias in Europe. Despite its name it was the first official pharmacopoeia that applied to the whole of England.⁷ Until the middle of the 18th Century the London Pharmacopoeia saw 5 editions (in 1618, 1650, 1677, 1721 (compiled by Hans Sloane), and 1746). These revised editions gradually incorporated the new drugs being imported from East Asia and South and Central America. Hence it presents an excellent source for the study of binding media.

The official Pharmacopoeia was much copied, English translations published, and altered (extended or shortened versions depending on the point of view of the editor) examples under similar title issued.⁸ Short versions of the Pharmacopoeia and private recipe collections were published as dispensatories⁹. These often acquired high

³ Just to name a few articles that are concerned with these and other topics, of which those with very close proximity to Viganì's collection are: COLE 1685; WALLER 1686; VAN LEEWENHOEK 1693; BENT 1698; HARTMANNUS 1699; ANONYMOUS 1700; PETIVER 1700; SHERARD 1700; SLOANE 1700; FLOYER 1702; PETIVER 1702; KRIEG 1704; VAN LEEWENHOEK 1704b; VAN LEEWENHOEK 1704a; PETIVER 1705.

⁴ SHERARD 1700.

⁵ PETIVER 1700; PETIVER 1702.

⁶ LONDON 1618.

⁷ MATTHEWS 1962, p. 74.

⁸ For example PARKINSON 1640.

⁹ For example SALMON 1683; BROOKES 1753.

esteem, like Nicholas CULPEPER'S *A Physicall Directory or A Translation of the Dispensatory made by the College of Physicians in London* (London, first published in 1649), or Bate's Dispensatory. Such dispensaries may equally be consulted for the study of painting materials.

In the discipline of pharmacy standard works of contemporary authors of continental Europe were either known and referred to in English publications, or existed as an English translation. Emphasis was laid on French and German works, particularly in chemistry and materia medica. In contrast original English pharmaceutical literature of scientific standard was rare. The instability within the profession of apothecaries and the rivalries with both the grocers and the physicians must be accredited for both the lack of literature based on discoveries in research and for a vast number of pamphlets in favour of one's own party or attacks on their rivals.¹⁰

It was indeed in the field of chemistry that major advances were made towards the end of the 17th Century. Systematic experiments to establish the effect of drugs on animals and human beings began. This went along with systematic terminology and characterisation of botanical drugs. It was observed that different specimens of the same plant could also be different in effectiveness as a remedy. Analytical chemistry and quantitative methodology started to develop as a means to find and quantify the active ingredient in a certain drug¹¹, but it was predominantly inorganic chemistry where reaction processes could be schematised and models for their explanation found. In the focus of interest was the formation of salts, acid/alkaline reactions, the corrosion of metals, and towards the beginning of the 18th Century oxidation processes in general and the character of gases. All of these observations can be seen as supporting more accurate, precise, and defined sources of increasingly reliable information relevant to painting materials. VIGANI'S *Medulla Chymiae*¹² is an example of the experiments predominantly in inorganic chemistry, as are the scripts of his lectures¹³.

Robert DOSSIE, more known in the world of art technology for his painting treatise *The Handmaid to the Arts*¹⁴, was actually a distinguished doctor and chemist, who

¹⁰ This accounts in particular for numerous works on drug adulteration, which cannot be relied on, since they present the subject with much exaggeration; STIEB 1966, p. 18 and footnote 84 on the same page.

¹¹ LEAKE 1975, p115.

¹² VIGANI 1683 and later editions.

¹³ LECTURE-NOTES 1707; LECTURE-NOTES undated.

¹⁴ DOSSIE 1758b; DOSSIE 1758c.

published extensively in this field. His chief work of interest to the analysis of fine art materials, *The Elaboratory laid open*¹⁵, is admittedly somewhat late with regard to Vigani, published in 1758, the same year as an edition of *The Handmaid*. However, this book is one of the very rare examples that give detailed, well-presented, and valuable information on the detection of adulteration of painting materials. But this work did not remain without heavy criticism by a fellow scientist, who reproached that Dossie claimed to have *given full instructions for the fabrication of the apparatus, there not having been, before, any attempt towards accommodating the instruments of chemistry solely to experimental purposes. The attempts for this purpose of Glauber, Vigani, Becher, and Doctor Shaw, are well known. How far our author's apparatus comes short of some of theirs, and how much he has borrowed from a later writer, Cramer, will be obvious upon comparison.*¹⁶

Biology together with anatomy and chemistry became one of the principal branches of the medical curriculum. In 1730 BRADLEY commented that biology had been neglected in England over the past years. The neglected *Physicks-Garden* in Oxford was now about to be restored by Dr. William Sherard, the late consul of Smyrna, *whose skill in Botany was hardly equall'd by any in Europe*¹⁷. Bradley was commissioned to find a suitable piece of ground for a botanical garden at Cambridge University. Botanical gardens furthered the knowledge about foreign plants beyond the traditional sources in the shape of herbals, travel reports with drawings and samples brought in through trade. This had an impact particularly on materials used as binding media, such as resins and gums, which were much more frequently reported on: either on the plants themselves and by sending samples over, or by reporting the use and preparation of the substance in the country of origin, or by describing its medical properties.

Within the tradition of alchemical literature a new group could be established that provided a key to the often cryptic alchemical books. These reference works explain alchemical terms and symbols in an encyclopaedic manner, thus facilitating access to chemical writings like those of Vigani's lecture-notes, where the *Medicinisch-Chymisch- und Alchemistisches Orakulum* proved very useful.¹⁸

¹⁵ DOSSIE 1758a.

¹⁶ A.Z. (1760). *Remarks on Mr. Robert Dossie's Institutes of Experimental Chemistry, in A Letter Addressed to the Auhors of the Review, &c.* London, printed for S. Hooper.

¹⁷ BRADLEY 1730, p. 2.

¹⁸ ANONYMOUS 1755 in the commented transcription of SCHNEIDER 1962.

Symbols can be replaced with the names for substances, vessels, or processes. Nonetheless, it is important to know that only few symbols, such as for the elements, were uniformly used. There were no international, not even national standards for the use of the majority of symbols. Furthermore, their meaning could vary considerably. Authors seem to have chosen their own repertoire of symbols out of the multitude of symbols, which re-occur in their texts with a particularly widespread meaning or one that only few authors, if not only the author himself, were accustomed to.

Material resources are present in collections such as those by Vigani, the physician Addenbrooke¹⁹, or the geologist Woodward²⁰. These collections have so far not received a great deal of attention from art technological studies and still need to be discovered as such.

3.2. Arts

In the field of the arts painting treatises account for the main type of reference work apart from paintings of the period that can be analysed, but then usually not without interference to the art work. It has also been possible to analyse painters' palettes or paints that were part of a painter's studio equipment, but those studied so far generally do not date back earlier than the 19th Century.²¹ A lucky find was *Das Einnahmen- und Ausgabenbuch des Wolfgang Pronner* from the late 16th Century which links the acquisition of painting materials to the actual paintings carried out at a German court.²²

Generally speaking painting treatises are more specific about pigments and their properties, than about binding media, whereas the sources from the natural sciences are much more concerned with gums and resins, that fall under binding media.

Historic painting treatises have been the subject of intense study that has lead to the standard reference works of TALLEY²³, HARLEY²⁴, and CARLYLE²⁵, as well as the ever

¹⁹ BRADLEY 1730.

²⁰ WOODWARD 1728; WOODWARD 1728-29.

²¹ For example RICHTER and HÄRLIN 1974; SCHRAMM and SCHRAMM 1999.

²² HALLER 2005.

²³ TALLEY and GROEN 1975; TALLEY 1981.

²⁴ HARLEY 1969; HARLEY 2001.

²⁵ CARLYLE 1988; CARLYLE 2001.

expanding series *Artists' pigments*²⁶. While TALLEY is mainly concerned with flesh painting in limning in the 16th and early 17th Century, HARLEY covers Vigani's time, discussing sources between 1600 and 1835 in a very concise manner for each pigment. Again, information on binding media is hardly included. CARLYLE'S work, that also does treat binding media as well as pigments focusses on the 19th century with only few references to the 18th Century. A detailed study that remains very close to the original text for the period between c 1600 and 1750 is missing. This dissertation aims to work on this basis, including a few treatises that have hitherto not been referenced anywhere else.

The authors of painting treatises, manuscripts or printed works, either drew from their own artistic experience, like NORGATE²⁷, or, more often than so far considered, were composed from authors with a background in the natural sciences like Dossie, or indeed physicians, like de Mayerne, Dufresnoy²⁸, or Salmon. They either drew on their own amateur experience in painting, incorporated their medical or biological knowledge into the subject, or copied from older sources. In few cases, like DE MAYERNE²⁹, they visited artists' studios and gained first hand advice through interviews.

The tight links between the natural sciences and the arts are mirrored in the authorships of treatises related to the arts. The interdisciplinary exchange of materials, specimens, as well as techniques and painting as a highly esteemed recreation of gentlemen can be accounted for the authorship of painting treatises not only by artists but also by scientists with an artistic interest. In some cases the necessity of describing and publicising finds, for example in botany, stimulated the interest in painting techniques. *Alexander Marshal (d. 1682), whose reputation as an artist dates from about the time Norgate was writing, was both a limner and flower painter, employing very similar techniques in both arts. A horticulturalist himself, with a circle of like-minded friends such as John Tradescant and General Lambert, whose son John was also an amateur artist, Marshal painted many flower pieces and a few portrait miniatures (...).*³⁰

²⁶ ROY 1993; FELLER, ROY et al. 1994 reprint.

²⁷ Transcribed and commented on in MULLER and MURRELL 1997.

²⁸ DUFRESNOY 1716; de Piles said that Dufresnoy should have become a medic, and that his father was an apothecary in Paris; PILES 1706, p. 363.

²⁹ VAN DE GRAAF 1958; BISCHOFF 2002; FAIDUTTI and VERSINI post 1967.

³⁰ MULLER and MURRELL 1997, 'Historical note' no. 8, p. 115.

Another important representative, demonstrating this relation, is the physician and professor of medicine William SALMON (1644-1713). He published extensively in the field of medicine and wrote one book dedicated to drawing, limning, and painting.³¹

Salmon's influence as a learned alchemist and chemist shows in some rather 'chemical' pigments, which he suggests for use. These are for example *Caput mortuum of Vitriol*³² and *pear green*³³ with verdigris, white tartar and vinegar.

BARDWELL 1756, a painter himself, complained that great masters did not have the frankness and generous spirit to pass their knowledge on to posterity in writing *which would have done the World more Service than their Pictures*³⁴. He admitted he had not heard of any attempt ever made in this direction. At that time DE MAYERNE'S private manuscript notes³⁵ had not yet been made public. Also in this discipline a strong interest in documenting the technique of the arts and in exposing its technique methodologically can be observed.

Painting treatises, mainly those directed at the amateur painter, quite often appeared under a pseudonym or were published anonymously. There are for example ANONYMOUS 1652, ANONYMOUS 1729, ANONYMOUS 1731, and ANONYMOUS 1749 just to list a few. The manuals of C.K. and Artlove were first made available and used for study in the description of the pigments in this dissertation. The undated C.K.'s *Art's Master-Piece* draws largely on ARTLOVE'S *The Art of Japanning*, 1730, in the chapter on Japanning, describing the same grounds and varnishes, but C.K. is much shorter and compared to Artlove very badly explained and therefore less comprehensible. New and extended in C.K. are only the introduction and a chapter on *strewing species*, a decoration technique where fine glass particles were strewn onto a wet preparation layer.³⁶

³¹ SALMON 1683; SALMON 1691; SALMON 1701.

³² SALMON 1701, p. 98.

³³ SALMON 1701, p. 53.

³⁴ BARDWELL 1756, p. 2.

³⁵ BISCHOFF 2002.

³⁶ K. ; ARTLOVE 1730.

3.3. Trade

An area that has not been looked at that intensely within the scope of this dissertation is that of trade and commerce. With England becoming the centre of a global Empire the Port of London was one of the largest in Europe for import, export, and re-export of goods. The exchange of goods in the ports were logged in so-called port books, which are available for studies, a painstaking process of tracking the painting materials, some of them part of the import of drugs, which only made out about 3 percent of the entire cargo.

Traders kept sample collections for identification purposes and in order to establish standards of qualities for the goods. One such cabinet for storing import samples from 1840 to 1890 is exhibited in the Museum of London.³⁷ Also manufacturers had reference collections for their customers, such as the well documented pigment collection of the paint manufacturer Haffkenscheidt in Amsterdam.³⁸

Another resource for the tradesman were dictionaries of commerce, which detailed composition, provenance, and manufacture of materials as well as their prices in various countries including taxes to be paid when crossing borders between countries. A famous work was Savary DES BRUSLONS *Dictionnaire universel de commerce*³⁹, which has also been consulted for this dissertation. HARRIS' *Lexicon Technicum*⁴⁰, 1704, would also conveniently fit within this category, albeit not directly linked to commerce. Yet, it was a very popular standard dictionary at the time.

A source currently extensively studied in Germany⁴¹, the so called apothecaries' taxes, did not exist in England due to the very different development of the professions.

³⁷ This sample cabinet contains some of the hundreds of products that moved through London's docks: spices, metals, woods, minerals, and ivory, all marked with their place of origin. Sample cabinets were set up all over the docks to help identify goods being traded. From Cutler Street Warehouse, Museum Number DK88.116.

³⁸ PEY 1987; PEY 1989; PEY 1998.

³⁹ SAVARY DES BRUSLONS 1759-1762.

⁴⁰ HARRIS 1704.

⁴¹ The studies are concentrated at the Doerner Institute, Munich, which provides an overview of the project as well as a list of publications pertaining to the topic on the Institute's website, see URL <http://www.doernerinstitut.de/en/projekte/taxenprojekt/index.html>

3.4. Connoisseurship

A field that has been extensively studied and is very well documented are curiosity cabinets and the museums, that grew out of them. Very famously the collection of Sir Hans Sloane formed the nucleus of the British Museum and the Natural History Museum London. This illustrates how wide the range of collectables was, that a well-connected and knowledgeable collector covered. Other such collections are for example the collection of Ashmole, who incorporated Tradescants's specimens. Today it is housed in the Ashmolean Museum Oxford. Many many more collections existed throughout Europe and were as popular with the Court as they were with tradesmen and scientists. Through private correspondence and visits, which were recorded in guest books, the collectors formed a tight network that was used to exchange objects. It was often widely known across Europe, where examples of a certain material were kept, as for instance BRADLEY 1730 mentioned in his lectures on materia medica that *Marchasite of Silver* (a white stone of marble out of which silver appeared to drop) could be found in the museums of the *Elector of Saxony, at present King of Poland*, of Hans Sloane, of Edward Little, Esq., and in the public library of Cambridge University.⁴²

When there was no successor in a family to take on an existing collection or when financial problems became unbearable, it was common practice to auction entire collections or parts of them. Here auction catalogues present a resource for research.

In conclusion it can generally be observed that historic contributions by “non-artists” to painting materials and their use in painting have only found their way into contemporary research on the topic, if they directly related to the fine arts or to artistic craftsmanship. Most of those sources that have been evaluated originate from scientific journals or dictionaries of the respective period. MASSING 1995 observed that contributions from the field of industrial development increased in France over the 18th Century with the growth of the dyeing and textile industry as well as the porcelain manufacture.⁴³, however it seems that such works have so far not been studied and evaluated in their entirety.

It must be emphasised that the broad range of literature and collections produced by the natural sciences have only just begun to be acknowledged in the field of art technological research and have proven very valuable to this purpose. Further

⁴² BRADLEY 1730, p. 14.

⁴³ MASSING 1995, p. 24.

investigation of these sources is highly desirable and will prove a fruitful venture. The author hopes that this study of Vigani's cabinet helps to raise awareness of such sources.

4. Vigani's Cabinet

Vigani's cabinet was made in 1704 consisting of two parts that sit on top of each other: an oak cupboard with a set of 26 small flat drawers on an oak chest of drawers, which contains three large drawers.



Fig. 1 Vigani's cabinet in the Long Gallery at Queens' College

The overall height of the cabinet from floor to top is 66".¹

The height of the upper drawer cabinet (excluding pediment of 2 and 5/8") is 30 and 3/4", the height of the lower drawer cabinet (including the base of the cabinet and the divider) is 26", without base and divider it is 23".

The depth of the upper drawer cabinet is 17", that of the lower drawer cabinet is 18". The width of pediment is 37" and the width of the upper drawer cabinet is 33", that of the lower drawer cabinet is 35", both taken as outside measurements.

The width of the doors is: left: 16 and 3/8" and right: 16 and 5/8". The height of the bun feet is 4 and 1/2".

¹ The cabinet was made in inches; hence these measurements were taken in inches. 1 inch = 2.54 cm.

The range and variety of samples, collected by Prof. Vigani, can be shown in a key to the lower drawers and to the upper drawers, the latter seen when the doors of the cabinet are opened:

Contents	Cabinet		Contents
empty	B	A	gums, resins
seeds	D	C	seeds
stones, pearls	F	E	minerals, gums
gums, resins	H	G	beans, peas, seeds
fruits	K	I	pigments
stones, minerals	M	L	fossils
shells, snails	O	N	barks
roots	Q	P	roots
woods, barks	S	R	animals
metals	U	T	flowers, fruits
plants	X	W	fossils
roots	Z	Y	pills, creams, syrups
oils, balsams, salts	2	1	balsams, oils
oils, solutions of salts, alcohols	La1		
	La2		
metals, pigments, resins, stones			
documents, key	La3		

The present arrangement of the drawers in Vigani's cabinet can be considered as the original arrangement as laid out by Vigani himself.

The small drawers are labelled in the order of the alphabet, omitting 'J' and 'V' and complemented with '1' and '2'. Although not all the labels are preserved, the various heights of the drawers make any other arrangement of the drawers impossible.

Drawers with the same height are:

A – K	1 and 1/4"
L – O	1 and 1/2"
P – S	2"
T – U	2 and 1/4"
W – X	2 and 7/8"
Y – Z	3 and 1/4"
1 – 2	4"

All upper drawers have a width of 15 and 1/2" and a depth of 15".

The contents are, where possible, arranged in the way that drawers on the same level complement each other (e.g. seeds - seeds for drawers 'C' and 'D' or minerals - stones for Drawers 'E' and 'F'). The volume and size of the samples had to be considered as well as the containers they were to be kept in. This is why we can find fossils in drawer 'L' (for small and flat examples) and in drawer 'W' (for large specimens, which would not have fitted in the compartments of the complementary drawer 'M').

Drawers 'A' to 'Z' contain open paper liners, each of which fill a compartment. The compartments are designed to fit accurately the size of the sample. This suggests that the cabinet was designed for an already known number and range of samples.² Drawer 'Y' mainly contains eggcup shaped glazed clay pots for the pharmaceutical mixtures as well as small paper wraps for pills. Drawers '1' and 2' are filled with glass bottles of two different kinds. The height and the compartment size are adjusted to the size and diameter of these bottles.

Drawer 'La1' is designed to keep large glass bottles and drawer 'La2' with various sizes of compartments seems to have had the function of a storage drawer for stock and spare materials for further supply of the small drawers.

Drawer 'La3' nowadays is the repository for the documents (such as invoices and correspondences) related to the cabinet.³ Its former use remains obscure. Stains from

² See also 4.1.2. Acquisition History, Vol. 1 of this dissertation.

³ For a complete list of these documents see Drawer La3 in Part 2 of the Inventory of the cabinet, Vol. 3 of this dissertation. Transcriptions of MS Quns Vig. 1 - MS Quns Vig. 18 are contained in the Appendix, Vol. 4 of this dissertation.

spilled liquids could indicate that it contained bottles, too, but the spillage could also have happened in one of the drawers above, especially as a few broken bottles exist.

The heights of these three lower drawer is 6" for La1, 7" for La2 and 8 and 1/2" for the bottom drawer La3.

The width of the lower drawers is 32 and 1/2" and their depth is 17".

The substances in the cabinet correspond to a large extent with the list of those recommended by the London College of Physicians at that time to be stocked in the apothecaries' shops.⁴

Most of the specimens are placed in a paper tray, some of these papers with gilt edges. The majority of the watermarks⁵ of the paper used for these trays correspond to those common in 1698. Those few bearing the watermark G.R. are from a later date than 1714, indicating that those particular substances were placed after this date and therefore not by Vigani. However, it is also possible, that a damaged original tray was exchanged for a new one in which case the samples were from Vigani.

There is evidence that Richard Bradley added some substances to the cabinet since the name 'R. Bradley' or his initials appear in two instances. He might have added or rearranged samples when he lectured⁶ on this and Addenbrooke's collection in 1730.

Wrappings of newspaper in the lowest drawer, one of them with the date 1793 in its text, suggest, that these substances were added at around this time, although they may also be new wrappings for older, perhaps original samples.

Around 1730, as the collection was kept under the supervision of the College's Master, BRADLEY mentioned in his lectures that *the collection of Materia Medica, by Signore Vigani, [was] now in Queens' College, under the care of the Reverend Dr. Davis, the*

⁴ PECK 1934, p. 45.

⁵ Watermark identification was carried out by Peck using a publication by Heawood in the Royal Geographical Journal, 1924, for reference (PECK 1934, p. 45). The author decided to rely on Peck's notes. Reinvestigation of watermarks would mean to remove the contents as well as the fragile paper trays from their compartments in the cabinet, which would carry a great risk for damaging either samples or paper trays.

⁶ BRADLEY 1730.

*present Master, to whom my self, and the gentlemen here present, are oblig'd for the Sight and Perusal of them.*⁷

After that the cabinet remained more or less undisturbed for the next 200 years until Peck discovered it in 1922 under the staircase in the old library of Queens' College. Peck was then able to find proper evidence for the 'hear-say' connection with Vigani having found the invoices among the College papers. In 1933 EVERS⁸ analysed 4 samples as part of Peck's studies. On 13 February 1933 PECK delivered his paper⁹ on Vigani and the cabinet in front of the Cambridge Antiquarian Society. Permission was granted by Queens' College to exhibit the cabinet at this lecture.¹⁰ In preparation of this lecture Peck investigated the cabinet, and it was most likely he who produced the first inventory, now referred to as the Old Inventory.¹¹ In 1936 the cabinet was exhibited again. This time it was at the loan exhibition of historic scientific apparatus in the East Room of the Old Schools in Cambridge, organised by the Cambridge Philosophical Society with scientific support by R.T. GUNTHER.¹² On this special occasion Vigani's cabinet was exhibited together with Addenbrooke's cabinet of materia medica, 17th Century, from St. Catharine's College and Heberden's cabinet of materia medica, c. 1748, from St. John's College. These three major collections were complemented with exhibits from the vast collection¹³ of geological specimens and fossils by Dr. Woodward, 17th Century, today kept at the Sidgwick Museum of Geology, Cambridge.

When the cabinet received too much attention from casual inspection in its location in Queens' Old Library and before the library was treated for woodworm and bookworm infestation in the 1970's, the keeper of the cabinet, Dr Callingham, moved it to a quieter and safer location, the President's Lodge, where it has remained ever since.¹⁴

The outstanding value of this cabinet must be seen in the very rare combination of detailed acquisition documents and the excellent preservation of Vigani's extensive collection in such a compact setting. This provides an extremely valuable asset for investigating fine art materials in England from around 1700. The collection is characterised by:

⁷ BRADLEY 1730, p. 15.

⁸ EVERS 1933.

⁹ PECK 1934.

¹⁰ PECK 1934, p. 49.

¹¹ See Inventory of the Cabinet, Vol. 2 of this dissertation.

¹² CAMBRIDGE PHILOSOPHICAL SOCIETY 1936 and GUNTHER 1937.

¹³ PRICE 1989.

¹⁴ WAGNER and CALLINGHAM 2003.

- precise acquisition date (1704) of the materials
- use of the terminology of the time
- attribution of prices via the original invoices
- occasional attribution of provenance
- the samples have been stored in exactly the condition at purchase, without further processing or adulteration
- close to stable climate conditions over 300 years
- no exposure to sunlight
- virtually untouched with almost no manual interference over 300 years
- collection embedded in teaching curriculum with rich documentation preserved

Vigani's collection is as important to the history of pharmacology and the natural sciences as it is to the history of art technology. The evaluation and interpretation of the collection as an assembly of pigments, colorants, and binding media is particularly important, as there are only few material collections of this kind preserved. Vigani's cabinet is outstanding amongst these for its accurate documentation of the provenance of the samples. Having the samples themselves available not only allows for the examination of their precise composition but also provides a rare opportunity for studying sample-specific ageing characteristics under defined acquisition and storage conditions. The following table gives an estimate of the number of samples contained in Vigani's cabinet today:

Roots	43	
Seeds	115	
Wood, barks, etc.	53	
Resins/balsams	61	
Gums	18	
Oils	14	(many unidentified)
Animal origin	51	
Fossils	26	
Stones	47	
Minerals, salts, inorganic pigments	127	
metals	32	
Solvents, acids, chemical reagents	1	(many unidentified)
Pharmaceutical mixtures	36	
Unidentified/miscellaneous	72	
TOTAL	696	

Before the samples are looked at in more detail, it is important to trace their acquisition history and evaluate the surviving invoices and other financial documents of Vigani's time. This will provide a valuable background for the inventory of the cabinet, the exposition of the painting materials contained in it, and the study of the pigments and colorants in particular.

4.1. Invoices and financial correspondence

Vigani's cabinet holds five invoices, which are all dated between 1703 and 1704/5 in the old calendar system. There are also four receipts and two other documents of the same period related to financial transactions.¹⁵

4.1.1. Link between invoices and cabinet

What leads us to assume that there is a connection between these manuscripts and the cabinet?

First of all, these items are lodged with the cabinet and the connection between them and the cabinet has been made before.¹⁶

More convincing evidence can be seen in a receipt over *Tenn pounds for a Cabinet for the use of Queen's College in Cambridge*¹⁷, signed by John Austin, possibly the cabinet maker himself.

This receipt is from the same period as the other financial documents, which often contain keywords like 'Vigani', 'Queens' College', 'Cambridge', or 'materia medica'.¹⁸ Combined with the contents of these documents this is indicative of a close relation with a project to accumulate materials under the close direction of Vigani and the

¹⁵ All of these manuscripts are kept in Drawer La3 of the cabinet. A full transcription is enclosed in the Appendix, Vol. 4 of this dissertation, documents MS Quns Vig. 1 - MS Quns Vig. 11.

¹⁶ PECK 1934, pp. 42-44.

¹⁷ MS Quns Vig. 6; 'Queen's College' was the common spelling up to the 19th Century.

¹⁸ MS Quns Vig. 1 – MS Quns Vig.11, MS Quns Vig. 9 for 'materia medica' in particular.

financial support and approval from Queens' College, represented by its bursar Poley Clopton¹⁹.

Looking at the invoices, they reflect the whole range of substances, of which samples can be found in the cabinet: seeds, barks, roots, gums, resins, oils, chemicals, stones, pigments, and substances of animal origin.

To confirm and tighten the link between the invoices and the samples in the cabinet, it should be noted that the invoices in the majority detail quantities of one or two ounces that were ordered. This is a good size for a sample rather than an order for stock material to carry out chemical experiments, or to equip a laboratory or a pharmacy with.

The connection between the ordered amounts in the invoices and the actual samples in the cabinet become strikingly obvious looking at originally stopped glass bottles:

¹⁹ Clopton had an academic career as a physician, was fellow and proctor in 1703-4 and acted as bursar to Queens' College; VENN and VENN 1922.

For instance in the case of copaiba balsam: The invoice lists *1oz [Bals] Capivae & glass*²⁰. The cabinet contains a small glass bottle with stopper that has *Bals Capivi* written on the attached label.²¹ In the invoice of another supplier there is *Bals Capivi 2oz*²², and the cabinet holds a larger vessel with leather cap that reads *Bals Cipivi 2oz*²³.



Fig. 1 *Bals Capivi 2/2*

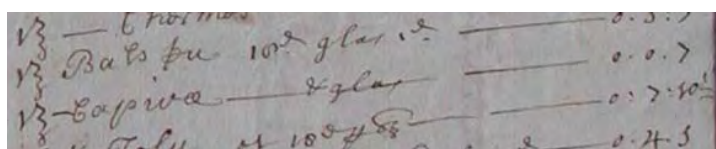


Fig. 3 *1oz [Bals] Capivae & glass*, from invoice MS Quns Vig. 4



Fig. 4 *Bals Capivi 2oz 1/4*

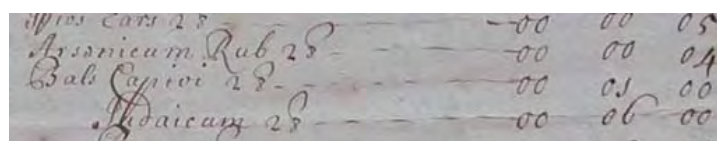


Fig. 5 *Bals Capivi 2oz*, from invoice MS Quns Vig. 2

Another indicator is *taccamahacca a shell 5oz $\frac{3}{4}$ at 18 pence per oz*²⁴. This example not only specifies the trade form, but also shows that the gum was weighed in the shell, which explains the uneven figure for the weight of 5 $\frac{3}{4}$ oz.

²⁰ MS Quns Vig. 4.

²¹ Drawer 2, number 2.

²² MS Quns Vig. 2.

²³ Drawer 1, number 4.

²⁴ MS Quns Vig. 7.



Fig. 6 *Tacamahaca* Z/1, in a shell, diameter ca 12cm

Finally N° 4 *Ven Vipers 3 English Ditto: Box 2p*²⁵ are a beautiful example of an item in an invoice that is represented in the cabinet as two (of originally four) Venice vipers on a stick, nicely fitted in a labelled wooden box.



Fig. 7 *Venice Vipers* N° 4 La2/1, in wooden box, only two vipers are preserved

These examples derive from the invoices of both main suppliers Porter and Colchester, which indicates that all invoices link to the contents of the cabinet.

²⁵ MS Quns Vig. 4.

4.1.2. Acquisition History

Having established certainty over the existence of a link between the documents in the large bottom drawer of the cabinet and the cabinet itself, it is now time to look at the history, which these manuscripts reveal on the process of acquisition of a collection as it presents today. We may thus also gain an insight on trade customs and goods transfer of Vigani's time.

To start with the earliest of the manuscripts appears correct in a chronological development of the history, but in effect this document²⁶ is the odd one out in terms of its relation to the cabinet collection. However, collecting is its prime subject. Vigani here subscribed to the acquisition of an insect collection, which, like a subscription to a journal, was to be delivered to the door in portions at specific intervals of time until the total number of 500 prepared English insects was reached. The total cost amounted to five pounds.

The London based²⁷ apothecary Edward Baker emphasised in this proposal the low price of the deal as well as his intention to keep the number of subscribers to such a collection low, an incentive, which was consistent with the collectors' spirit of the time who deemed rarity an essential aspect of collectables and thus made Baker's proposal worthwhile considering.

Baker signed the proposal as witness of having received of Vigani the sum of 10 shillings as down payment towards the insect collection. Looking at how business was run in those times Vigani may have sent a courier to London to deposit the money, who in return brought this receipt back.

None of the acquired insects: butterflies, moths, dragonflies, bees, beetles, flies, or grasshoppers appear in the cabinet. Where this collection, if ever completed, remained is unknown.

Only about two weeks after the subscription to the insect collection, the druggist Francis Porter, on 7 March 1703, sent an invoice to Vigani on goods that Porter had sent to Cambridge. Now this invoice²⁸ lists 73 items, which very closely relate to the

²⁶ MS Quns Vig. 1.

²⁷ in Forestreet, today between Moorgate tube station and the Barbican centre.

²⁸ MS Quns Vig. 2.

contents of the cabinet. They amount to 14 pounds and 5½ pence. This is the first recorded instance that points to the systematic assembly of sample sized specimens by Vigani and represents the whole spectrum of materials from seeds to barks, oils, balsams, resins, to minerals, chemicals, and animal products. As today, packing had to be paid for separately. Porter charged 5 shillings and 10 pence for boxes and glasses.

Since this invoice carries no address Porter must have sent out someone who knew Vigani and where he resided. We will learn more about carriers from later correspondence.

The following correspondence²⁹ from the same month, March 1703, is not entirely clear in terms of the purpose of the transaction and the identities of Mr Purvar in Bishopgate Street and Mr Thomas Hiccox. The document relates to the later MS Quns Vig. 11 from 9 February 1704. In it Queens' College bursar Poley Clopton asked a certain Mr Purvar or his cash keeper at *the black Bull in Bishop-gate Street*³⁰ to return 20 pounds to Vigani. On the reverse of this note Vigani signed on 16 November 1704 for having received the said sum through Thomas Hiccox. After this, on 9 February 1704 (remember, this is the old calendar system, and converts to 1705 in today's calendar) Clopton informed Vigani of having paid Purvar for the return of the 20 pounds and also for the carriage of six boxes and a basket of glasses and for gilt paper and other paper, a total of 3 pounds, 2 shillings, and 6 pence, which the Master of Queens' College reimbursed.³¹

It remains unknown as to why Purvar owed Vigani 20 pounds and why the College had to pay for the return of these. Perhaps cost for secure transport of money? Boxes and glasses may be containers for the cabinet, and the gilt paper is perhaps the one used for the paper liners in most of the drawers (they have gilt edges), though all of this is speculative.

It is interesting, that there is a huge time lapse between the demand to *pay upon sight hereof*³² the sum of 20 pounds, a statement that indicates a certain sense of urgency, posted by Clapton in March, and the receipt of the actual payment 8 months later!

²⁹ MS Quns Vig. 3.

³⁰ Probably in London, Bishopsgate, today between Liverpool street Station and Tower 42. The Black Bull in Bishopgate Street was, at least in 1637, the inn, where the coaches and wagons from Cambridge came to twice a week; TAYLOR 1637, by alphabet under C.

³¹ MS Quns Vig. 11.

³² MS Quns Vig. 3.

The most comprehensive delivery of goods can be traced in the invoice³³, dated London 11 April 1704, sent from the druggist Henry Colchester. The amounts ordered do normally not exceed 2 ounces per product, which would indicate that these relatively small amounts were intended for exhibition in the cabinet. The products range from resins, balsams, roots, seeds, animal substances, mineral substances, gems, and so on. They represent the entire spectrum of substances in the cabinet, as well as the enormous range of trade goods, which a druggist, based in London, could offer to his clients without delay. This is indicative of the sophisticated organisation of stock acquisition, stock keeping, and storage, as well as of the trade connections, which a druggist had to maintain in order to be successful and competitive in his business. Colchester charged 1 or 2 pence for each glass, pot, or box, in which a liquid or the vipers or seahorses came. Hence a druggist had a large number of empty containers at his disposal, probably in different sizes, because all of Vigani's samples fit accurately in the containers provided. The druggist could then fill these containers appropriate to the customer's needs from larger stock quantities, which were stored in the shop.

It is appropriate to mention here that all the invoices for drugs, which survived to the present time and are related to the cabinet, were issued in London. Apparently Vigani chose druggists from London for his orders and not local pharmacists or druggists. Probably the range of goods, or their availability, or quality were higher in the City than outside in more rural areas, which made these less favourable for an order at that range and scale. Interestingly enough Vigani himself ran a pharmacy in Newark-on-Trent, even while teaching at Cambridge. As we shall see he, too, ordered, substances for Newark together with orders for the cabinet. It shows that his own pharmacy was not equipped to an extent, which would suffice the range of products required for a sample collection of *materia medica*.

As with Francis Porter we do not know any details about Colchester and his shop apart from his own words in his invoice, where he calls himself *Druggist at the Maiden-head in Cheapside near Bow Church*³⁴ in London. This invoice sets the relationship clear as Vigani being the person who bought the products on behalf of the College's bursar Poley Clopton, who then paid for them. It states clearly that Vigani bought the products from Colchester on 18 February 1703/4 and ordered Colchester to send the invoice directly to Clopton, which he did two months later.

³³ MS Quns Vig. 4.

³⁴ MS Quns Vig. 4, today between the Bank of England and St Paul's Cathedral.

Again it is astonishing how much time was allowed between purchase and invoice, particularly in a case where the bill reached 20 pounds, 2 shillings and 11 pence! This covers 318 substances, in number almost half the contents of the cabinet.

This procedural set-up for purchase and transactions between Vigani, Clopton, and the salesman/vendor is confirmed in an invoice³⁵ that Charles Clutterbuck from *the hour Glass in Newgatestreet*³⁶ sent to Poley Clopton on 6 May 1704. Vigani ordered glass vessels and other, not specified, things from Clutterbuck, which he sent to Clopton in a parcel, and also instructed Clutterbuck to send the invoice over 2 pounds 12 shillings and 6 pence to Clopton. Clutterbuck asked Clopton to send a carrier down to London with the money. This is the only reference to Clutterbuck and we may assume that he was a seller of glassware.

In August 1704 the cabinet maker John Austin³⁷ signed a receipt³⁸ over 10 pounds for a cabinet made for the use of Queens' College. We do not know when the cabinet was actually delivered, but can assume that there was enough time between the first arrival of materia medica samples in February from Colchester and Porter and the manufacture of the cabinet to design the layout of the cabinet and its drawers, which then so nicely and accurately fitted the sample sizes, glass bottles, and clay containers. With those roughly 400 specimens around, Vigani must have had a clear enough picture of the contents to be able to draw up a design that would allow him to present the samples in convenient groups and matching sizes.

The following invoice³⁹ is a copy of Porter's invoice from 7. March 1704⁴⁰. Meanwhile it had turned December of the same year, and Porter still had not received the money that Vigani/the College owed him. Porter politely recalled: *I did formerly Send an accoumpt of them thither which I perceive by yours Miscarried.*⁴¹ It is addressed to Vigani *At Katharine Hall In Cambridge*, where Vigani must temporarily have lodged and perhaps also taught. In order not to confuse deliveries Porter added a list of items sent to Newark, that is most likely to Vigani's home and pharmacy, in March 1703, which amounted to 13 pounds, 10 shillings and 9 pence, and perhaps had not been paid for

³⁵ MS Quns. Vig. 5.

³⁶ Probably in London, between the Old Bailey and St. Paul's Cathedral.

³⁷ John Austin comes from a joiners' family in the Cambridge area. Adam Bowett collected further details on him in relation to Vigani's cabinet: BOWETT 1994.

³⁸ MS Quns Vig. 6.

³⁹ MS Quns Vig. 7.

⁴⁰ MS Quns Vig. 2.

⁴¹ MS Quns Vig. 7.

either. The two invoices, the original and the reminder, are identical as far as the items for Cambridge are concerned. Also the order in which the substances are listed is almost identical.⁴² The reminder is in few cases a bit more specific with the price/ounce or the cost of the container detailed out. This shows good record keeping practice. But perhaps more importantly it should be noted, that Porter was able to wait for half a year before he felt it was necessary to claim his money. This is only possible if his business went so well that there was always a cash surplus that would comfortably afford him to be able to wait for lazy customers.

None the less it is within only one month that Porter trustingly responded to a further order by Vigani and had a parcel sent to him on 2 January⁴³, again at Catharine Hall. On 16 January 1704 (old calendar) the invoice⁴⁴ followed. The sum however was much smaller, only 1 pound 2 shillings and 9 pence. The goods contained some gums and resins, specimens of woods, tartar, and vitriol as well as some opium and bull's gallstones, 29 substances in total. Porter elaborated that it had been difficult to get hold of some of these substances, which indicates, that not all the substances a customer required were always in stock, but that the druggist ventured out to purchase them at discretion, and probably in small amounts. Porter also insisted on the good quality of the products he sold. For example he would not send Spanish saffron, because the one he could obtain was of bad quality. In the cases of *Raw Sack yarne* and silk Porter was not sure of the quality or sort his customer wanted, so asked Vigani to send some samples. There were three items that Porter could not get hold of at all, one of them being *black lead Spongia*. Apparently Porter was also interested in passing on a fair price to his customers for he refused to get a *ball thats found in a bullocks stomach* for which he was asked to pay 10 shillings.

The introductory letter to this invoice also tells about financial customs and the importance of safe transport of money by a trusted carrier and the necessity for receipts for such transactions. These transactions, orders, and hand deliveries were not mere business, but allowed time for socialising. So Porter wrote to Vigani: *Your freind [who dealt with the order in London on Vigani's behalf] came in a Morneing & not a drinking time. If he would have beene plesed to have come at an evening should have beene glad to have presented him with a glass of Wine.*⁴⁵

⁴² The only fault could be detected with lapis lazuli, which in the earlier invoice is written down as 3 ounces and in the reminder as having been 2 ounces only.

⁴³ We know this date from MS Quns Vig. 10.

⁴⁴ MS Quns Vig. 8.

⁴⁵ MS Quns Vig. 8.

A mystery to date is the address/sender of this invoice on the recipient's page, which reads:

M^r The: Sherman

against the 2 swans

without olgate

Perhaps Porter worked for Sherman, who may have been the owner of the drugstore? Sadly none of the other invoices reveal any clues to this.

Eventually, in the beginning of February 1704 (old calendar), Porter received the outstanding sum, nearly one year after delivery of the goods! And again, Vigani, or the College, "forgot" to pay for the latest delivery from January, which Porter again reminded Vigani kindly to pay.⁴⁶

This last letter from Porter was received as Vigani and Clopton calculated up the sums that went into the purchase of the cabinet upon review of the bills.⁴⁷ They found a total of 51 pounds 7 shillings and 4½ pence in the bills.

An overview of the surviving invoices and receipts of the cabinet presents the following sums (excluding the insect collection and parcels delivered to Newark):

Manuscript No.	Paid for	Sum £ s d	Number of specimens
MS Quns Vig. 2	specimens from Porter	14 00 05½	73
MS Quns Vig. 4	specimens from Colchester	20 02 11	318
MS Quns Vig. 5	glasses etc from Clutterbuck	02 12 06	-
MS Quns Vig. 6	cabinet from Austin	10 00 00	-
MS Quns Vig. 8	specimens from Porter	01 02 09	29
MS Quns Vig. 11	payments to Purvar for carriage, glasses, and paper	03 02 06	-
Total		51 01 01½	420

A comparison of the total sum of the preserved invoices and the sum calculated by Clopton and Vigani shows a difference of only 6 shillings 3 pence. It appears safe to conclude that the invoices and receipts that are preserved describe the purchases for

⁴⁶ MS Quns Vig, 10.

⁴⁷ MS Quns Vig. 9.

which Purvar and Vigani had full accounts. Only a few documents can be missing that would piece together the remaining questions, as detailed in the history above.

This sum (£51 01 01½) covers 420 out of the 696⁴⁸ specimens in the cabinet. Poley Clopton added to his calculations that *it his sewerall tings in the repositori that it is nat in the bills besead mey Charge to London wick come to twenty tow pound 3 shell receved bifer naw*.⁴⁹ Perhaps this undocumented sum covers part of the remaining 276 (and more, since some substances have become lost over time) substances that have not been accounted for in the invoices. Some of the substances were possibly also donations by Vigani and others.

Adding these 22 pounds 3 shillings to Clopton and Vigani's calculated sum the total value of the cabinet and contents was 73 pounds, 10 shillings and 4½ pence.

Using the retail price index this sum would in 2006 approximately have been equivalent to the purchasing power of £ 10,027!⁵⁰

For comparison, the value of the goods in Vigani's Newark Laboratory was estimated at 20 pounds after his death in 1713.⁵¹

These are just a few examples to give an idea of the enormous value of the cabinet already at the time of purchase. However it must be said that the retail price index fluctuated dramatically within a few years of time.⁵² Therefore great care must be taken when considering comparisons with prices of other years close to 1704.

⁴⁸ This is the number of substances preserved today. The original number of specimens was possibly a little higher.

⁴⁹ MS Quns Vig. 9.

⁵⁰ Currency converters of historic currencies into today's values use different comparison series. In the calculator that has been used here *Purchasing Power of British Pounds from 1264 to 2006* the measure is the Retail Price Index. OFFICER, Lawrence H., *Purchasing Power of British Pounds from 1264 to 2006*. 2007, URL: <http://www.MeasuringWorth.com>.

⁵¹ PECK 1934, p. 38.

⁵² OFFICER, Lawrence H., *What Were the U.K. Earnings Rate and Consumer Price Index Then?* Economic History Services, February 2004, URL: <http://eh.net/hmit/ukearncpil/>.

4.1.3. Painting materials in the invoices

The invoices are laid out and calculated in pounds, shillings, and pence (pennies), with the indication of halfpennies as '½' attached to the notation of the pence. The conversions are as follows:

1 pound (£) = 20 shillings

1 shilling (s) = 12 pence

1 penny (d) = 4 farthings

1 halfpenny (½d) = 2 farthings

1 farthing (¼d)

It was found that apothecaries' weights were used, which convert weights most conveniently within the invoices. The units of apothecaries' weights are as follows:

1 pound (℔) = 12 ounces

1 ounce (℥) = 8 drams

1 dram (ʒ) = 3 scruples

1 scruple (ʒ) = 20 grains

1 grain (gr)⁵³

The most expensive substance within the relevant materials is ambergris, which appears in treatises mainly out of curiosity and may reflect older recipes. It cost 4 pounds per ounce, followed by *Cattechaw perxp*⁵⁴ at 4 shillings 6 pence, *Balme gil* at 3 shillings, and *Gum Carannae* at 2 shillings 6 pence. Only then cochineal appears, followed by lapis lazuli.

At the bottom of the list, the products with the lowest prices are the arsenicals, burgundy pitch, and red lead, all below 1 penny per ounce. In the region of 1 penny per ounce there are some turpentine, cerussa, red sandalwood, curcuma, some vitriols, tartars, and rock alum.

Note that dates in the following tables are taken directly from the invoices and hence follow the old calendar system. A ranking of all the painting materials by descending price/ounce is added in a long table at the end of this chapter.

⁵³ 1 grain equals approximately 60 milligrams in the metric system.

⁵⁴ probably stands for 'per expressionem'.

4.1.3.1. Pigments, Lakes, and Dyes

Looking at the prices for cochineal and kermes it shows clearly that dried cochineal scale insects were far more exquisite and expensive a commodity than dried kermes scale insects. Cochineal was over 4.5 times more expensive; in fact, cochineal ranged as the second most expensive colouring material after expressed catechu. Cochineal even superseded true lapis lazuli in price.

Interestingly, a medical preparation that most likely contained kermes was more expensive than kermes as such. The preparation may yield a high concentration of the dye. Analysis of the said preparation would be interesting.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>1oz Cochineale</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	2	4	00	02	04
<i>Succus Kermis 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	10	00	00	05
<i>Succ Kermes 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	10	00	00	05
<i>1oz Bacc----- Cherme⁵⁵</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06

The price list also shows that *Cocculus Indiae* is not identical with cochineal, a confusion that had been caused by GEOFFROY 1736 by a synonymy in the names.⁵⁶

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>oz Coccul Indie</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
<i>Coculus Indiae 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	06	00	00	03

Lapis lazuli, the fourth most expensive colour, was twice as expensive from the druggist Colchester than when Vigani bought it from Porter the month before. They may relate to a difference in purity of the stone qualities that the two druggists traded in at the time. Vigani must have been relatively confident about the quality of the material

⁵⁵ *Bacc.* is abbreviated for Latin 'bacca', meaning berry, a frequent misconception of the nature of kermes; see *Chirmes Grana* K/7 in the Inventory Part 2, Vol. 3 of this dissertation.

⁵⁶ GEOFFROY 1736, p. 370, see *Cochinella* R/12, Terminology and Trade.

he would receive, since he ordered 3oz and 5 oz respectively, whereas usually quantities range between 1 and 2 ounces for relatively cheaper products. It must be said though, that in Porter's copy of the invoice from December of 1704⁵⁷ an incongruity could be observed: instead of 3 ounces here there are only 2 ounces of lapis lazuli at the same price, which would reduce the price difference between Colchester and Porter. It cannot be established which of the two is correct.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>5oz ----- [Lap] Lazuli at 2 shilling per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	10	0	00	02	00
<i>Lap Lazulae 3oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	03	00	00	01	00
<i>Lap Lazulae 2oz</i>	MS Quns Vig. 7 Porter 12/12/1704	00	03	00	00	01	06

Again Colchester was the somewhat more expensive retailer for native cinnabar, and again, as in the case of lapis lazuli, Vigani ordered double the quantity from him than from Porter. Artificial cinnabar was 1.5 to 2.25 times cheaper than natural cinnabar.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>4oz Cin: Nativae</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	6	0	00	01	06
<i>Natt: Cinnabor 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	02	00	00	01	00
<i>3oz Cinabor offactic 2 shilling all</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	08

Colchester sold two different qualities of dragon's blood, the superior one being double the price of the ordinary. Porter's dragon's blood ranged between the two, but we do not know its quality. Three types of dragon's blood are kept in the cabinet: as it drops from the tree, in short pipes, and in long pipes (H/11, H/12, and H/13). How these may refer to the products from Colchester and Porter is unclear.

⁵⁷ MS Quns Vig. 7.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>1oz Sang Dracon opt</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	01	00
<i>Sang draconis 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	09	00	00	09
<i>1oz-----[Sang Dracon] 2^d</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06

The comparatively cheap *Gum Dragon* (3 pence/ounce) that Colchester⁵⁸ also sold must not be confused with dragon's blood. Gum dragon is an alternative name for gum tragacanth, samples of which are *Gum Tragacanth A/30* and *Gum Tragacanth Exceeding fine La2/4* in the cabinet.

Another sample where the invoices help to clarify similar terminology for different materials is in the case of aloes. The gum derived from plants from the genus *Aloe*, which are used in dying, as well as for medical purposes, cost between 4 and 6 pence per ounce.

In contrast lignum aloes cost an exorbitant sum of 2 shillings and 6 pence for the best (*opt*, abbreviated for Latin 'optimum', the best) quality. This is wood from an evergreen tree of the genus *Aquilaria* native to south east Asia, which in response to a certain fungus growth develops a very aromatic resin which was esteemed as incense and an ingredient in perfumes and priced accordingly.⁵⁹

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>4oz Aloes Succotr</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	06
<i>fine Aloes 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	08	00	00	04
<i>Yall Alloes 2oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	06	00	00	03
<i>Barbados Alloes 2oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	04	00	00	02

Aloes is represented in the cabinet as *Aloes roast H/8*, *Aloes cabal H/9*, and *Aloes Hepat H/10*. A piece of lignum aloes is preserved in *Lignum Aloes S/7*.

⁵⁸ MS Quns Vig. 4.

⁵⁹ *Sustainable agarwood production in Aquilaria trees*. Research project at the University of Minnesota, URL <http://forestpathology.coafes.umn.edu/agarwood.htm>.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>Lig Alloes opt 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	05	00 ⁺	00	02	06
<i>2oz Lign Aloes 6 pence per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06

Unfortunately it could not be discovered, whether *Rad. Cass: Mumiae* and *Mummae* are linked in any way. It looks as if the former is a substance derived from a root (*Rad.* usually stands for Lat. 'radix', root). The latter may describe mummy. Neither of the two appears in the cabinet. The price difference in the invoices does not help either, since the more than double price could simply be an indication of differences in quality.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>Rad Cass: Mumiae 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	01	06	00	00	09
<i>1oz Mummae</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	04

All three types of sandalwood are represented in the cabinet, both as a piece of wood and in the form of raspings (S/5, S/8, S/11). The invoices do not tell, whether wood and raspings could be bought separately, but they show that this is a case where the prices for all three types are mostly the same, whether bought from Colchester or from Porter. White sandalwood was the dearest, and red sandalwood the cheapest.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>2oz ----[Lign] Sant Alb 6 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>W^t Sanders 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	03	00	00	03
<i>2oz --[Lign] [Sant] Citri 4 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
<i>Yall Sanders 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	02	00	00	02
<i>2oz --[Lign] [Sant] Rub 3 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^½
<i>Red Sanders 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01

Vitriols, according to Colchester's price list, had a clear price ranking with Roman vitriol (most likely blue copper vitriol⁶⁰) at the top at 3 pence/ounce, followed by green iron vitriol and white zinc vitriol⁶¹.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
2oz ---- [Vit] Rom	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
1oz ---- [Vit] Virid	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	02
1oz Vit Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	0	1	00	00	01
Dantz Vitrioll picht 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01

All the different types of arsenic cost exactly the same from Colchester. With a price of only 3 farthings per ounce the arsenicals were by far the cheapest products. Only Burgundy pitch was less. It cannot be traced why Porter's red arsenic on the other hand came to 2 pence per ounce, more than double Colchester's price.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
Arsenicum Rub 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	04	00	00	02
4oz Ars Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}
4oz ----- [Ars] Citr	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}
4oz Ars Rubr.	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}

Regardless of the retailer, terra sigillata cost 2 pence per ounce. Interestingly it was sold by weight and not by piece. All three samples are kept in the cabinet (M/11, M/12, M/13)

⁶⁰ See *Vitriolum Romanum* E/3.

⁶¹ See *Vitriolum viride* E/2 and *Vitriolum album* E/1.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>Sigill Lemnia 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	04	00	00	02
<i>2oz Terra Sigill: Rub</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
<i>2oz ----- [Terra Sigill:] Alb</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02

There is no sample named 'fine bole' in the cabinet, whereas there are three of Armenian bole (I/15, M/9, La2/15). Neither of these can with certainty be attributed to the items in the invoices, and hence it cannot be established what accounted for the difference in price between the two.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>1oz Bol Armen</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	02
<i>fine bole 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	02	00	00	01

Research suggests that terra japonica was pale catechu.⁶² If it were the same material, the enormous price difference is astonishing, unless this catechu was of a different sort, such as black catechu or areca catechu. It is also possible that the way of extraction 'per expressionem' accounted for its more expensive price. A sample of terra japonica is kept in the cabinet in H/5, whereas there is no label for catechu. It could perhaps be among the unlabelled samples in drawer H, the drawer that terra Japonica is in. Analysis would be helpful in clarifying the situation.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>Cattechaw perxp^[63] 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	04	06	00	04	06
<i>4oz ----- [Terra] Japon</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	03

⁶² See *Terra Japonica* H/5, Terminology.

⁶³ Probably stands for 'per expressionem'.

From the range of the fine art materials in the cabinet, coloured metal powder, glass plates, and some of the pigments do not occur in the invoices, and there is no evidence of them having been bought from either of the druggists.

4.1.3.2. Gums, Resins, and Oils

It can be observed that materials used for limning tend to be more expensive than materials used in oil painting. Considering the fact that limning was usually confined to small formats it may not have made a huge financial impact, however it may contribute to the perception of limning as a fine, expensive, refined art.

Generally balsams are more expensive than gums and resins. The turpentine is at the bottom of the pricelist, with exception of turpentine from Cyprus. Isinglass is at the same price level with gums and resins, of which the most common ones used in oil painting, limning, and japanning are listed in the table below. Linseed oil as such is not among the labelled items in the cabinet and does not occur in the invoices. However linseed (----[Sem] Linni) does, for which account is given here.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
2oz ----- [Gum] Haedaerae	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	01	00
2oz Icthycolla opt 1 shilling	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
1oz Succ Accatiae	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
2oz ----- [Gum] Copall	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz ----- [Gum] Mastich	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz Gum Ammon	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
Amoniacum 1[lb] ^[64]	MS Quns Vig. 2 Porter 7/03/1703	00	03	04 ⁺	00	00	02 ^½
2oz ----- [Sem] Linni	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^½

Balsam of Peru appears twice in Porter's invoice, which suggests that it may have been traded in little containers of 2 ounces volume. Colchester priced it similarly. It ranges among the more expensive balsams.

⁶⁴ The notation is unclear. It is not certain whether gum ammoniac or sal ammoniac is meant.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>[Bals] Peru 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 03 04	00 01 08
<i>Balsam Peru 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 03 04	00 01 08
<i>1oz Bals peru 18 pence glass 1 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 1 7	00 01 06

Tolu balsam, which is related to balsam of Peru, since they are balsams from the same family and genus of South American trees, was slightly cheaper than balsam of Peru. The *Tolum Mont* was less than one fourth of the price of Tolu balsam, which suggests that it has to be counted as a different material all together.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>[Bals] Tolu 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 03 00	00 01 06
<i>5¼oz ---- [Bals] Tolu at 18 pence per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 7 10½	00 01 06
<i>2oz Tolum Mont 4 pence per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 8	00 00 04

The price for copaiva balsam was very consistent at 6 pence per ounce from both, Porter and Colchester. Samples of copaiva balsam are kept in glass vessels in 1/4 and 2/2 in the cabinet.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>Bals Capivi 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 01 00	00 00 06
<i>Balsam Capevae 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 01 00	00 00 06
<i>1 oz ----- [Bals] Capivae and glass</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 7	00 00 06

Turpentine range among the cheaper products in the list of balsams, resins, and oils with the exception of turpentine from Chios that was sold for 1 shilling per ounce, that is 12 times the price of more "ordinary" turpentine. Also turpentine from Cyprus was more expensive, but half the price of that of Chios. All of the turpentine listed below

are still kept in the cabinet, even two samples of Venice turpentine. Burgundy pitch can be found under *Pix Burgundica A/23*.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
1oz ---- [Tereb] E. Chio 12 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	1	1	00	01	00
1oz ---- [Tereb] Cypria 6 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	06
2oz ---- [Tereb] Strass 4 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	5	00	00	02
2oz Com Tereb 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Tereb venetiae 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Ditto [Tereb venetiae] 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Ol Tereb 2 pence Gl 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
Burg pitch 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	01	00	00	00 ^{1/2}

White and black petrol were sold for the same price. Both samples are kept in the cabinet (2/5 and 2/6). It was more expensive than most turpentines.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
2oz --- [Ol] Petrol Alb 3 pence per oz Glass 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	03
2oz ----- [Ol] [Petrol] Nigri 3 pence per oz Glass 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	03

Some materials of different qualities can show big differences in price, for instance white amber⁶⁵ was 4 times as expensive as yellow amber. In addition to these two (E/13 and E/15) the cabinet contains two more types: *Succinum flavan* E/14 and *Succinum nigrum* E/16. All apart from the black amber show crushed and whole amber beads within the sample.

⁶⁵ The translation of Lat. 'succinum' with amber in this place is merely due to common practice and the looks of the samples and lacks proof via chemical analysis.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>1oz Succ: Alb</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	01	00
<i>2oz ----- [Succ:] Citr</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03

The invoices lack the clear description of lac and shellac that we can find in the cabinet as *Gum Lacca in Granis A/7* and *Gum Lacca in Massis A/8*, or *seedlac La2/2*.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>2oz ----- [Gum] Lacc</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>2oz ----- [Gum] Shellack</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03

A huge price gap can be observed between the two types of tacamahaca. Porter sold a superior (Lat. 'optimum', best) variety for 1 shilling and 6 pence, which was more than 4 times the price of Colchester's tacamahacca. Porter's tacamahaca has an irregular weight of $5\frac{3}{4}$ ounces, which suggests that this one may refer to the sample that is preserved in a shell. Literature on tacamahaca suggests several plants and provenances for this gum, which is very confusing. However a note in an American dispensatory⁶⁶ from the early 20th century refers to tacamahaca from East India that comes to the market in gourd shells covered with reed leaves. This should be followed up. Perhaps the different provenances account for the price difference, one being scarcer than the other.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>Tacamahacca opt 5oz$\frac{3}{4}$</i>	MS Quns Vig. 2 Porter 7/03/1703	00	08	07 $\frac{1}{2}$	00	01	06
<i>2oz ----- [Gum] Taccemehac</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04

⁶⁶ WOOD and BACHE 1918.

Substances that are probably plant waxes (styrax) of some type show quite considerable differences in price, ranging between 3 pence and 1 shilling and 2 pence per ounce. These products should be looked at more closely for proper identification.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>Styrax Collat 4oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 04 08	00 01 02
<i>St Storax 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 02 04	00 01 02
<i>Styrax 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 00 08	00 00 04
<i>2oz ----- [Gum] Storax Callam</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 8	00 00 04
<i>2oz ----- [Gum] [Storax] Liq^d:</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 7	00 00 03 ^{1/2}

Both ambergris and spermaceti are organic products from the whale. Ambergris is a fatty substance from the intestines, the other a fat that fills cavities in the skull and along the back of some whales. Ambergris was a very rare and highly esteemed substance and ranks among the highly expensive products in the cabinet with a price of 4 pounds per ounce.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>1dram Amber-greese 10 shilling</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 10 0	04 00 00
<i>Sperma Ceti 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00 02 00	00 01 00
<i>1oz Sperm Ceti 12 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 1 0	00 01 00

4.1.3.3. Chemicals and Additives

The price of alum, a very important reagent in the dying process, lake making, and several other chemical operations, could depend on its quality, mainly the purity, since alum plumosum, a very pure sort, was 6 pence per ounce compared to the much cheaper rock alum.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>2oz Allum Plumos</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 1 0	00 00 06
<i>2oz ----- [Allum] Roach</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 2	00 00 01

Similarly a difference in purity accounts for price differences of saltpetre:

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>2oz Sal Petre Refined</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 4	00 00 02
<i>2oz ----- [Sal Petre] uNoefined</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 3	00 00 01 ^½

From the invoices we can see that plenty of different types of tartar could be bought, and that at a very affordable price. This suggests that Vigani's tartar *Tartar: Cremor J. Francisci Vigani* M/8, which he added to the tartars in the cabinet, was purely for demonstration purposes.

Item	Invoice No Supplier & Date	Price in invoice £ s d	Price/ounce £ s d
<i>2oz Tart Alb:</i>	MS Quns Vig. 4 Colchester 11/04/1704	0 0 2	00 00 01
<i>Red Tartor 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00 00 01	00 00 01
<i>Cr: Tartor 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00 00 01	00 00 01
<i>Bolognian Tartor 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00 00 01	00 00 01

Metals that often occur in recipes, like antimony and mercury, were a bit more expensive:

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>4oz Antimony crud</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	06
<i>4oz Arg Vivum and glass</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	9	00	00	05

For the artist to prepare and use his paints he would additionally have to spend half a crown to 5 shillings for a marble grinding stone, 18 pence to 2 shillings for a muller, and between 1 penny to 6 pence for small to large brushes, as well as 2 to 8 pence for the largest sort of brushes made with fine hair either in tin cases or in wooden stocks. Crucibles were 2 pence each if they were large, the other sizes a penny each and the smallest a halfpenny. Grinding stone, muller, brushes etc. could be had at the colour shop, crucibles at the iron mongers in Fosterlane, London.⁶⁷

⁶⁷ SMITH 1705, pp. 12-13.

TABLE - Ranking of substances occurring in manufacture of painting materials and in art technology

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>1dram Amber-greese 10 shilling</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	10	0	04	00	00
<i>Cattechaw perxp⁶⁸ 1oz</i>	MS Quns Vig. 8 Porter 16/01/1704	00	04	06	00	04	06
<i>Balme gil 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	06	00	00	03	00
<i>2oz ----- [Gum] Carannae</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	5	0	00	02	06
<i>1oz Cochineale</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	2	4	00	02	04
<i>5oz ----- [Lap] Lazuli at 2 shilling per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	10	0	00	02	00
<i>[Bals] Peru 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	03	04	00	01	08
<i>Balsam Peru 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	03	04	00	01	08
<i>[Bals] Tolu 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	03	00	00	01	06
<i>Tacamahacca opt 5oz¾</i>	MS Quns Vig. 2 Porter 7/03/1703	00	08	07½	00	01	06
<i>4oz Cin: Nativae</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	6	0	00	01	06
<i>1oz Bals peru 18 pence glass 1 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	7	00	01	06
<i>5¼oz ---- [Bals] Tolu at 18 pence per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	7	10½	00	01	06
<i>Styrax Collat 4oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	04	08	00	01	02
<i>St Storax 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	02	04	00	01	02
<i>Lap Lazulae 3oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	03	00	00	01	00
<i>Natt: Cinnabor 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	02	00	00	01	00
<i>Sperma Ceti 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	02	00	00	01	00
<i>1oz Sperm Ceti 12 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	01	00
<i>1oz ---- [Tereb] E. Chio 12 pence pott 1 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	1	00	01	00
<i>1oz Sang Dracon opt</i>	MS Quns Vig. 4	0	1	0	00	01	00

⁶⁸ probably stands for 'per expressionem'.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
	Colchester 11/04/1704						
2oz ----- [Gum] Guaici	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	01	00
2oz ----- [Gum] Haedaerae	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	01	00
1oz Succ: Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	01	00
Rad Cass: Mumiae 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	01	06	00	00	09
1oz Fol Ros R 9 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	9	00	00	09
Sang draconis 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	09	00	00	09
precipitate 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	01	04	00	00	08
3oz Cinabor offactic 2 shilling all	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	08
Bals Capivi 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	01	00	00	00	06
Balsam Capevae 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	01	00	00	00	06
2oz Icthycolla opt 1 shilling	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
1oz ---- [Tereb] Cypria 6 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	06
2oz Lign Aloes 6 pence per oz	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
1oz ----- [Sang Dracon] 2 ^d	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
1oz Succ Accatiae	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
4oz Antimony crud	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	06
4oz Aloes Succotr	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	06
2oz ----- [Gum] Annimi	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz ----- [Gum] Assafaetid	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz ----- [Gum] Copall	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
4oz ----- [Gum] Benzoin	MS Quns Vig. 4 Colchester 11/04/1704	0	2	0	00	00	06
2oz ----- [Gum] Elemi	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz ----- [Gum] Mastich	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
2oz Allum Plumos	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	06
1 oz ----- [Bals] Capivae and	MS Quns Vig. 4	0	0	7	00	00	06

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
<i>glass</i>	Colchester 11/04/1704						
<i>1oz Coccul Indie</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
<i>China Ink 3 pieces</i>	MS Quns Vig. 8 Porter 16/01/1704	00	01	06	00	00	06 (per piece)
<i>1oz Bacc----- Chermes</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	06
<i>Succus Kermis 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	10	00	00	05
<i>Succ Kermes 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	10	00	00	05
<i>4oz Arg Vivum and glass</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	9	00	00	05
<i>2oz ----- [Gum] Myrrh</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	9	00	00	04 ^{1/2}
<i>fine Aloes 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	08	00	00	04
<i>Styrax 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	08	00	00	04
<i>2oz Tolum Mont 4 pence per oz</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
<i>2oz Gum Ammon</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
<i>2oz ----- [Gum] Galban</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
<i>2oz ----- [Gum] Storax Callam</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
<i>2oz ----- [Gum] Taccemehac</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	8	00	00	04
<i>1oz Mummiæ</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	04
<i>2oz ----- [Gum] [Storax] Liq^d:</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	03 ^{1/2}
<i>Coculus Indiae 2oz</i>	MS Quns Vig. 2 Porter 7/03/1703	00	00	06	00	00	03
<i>2oz --- [Ol] Petrol Alb 3 pence per oz Glass 1 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	03
<i>2oz ----- [Ol] [Petrol] Nigri 3 pence per oz Glass 1 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	7	00	00	03
<i>2oz ---- [Lign] Sant Alb 6 pence</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>4oz ----- [Terra] Japon</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	1	0	00	00	03
<i>2oz ---- [Vit] Rom</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>2oz ----- [Gum] Lacc</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>2oz ----- [Gum] Shellack</i>	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
<i>2oz ----- [Gum] Olibanum</i>	MS Quns Vig. 4	0	0	6	00	00	03

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
	Colchester 11/04/1704						
2oz ----- [Succ:] Citr	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
1oz Aur: Jud	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	03
2oz Sal Ammon	MS Quns Vig. 4 Colchester 11/04/1704	0	0	6	00	00	03
Yall Alloes 2oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	06	00	00	03
W ^r Sanders 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	03	00	00	03
Amoniacum 1[lb] ^[69]	MS Quns Vig. 2 Porter 7/03/1703	00	03	04 ⁺	00	00	02 ^{1/2}
Arsenicum Rub 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	04	00	00	02
Sigill Lemnia 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	04	00	00	02
2oz ---- [Tereb] Strass 4 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	5	00	00	02
2oz ----- [Lign] [Sant] Citri 4 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
2oz Sal Petre Refined	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
2oz Terra Sigill: Rub	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
2oz ----- [Terra Sigill:] Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
1oz ---- [Vit] Virid	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	02
1oz Bol Armen	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	02
2oz Sal Gem	MS Quns Vig. 4 Colchester 11/04/1704	0	0	4	00	00	02
Barbados Alloes 2oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	04	00	00	02
Tripolo Earth a peice	MS Quns Vig. 8 Porter 16/01/1704	00	00	02	00	00	02 (per piece)
Yall Sanders 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	02	00	00	02
Palme Oyl 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	03	00	00	01 ^{1/2}
2oz ----- [Lign] [Sant] Rub 3 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^{1/2}
2oz ----- [Sem] Linni	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^{1/2}
2oz ----- [Sal Petre] uNoefined	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^{1/2}
4oz Talc Com	MS Quns Vig. 4	0	0	6	00	00	01 ^{1/2}

⁶⁹ The notation is unclear.

Item	Invoice No Supplier & Date	Price in invoice			Price/ounce		
		£	s	d	£	s	d
	Colchester 11/04/1704						
2oz ----- [Rad] Rub Tintor	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^{1/2}
2oz ----- [Gum] Arob	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01 ^{1/2}
fine bole 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	02	00	00	01
2oz Com Tereb 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Ceruss 2 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	01
2oz Tereb venetiae 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Ditto [Tereb venetiae] 2 pence pott 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Ol Tereb 2 pence Gl 1 pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	01
2oz Tart Alb:	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	01
1oz Vit Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	0	1	00	00	01
2oz ----- [Rad] Curcum	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	01
2oz ----- [Gum] Senega	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	01
2oz ----- [Allum] Roach	MS Quns Vig. 4 Colchester 11/04/1704	0	0	2	00	00	01
Dantz Vitrioll picht 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01
Red Tartor 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01
Cr: Tartor 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01
Bolognian Tartor 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01
Red Sanders 1oz	MS Quns Vig. 8 Porter 16/01/1704	00	00	01	00	00	01
4oz Ars Alb	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}
4oz ----- [Ars] Citr	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}
4oz Ars Rubr.	MS Quns Vig. 4 Colchester 11/04/1704	0	0	3	00	00	00 ^{3/4}
Burg pitch 2oz	MS Quns Vig. 2 Porter 7/03/1703	00	00	01	00	00	00 ^{1/2}
2oz Minium 1pence	MS Quns Vig. 4 Colchester 11/04/1704	0	0	1	00	00	00 ^{1/2}

**Fine Art Materials in Vigani's Cabinet, 1704,
of Queens' College, Cambridge**

dissertation

in four volumes

submitted by Lisa Wagner

Volume 2

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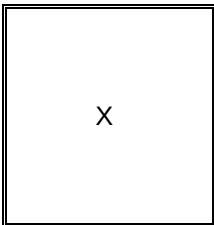
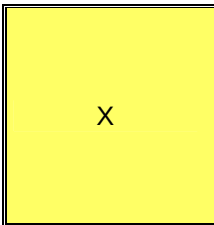
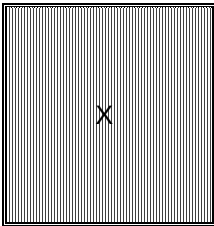
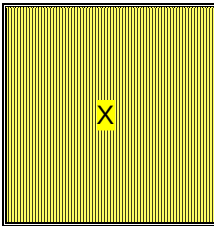
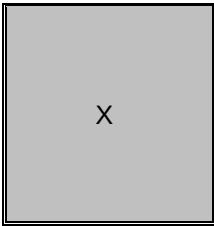
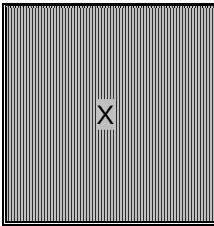
<i>Gold fr.</i>	I/34
<i>French Oker</i>	I/35
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<i>Dutch Gold</i>	I/37
<i>Silver Colour'd Sp</i>	I/38
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<i>[metal powder, not labelled]</i>	I/47
<i>Lem. c?'d Sp</i>	I/48
<i>[metal powder, not labelled]</i>	I/49
<i>[metal powder, not labelled]</i>	I/50
<i>[metal powder, not labelled]</i>	I/51
<i>Lake</i>	I/52
<i>[metal powder, not labelled]</i>	I/53
<i>Copper col. Spec.</i>	I/54
<i>Red Oker</i>	I/55
<i>Venice Lake</i>	I/56
<i>[metal powder, not labelled]</i>	I/57
<i>[metal powder, not labelled]</i>	I/58
<i>Brown fr.</i>	I/59
<i>Ash colour fr.</i>	I/60
<i>[metal powder, not labelled]</i>	I/61
<i>(black) fr.</i>	I/62
<i>Iridicum Atramen:</i>	I/63

Inventory of the Cabinet

Vigani's original arrangement of drawers and layout of compartments within them was used as the matrix for the inventory of the cabinet. All his labels and the few labels from later additions were transcribed and compared with the earlier reading in the so-called Old Inventory. The Old Inventory is a typewritten list kept in a folder in the lowest large drawer of the cabinet. It was most likely compiled by PECK in connection with his research¹ for the Cambridge Antiquarian Society in 1933.

Representation of the Drawers

In a schematic map of each drawer some aspects of the condition of the samples was recorded to provide the reader with a quick reference. It includes the distinction whether a sample is present or whether the compartment is empty, the presence or absence of labelling, and whether a sample can be considered as painting material or as a raw product used in the manufacture of fine art materials:

	- contains sample - label and/or transcription exist		- contains sample - label and/or transcription exist - is painting material (according to label and/or transcription)
	- no sample - is labelled		- no sample - is labelled - would have been painting material (according to label or transcription)
	- contains sample - no label, no transcription exist		- no sample - no label, no transcription exist

X represents the compartment number.

¹ PECK 1934.

The compartments within a drawer are numbered from right to left, and from front row to back row. This follows Vigani's original numbering scheme. The numbers given in the inventory consist of a letter for the drawer and a number for the compartment within the drawer, separated by a dash. For example I/31 stands for drawer I, compartment 31. This compartment contains a yellow powder labelled *Orpiment*.

It is important to notice that these numbers represent the compartments, rather than the samples or the containers (bottles, wooden boxes, etc.) within the compartment. Some compartments hold more than one sample and/or more than one container. Thus the number indicates the location of the samples and containers within the cabinet.

This system is designed to give an illustrative overview of the information kept in Vigani's cabinet. It is not an interpretation of the names, the contents, or the correlation between both. It simply says whether a compartment contains material or not and if we know of any description on the compartment. The description can either derive from the name written on a label and/or from the transcription given in the early typewritten Inventory. We assume that the name on a label describes the material in that compartment (which would have to be proved by analysis and investigation into commonly used contemporary terminology).

Transcription Tables

In the inventory a table with the transcription and its comparison with the Old Inventory follows the schematic overview of a drawer.

The labels in the cabinet were read and transcribed, partly using a magnifying glass to assist the reading. None the less there were passages, which could not be transcribed because some parts of their papers were missing, or because the ink had completely faded. Furthermore, some labels or parts of labels had become detached from the bottles and were subsequently lost. Such losses are indicated with the following notations:

- [.] one letter at the beginning, the end or within a word could not be identified
- [...] several letters at the beginning, the end or within a word could not be identified; or an entire word could not be read

The Old Inventory helped in some cases to attribute names to samples, when deciphering of labels was no longer possible. However, the names given in the Old Inventory appear not only to involve strict transcriptions but also contributions by its writer in terms of the naming of certain samples. The Old Inventory's entries were added to these transcription tables when they differed from the present reading, thus providing a further option for the interpretation of the samples.

The transcription tables for each drawer are followed by the description of the pigments and colorants contained in the cabinet. The system of description does not only apply to pigments but could be extended to fine art materials and their raw products in general.

Description of fine art materials

The description of the fine art materials is designed to be applicable to all materials in the cabinet. Each description is a self-contained unit that can be augmented, not only by the author, but by further researchers. The option of keeping the description open for future expansion of the work was seen as a key aspect.

The descriptions are clearly defined by a framework consisting of a repeating sequence of headings that would allow for systematic exploration of samples in the context of literary sources and help the reader in cross-referencing between samples. This structure keeps to the following headings:

Title Compartment number followed by transcription of label next to an image of the sample and a brief description of the visual appearance of the sample with reference to amount, shape, colour, storage, and visible changes or adulterations.

List of references to Vigani indicates in which invoices and lecture-notes this substance occurs. The invoices are listed by the record number they were given in the Appendix: MS Quns Vig. 1 – MS Quns Vig. 11. As for the lecture notes: 'LECTURE-NOTES undated' refers to the volume kept at Cambridge University

Library, classmark Dd.12.53.² 'LECTURE-NOTES 1707' refers to the volume kept in the Old Library of Queens' College.³

Terminology synonyms used at Vigani's time and today's equivalents when they help to clarify the historic terms. Questions that may be answered are: What is the common name today? Why had a different name been used in former times? Was this name very common at that time and/or is it linked to Vigani, the trade, or its pharmaceutical use? Could it be a wrong name for the material chosen out of ignorance or a different understanding of chemistry and physics?

Composition as understood by writers of the 17th and early 18th centuries

Provenance the country of origin of the sample material and/or the place of manufacture

Trade (with reference to the invoices) Answers may be found to the following questions: Where did the material come from? How was it traded and which historical events influenced its trade? Did this have consequences for the availability of the material and its price? What influenced the import of new materials? What was the reason for or the prejudice against the import or acceptance of a new material? Where was the material transformed into what form and who did it? Who was involved in the trade of drugs and painting materials?

Quality/Adulteration deals, in close connection to the trade with historic reports on quality control, the occurrence, and frequency of adulteration as well as means of their detection

Properties describes the properties that were attributed to the material in respect to its usefulness as a painting material, including observations on changes upon ageing

Manufacture collects historic sources that describe the manufacturing process of the painting material from its raw products. Industrial large-scale processes as well as laboratory-seized experiments are included.

² Transcription in Appendix, Vol. 4 of this dissertation.

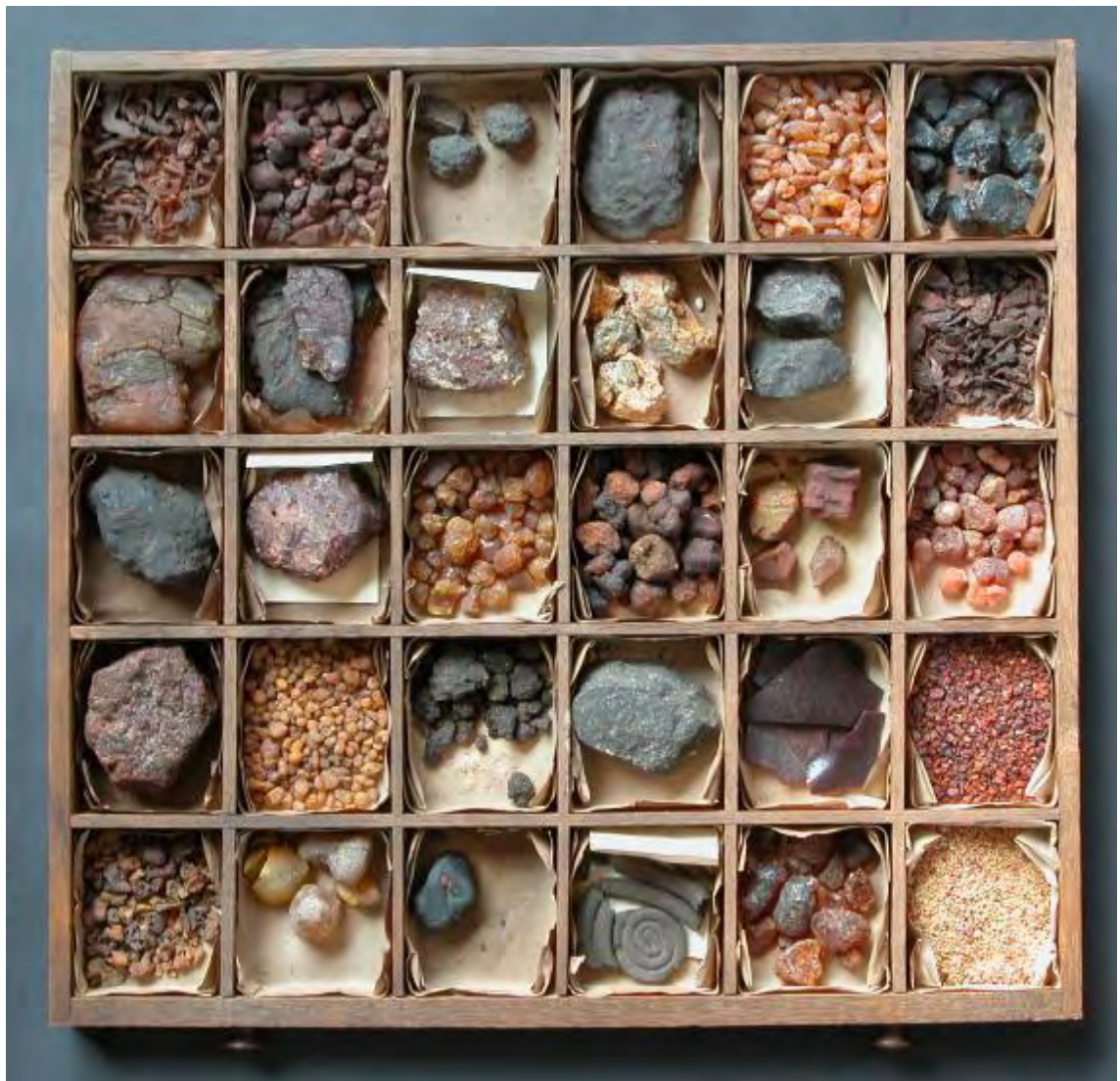
³ Transcription in Appendix, Vol. 4 of this dissertation.

Preparation the preparation of the paint, which comprises aspects such as grinding, washing of the pigment, and mixing with binding media

Use in oil painting, limning, other relevant arts, and in medicine/pharmacy around 1700 is investigated. The dual roles of some materials shall be considered.

Emphasis is strongly laid on the incorporation of sources from the 17th and early 18th Centuries. Only in the second instance will modern reference works be included. Since the samples are contained within a collection of the natural sciences, publications from these disciplines will be referenced. The study of publications by Vigani and contemporary scientists allows an insight into their understanding of the materials and the principles of their reactions. Conclusions can be drawn about the use as well as the significance and meaning of the materials in the late 17th and early 18th centuries.

As much as possible these topics are restricted to a consideration of the samples in the cabinet with literature excerpts being chosen accordingly.



Drawer A

Drawer A

30	29	28	27	26	25
24	23	22	21	20	19
18	17	16	15	14	13
12	11	10	9	8	7
6	5	4	3	2	1

No A/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1. Saviocolla.	G. Saviocolla Aloes Succotrina
2	2 Gum Senica	Gum Senica Gum Senegal. Acacia Senegal.
3	3 Labdanum	Labdanum Gum from Cistus Labdaniferus
4	Labdanu[.] [.]um Antiquorum	Labdanum Verum Antiquorum
5	5. G. Animi	Gum.Animi Exudation of Boswellia Frereana

6	6 Euphorbium	Euphorbium from Euphorbia Resinifera
7	7 Gum. Lacca in Granis	Gum Lacca in Granis. Resin from Ficus Indica
8	8 Gum. Lacca in Massis	
9	9 Gum Carannae	
10	10 Gum Hedera'	Hum Hedeoma
11	11 Mastiche	Mastiche A resin from the Lentisk- Pistacia Lentiscus L.
12	12 1[.] [paper lost] Styrax Calam.	Styrax Calam. Styrax Calamatina
13	13 Olibanum	Olibanum. Francincense.
14	14 Cambogium	Cambogirem. [later corrected to Cambogium]
15	15 Opopanax	Opopanax. A resin from Opopanax.
16	16 Arabicum	Arabicum. Gum Arabic.
17	17 [.]nzoin [paper lost]	Benzoin. Resin from Styrax Benzoin Dryander.
18	18 Sagapenum	Sagepenum. [later corrected to Sagapenum] From Species of Ferula growing in Persia
19	19 Styrax non calam.	Hyrax non Calam. [later corrected to Styrax] Resin of Liquidamtar Bark. [later corrected to Liquidamvar]
20	20 Scammonium	
21	21. Gum Copal	Gum Copal. Resinous Gum from New Spain
22	22 Tacamahaca	Taccamahaca
23	23 [.]3 [paper lost] Pix Burgundica	Pix Burgundica. Pinus Abies. Norway Spruce Fir.

24	[.]4 [paper lost] [.]m. Elemi [paper lost]	Gum Elemi. Resin from Canarium Commune.
25	[.]5 [paper lost] Gum Guiaci	Gum Guaiaci. Guaiacum Officinale
26	26 Sandaracha	
27	27 Galbanum	Galbanum. Gum resin from Ferula Galbaniflua.
28	28 Bdellium	Bdellium. [later corrected to Bdellium.]
29	29 Ammoniacum	Ammoniacum. Gum Resinous exudation of Dorema Ammoniacum.
30	30 Gum Tragacanth[.] [paper lost]	Gum Tragacanth. Gum from Stem of Astragalus.



Drawer B

Drawer B

20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No I/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1-20	[empty]	[no transcription]



Drawer C

Drawer C

35	34	33	32	31	30	29
28	27	26	25	24	23	22
21	20	19	18	17	16	15
14	13	12	11	10	9	8
7	6	5	4	3	2	1

No C/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Sem. Cardamomi	
2	2. S. [...]x[...]agiae [paper lost]	[no transcription]
3	3 Sem. Thlaspios	
4	4 Sem. Cymini	Sem.Cymini. From Cuminum Cuminum
5	5 Semen Ebuli	
6	6 Semen Psyllii	Semen. Psyllii. Plantago Psyllii.

7	7 Sem. Moschi	Sem Moschi Hibiscus Homoschus [added later]
8	8 Sem Anisi	Sem Anisi. Dried fruit of Pinipiwella Anesuni. [later changed to Pimpinella Anisum.]
9	9 Sem. Santonicum	Sem Santonicum. Dried unexpanded flower of heads of Astecisia maritima. [later changed to Astemisia maritima]
10	10 Sem. Apii	Sem Opii Papaver Somniferui [later changed to Somniferum]
11	11 Sem. Cichorii	
12	12 Sem. Hyoscyami	Sem Hyoscyami Ripe seed of Hyoscyamus Niger.
13	13 Sem. La[.]luca [or La.tuca] [paper lost]	Sem Lactuca Lactuca Virosa.
14	14 S. P[...].gi[.] nigr. [paper lost]	Sem ?
15	15 Sem. Anethi[.] [paper lost]	Sem Anesti [later changed to Anethi] Dried fruit of Pencedanura [later changed to Pencedanum] Graveoleus
16	16 Sem. Canthami [or Carthami]	Sem Carthami
17	17 Sem. Cochlearia [or Cochlearsia]	Sem Cochleariae. Cochlearia Armoracia.
18	18 Sem P[.]g[...].a Rom [paper lost]	Sem Ph ?
19	19 Sem Portulacae	
20	20 Sem Cydonierum	Sem Cydoniorum. Dried Seeds of Cydonia Vulgaris
21	21 Sem. Urticae	Sem Urticae. „Pilulifax“ [later changed to „Pilulifex“]
22	22 Sem. Alexandr.	[no transcription]

23	23 Sem. Bombecis ['e' and 'i' not with certainty]	[no transcription]
24	24 Sem. Petroselini vulg.	Sem Petroselini Inlg. [later changed to Vulg.] Parsley.
25	25 Sem. Coriandri	Sem Coriandri Coriandrum Sativum.
26	26 Sem. Angelicae	
27	27 Sem. Basilici	Sem Basilici Basil seeds Ocimum Vulgare.
28	28. Sem. Milii Salis	Sem Milii Solis.
29	29 Sem Genistae	
30	24 S. Faeniculi com	Sem Foeniculi Com. Dried fruits of cultivated plants of Foeniculum Vulgare.
31	31 Sem. Colocynthidos	Sem Colocynthidis. Citrulliss Colvagnthus [later changed to Citrullus Colocynthus]
32	32 Sem. Bardanae	
33	33 Sem. Sumach	
34	34 Sem. C??l?i Benedicti [paper lost]	Sem Cardui Benedidi [later changed to Benedicti]
35	35 Sem. Levistici	Sem Levistici. Lavage.

No **C/30** originally belonged to Drawer D in compartment 24, whereas No D/24 '30 /
Sem. Raniculi dulc.' was originally placed in compartment 30 of Drawer C.



Drawer D

Drawer D

35	34	33	32	31	30	29
28	27	26	25	24	23	22
21	20	19	18	17	16	15
14	13	12	11	10	9	8
7	6	5	4	3	2	1



No D/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Semen Rutae	Semen Rutae. Ruta Graveolens.
2	[paper lost ; first two letters probably 'Ca']	[no transcription, later changed to: Semen Carui; the comment is: Carrum Carri, later changed to Carum Carvi]
3	S. [...]p[...] [paper lost]	Sem Sinapisi. Seeds of Brassica Nigra.
4	Lupini	Lupini. Hops.
5	5 S. Lini	Sem Lini. Seeds of Linum usitatissimum

6	[paper lost]	Orange Pips.
7	S. Acetosae	
8	8 S. Cardamomi min.	
9	9 S. Paoniae	Sem Paeoniae Paony Seeds.
10	10 S. Dauci Cretici	Sem Dauci Cretici. Carrot.
11	11 S. Erucae	[no transcription]
12	12 S. Petroselini maced.	Sem Petroselini.
13	13 S. Agni Cas[.]i	Sem Agni Castrum.
14	14 S. Althaea	Sem Althaea. Althaea Officinalis.
15	15 S. melonum	Sem Melonium
16	16 S. Cucurbitae	Sem Cucurbitae. Hesley Hecumbeut [later changed to Heshey Recumbeut] Plant – Mediteranean. Squirting Cucumbers were cultivateed in England.
17	17 S. Cucumeris	Sem Curcum.
18	18 S. [.]epon[...] [paper lost]	Sem Pepin Veg Marrow.
19	19 S. Dauci Com.	Sem Doana Com. [later changed to Dauca Com.] Carrot.
20	20 S. Amomi	
21	S Endiviae	
22	22 S. Ammeos	Sem Ammeos. Ammeos Biships' Weed
23	23 S. Plantaginis	Sem Plantaginis. Plantago Decumbens.
24	30 Sem. raniculi dulc. [or faniculi dulc.]	Sem Saniculidul [later changed to Saniculi dulce]

25	25 S. Staphidis agrio.	Sem Staphisagria. Delphinium Staphisagria
26	26 S. Faenugraeci	Sem Foenugreek.
27	27 S. Papaveris alb.	Sem Papaver alb. Papaver somniaferum Var. Alb.
28	28 S. Seseleos	Sem Seselios
29	27 S. Cataputix	Sem Caiuputa.
30	30 S. nasturtii	
31	S. Ci??i	Sem Cucurbet. [later changed to Cucurbit.]
32	[ink totally faded]	[no transcription]
33	33 S. Col[...]p[...]os [or Col...n...os]	Sem Colocynthus.
34	[empty, no paper box]	[no transcription. Comment: Empty.]
35	~~S. Rhus Virg.~~ S. Rhus Virg:	Sem Illicum Anisatum.

No **D/24** originally belonged to Drawer C in compartment 30, whereas No C/30 '24 / S. *Faeniculi com*' was originally placed in compartment 24 of Drawer D.



Drawer E

Drawer E

30	29	28	27	26	25
24	23	22	21	20	19
18	17	16	15	14	13
12	11	10	9	8	7
6	5	4	3	2	1

No E/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Vitriolum album. I.	Vitriolum Album $\text{Zn} \cdot \text{So}_4 \cdot 7\text{H}_2\text{O}$
2	Vitriolum viride 2.	Vitriolum Viride $\text{Fe} \cdot \text{So}_4 \cdot 7\text{H}_2\text{O}$
3	Vitriolum Romanum 3.	Vitriolum Romanum $\text{Cu} \cdot \text{So}_4 \cdot 5\text{H}_2\text{O}$
4	[paper box lost]	[no transcription]
5	[paper box lost]	[no transcription]
6	Arsenicum Rubrum 6	
7	Alum. Roch. 7	
8	Amiantus 8.	Amiantay.

9	Talcum commune 9	
10	Talcum Venetum 10.	
11	[not labelled]	[no transcription]
12	Arsenicum Album 12	
13	Succinum Citrinum 13.	
14	Succinum flavan 14	Succinum Slavon.
15	Succinum albam 15.	
16	Succinum nigrum 16	
17	Ambrae grissa 17	Ambreigrisa
18	Arsenicum citrinum 18	
19	Praecipitatus	
20	Sulphur vov. 20.	Sulphur.
21	Sulphur nativum Persicum 21.	
22	Sulphur nativum Lancashiense. 22	Sulph Naritum. [later corrected to Nativum]
23	Minium 23	Minium Red Lead Pb3O4
24	Cerussa 24.	Cerussa. Cerrussa. White Lead PbCo3
25	Cinnabaris nativa Persica 25.	
26	Cinnabari nativum é Guinea 26.	
27	Cinnabaris nativ[.] [loss of paper] Hungaricum. 27	Cinnabaris nativa Hungaricus
28	Cinnabaris nativi al. Species 28.	
29	Cinnabaris nativi alia Species. 29	
30	Cinnabaris factitia 30.	



Fig. 1 Vitriolum album E/1

E/1 Vitriolum album

The large white clump appears to consist of a conglomerate of small bright white spheres, which rub off easily. Two small pieces of paper dropped onto the sample. Other than that it appears to be very pure.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Information particular to white vitriol can be found below. For further reference the respective chapters of *Vitriolum viride* E/2 may be consulted.

Terminology

A synonym for white vitriol is the Latin 'vitriolum album'.

Composition

White vitriol is mainly composed of zinc sulphate.

Provenance

White vitriol occurred naturally and could be mined in various places in Europe, often in places with green and blue vitriol.

Trade

White vitriol (*Vit Alb*) was the cheapest of the three types of vitriol that Vigani bought from Colchester¹, London, in February of 1704 (old calendar: 1703). He paid 1 penny per ounce.

Further details on trade properties or even its manufacture were not included in the treatises consulted within the scope of this research.

¹ MS Quns Vig. 4.

Preparation

In some recipes roasted zinc vitriol was recommended as a drying agent in varnishes. Pieces of vitriol were burned in a red-hot oven until the pieces could easily be broken down to powder.²

Use

DE MAYERNE suggested the use of zinc vitriol as a drying agent in linseed oil varnishes, in transparent coloured lacquers, when there was no drying pigment involved, and in an amber varnish.³

² BL MS Sloane 2052, p. 20 v.

³ BL MS Sloane 2052, p. 20 v, BL MS Sloane 2052, p. 87 and BL MS Sloane 2052, p. 161 v.



Fig. 1 Vitriolum viride E/2

E/2 Vitriolum viride

This is a pale opaque green mineral with a jagged, stepped structure, which folds in layers at right angles to each other. Within the stones there are white areas with a slightly pink cast. Traces of a dark brown substance occur within the sample.

- MS Quns Vig. 4
- LECTURE-NOTES undated, p. 14

This sample includes impurities indicating that it might be a natural product, which Vigani purchased for the collection. Vigani bought it despite knowing how to produce artificial green vitriol, as further described below, which would probably have resulted in a purer product.

Terminology

The name 'vitriol' was said to derive from 'vitrum', for its transparency and glass-like colour.¹

Green Vitriol in GEOFFREY 1736 is called *Roman, Swedish, English or French Vitriol*.² The term 'Roman vitriol' used to be attributed either to the blue or the green variation of vitriol, which can be found throughout the English literature of this period.

In the manuscript book of Vigani's lectures artificial green iron vitriol is called *vitriolum martis*.³ Most likely the *sal martis*, in a demonstration on the reaction principle of acids⁴, is likewise iron vitriol. If so, investigation of literature references for 'sal martis' could provide further insight into the manufacture and use of green vitriol.

Composition

Green vitriol is iron vitriol, mainly composed of iron sulphate. The natural product usually contains other types of vitriols in small proportions.

¹ GEOFFROY 1736, p. 106.

² GEOFFROY 1736, p. 107.

³ LECTURE-NOTES undated, p. 14.

⁴ LECTURE-NOTES 1707, pp. 48-51.

In Vigani's time it was understood that the green colour derived from the iron content in green vitriol.

Provenance

According to GEOFFROY 1736 Roman, English, Swedish, and French Vitriol came from their respective countries. He also reported that there was vitriol from Germany.⁵ A collection in Zurich was reported to contain vitriol from the Swiss Alps and the rivers that enter the Zurich lake.⁶

From the middle of the 17th Century artificial vitriol could be found for sale in apothecaries' shops, which was used for pharmaceutical and chemical purposes.⁷ Because of the coloured inclusions Vigani's sample suggests a natural product.

Trade

Vigani bought *Vit Virid* at 2 pence per ounce from Colchester⁸, a druggist in London, on Feb 18 1704 (old calendar: 1703). This green vitriol was twice as expensive as the white vitriol *Vit Alb*, and two thirds the price of Roman vitriol *Vit Rom* bought with the same order.

*It is kept in the Shops either in large rhomboidal Crystals, or in Heaps of small crystal Grains, sometimes a little unctuous, and sticking to the Hands.*⁹ From German stock takes in apothecaries' shops it is known that vitriols were stored in large quantities.¹⁰

Quality / Adulteration

Different qualities of vitriol were traded depending on the purity and the intensity of the colour of the mineral. The naturally occurring vitriols were always mixtures of different vitriols sometimes in conjunction with other minerals. Some mines produced purer vitriol than others. Purification processes were known and applied, as will be explained below.

Properties

Vitriols generally receive very little attention in treatises on art technology. Their properties seem to have been unnecessary to describe, since vitriols were used in small quantities as an additive, like a pinch of salt in cookbooks.

⁵ GEOFFROY 1736, p. 107.

⁶ PETIVER 1705.

⁷ KREKEL 2005.

⁸ MS Quns Vig. 4.

⁹ GEOFFROY 1736, p. 107.

¹⁰ KREKEL 2005.

Manufacture

Vigani taught a laboratory-scale recipe to make *vitriolum martis* from four ounces of iron filings, sulphuric acid, and water.¹¹ The production of iron vitriol further developed into a large-scale manufacturing industry in England:

In England, at the Distance of about a League from London, green Vitriol is made from the Pyrites¹², which are heavy, dense Stones, of a dark Colour on the Outside, but their inner Surface is radiated from the Centre to the Circumference, the Rays shining like Bath Metal. (...) The entire Stones (pyrites) are spread abroad in a large Area, to the Height of about three Feet; and there they lie exposed to the Air for three Years, being turned once in six Months, that the Rays of the Sun may calcine them the better, and the Rains penetrate them more easily. By this means they are reduced to a vitriolick Earth, which being well washed with Rain-Water, the Liquor is afterwards conveyed by Pipes into Cisterns. Then they boil it to a due Consistence in large leaden Vessels, throwing in a Quantity of old Iron, which is presently consumed by the Lixivium. Afterwards the Liquor is set to cool in other leaden Vessels, with Sticks fixed a-cross, about which the Vitriol crystallizes.¹³

Preparation

To purify vitriol advice could be found in the treatise by the anonymous writer K.C.:

Take the best Vitriol, and dissolve it in common warm Water, let it stand three Days til it is impregnated with Salt; filtre and evaporate it in Glass Bodies till two Thirds of the Water is consumed; put the remainder into earthen glazed Vessels, set them 12 Hours in a cold place, and the Vitriol will shoot into pointed pieces, appearing like natural Chrystal of a fair Emerald Colour. Let this Vitriol be dissolved again, do as before, and thrice repeat it at each dissolving; there will remain at the bottom a yellowish Substance, which is unprofitable Sulphur, and must be removed. At the third time you will find the Vitriol so putrified, that it will make a strong Aquafortis, particularly if the Nitre be well refined.¹⁴

¹¹ LECTURE-NOTES undated, p. 14; and in LECTURE-NOTES 1707, pp. 48-51 as sal martis.

¹² Pyrites are mainly composed of iron sulphide.

¹³ GEOFFROY 1736, pp. 107, 108.

¹⁴ K., p. 97; for *Aquafortis* and *Nitre* see Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

Use

PEACHAM 1606 used *greene vitriol*, *Sal Gemma*, and *Sal Armoniack* to make a golden coloured ink.¹⁵

To make Japan or Shining Ink.

*Take Gum-Arabick and Roman Vitriol, of each an ounce, Galls well bruised a pound, put them into Grape Vinegar, or Vinegar made of clear Small-Bear; let them remain in a warm place, often stirring, till the Liquor becomes Black, then add to a Gallon, an ounce of Ivory black, and a quarter of a pint of Seed Lac-Varnish, and it will be a curious Black Shining Ink.*¹⁶

VIGANI 1683 used green vitriol to describe a method of purifying ferrous sulphate and of preparing from it ammonium sulphate.¹⁷

GEOFFROY 1736 lined out that vitriol was an emetic, detergent, anti-inflammatory, and used to expel intestinal worms, but was seldom given orally.¹⁸

¹⁵ PEACHAM 1606, p 62.

¹⁶ K., p. 64.

¹⁷ VIGANI 1683, pp. 6-7 and COLEBY 1952, p. 53.

¹⁸ GEOFFROY 1736, p. 110.



Fig. 1 Vitriolum Romanum E/3

E/3 Vitriolum Romanum

These are several pieces of rhomboid shaped semitransparent crystals of a strong blue colour. On average they are ~1.5cm long and are evenly formed. Their surface mildly reflects the light. The blue appears lighter towards the edges.

- MS Quns Vig. 4
- LECTURE-NOTES 1707

Below additional information particular to blue vitriol can be found. For further reference the respective chapters of *Vitriolum viride* E/2 may be consulted.

Terminology

Roman vitriol was usually known to be a pure form of iron vitriol and therefore green in colour. Authors such as GEOFFREY 1736 kept to this common definition. It is surprising, that Vigani, a native Italian, labelled these blue crystals *Vitriolum Romanum*. Perhaps they were traded under this name by Colchester, Vigani's London druggist, from whom he bought *Vit Virid*, green vitriol by name, and *Vit Rom*, Roman vitriol. Since the item *Vit Virid* covered green vitriol in this order, perhaps the *Vit Rom* was blue vitriol in this case, which is reflected in this sample (E/3).

GEOFFROY 1736 called the blue vitriol either *Hungarian Vitriol* or *Vitriol from Cyprus*.¹ According to recent studies², vitriol from Hungary up until the end of the 16th Century was mainly blue copper vitriol. From the early 17th Century mainly green iron vitriol was gained from the same mines, the reasons for this being a dramatic decline in the mining industry in the area and a decrease of copper content in the ore. It may still be possible that blue vitriol was traded from Hungary at Vigani's time. A remark in the notes of Vigani's lectures seems to support this supposition as it reads that a *blue vitriol* could be produced *like that which is brought from Hungary*.³ Alternatively, Geoffroy's use of terminology as well as Vigani's trade reference may be purely

¹ GEOFFROY 1736, p. 106, 107.

² KREKEL 2005.

³ LECTURE-NOTES 1707, p. 70.

traditional custom, and could be applied to any good quality of blue vitriol regardless of its provenance.

SALMON⁴ 1701 usually spoke of Roman vitriol in his recipes, but in one recipe on the preparation of black writing inks we can find that it was necessary to add *Roman Vitriol or green Copperas* and in another *Common Vitriol or Copperas*. KREKEL et al. 2005 suggested that such expressions as 'Vitriolum commune' or 'vulgare' meant iron vitriol from local mines, based on terminological studies in Germany.⁵ It appears though that in Salmon's recipe *Common Vitriol* was chosen for its source of copper and would probably have been vitriol with high copper content.

These examples show that further investigations into the English terminology of vitriols are needed.

Special attention should be drawn to the expression *sal veneris* (salt of copper), which appears in one of the scripts of VIGANI's lectures. It is produced by evaporating and crystallising a solution of copper filings, *oil of vitriol* (sulphuric acid), and water in an experiment to show the reaction scheme of acids.⁶ This salt could very well be copper vitriol. Hence investigating literature references for 'sal veneris' may provide further insights into manufacture and application of blue vitriol.

Composition

Blue vitriol is copper sulphate, the natural product partly containing other types of vitriols and other impurities. GOFFROY 1736 described that [...] *its beautiful blue Colour is owing to the Copper which it contains*.⁷

Provenance

According to GEOFFROY⁸ 1736 it mainly came from Hungary and Cyprus, however, as discussed under terminology, these provenances did not necessarily apply.

Blue vitriol existed also as synthetic product, at least in chemical laboratories.

⁴ SALMON 1701.

⁵ KREKEL 2005.

⁶ LECTURE-NOTES 1707, pp.48-51.

⁷ GEOFFROY 1736, p. 106.

⁸ GEOFFROY 1736, p. 106.

Trade

The druggist Colchester sold Roman vitriol (*Vit Rom*) to Vigani at 3 pence per ounce ⁹, That means it was three times as expensive as white vitriol (*Vit Alb*) and one and a half times the price of green vitriol (*Vit virid*) in Colchester's shop.

Quality / Adulteration

Roman Vitriol must have been available in different grades of colour. SALMON 1701 stated in a recipe to make ink, which advised the use of *Roman Vitriol well colored*, that *common* vitriol may do better instead¹⁰. This may have been a decision based on economic considerations, for the common, less coloured vitriol was the cheaper.

Properties

GEOFFROY 1736 explained that *Blue Vitriol [was] dry to the Touch, and concreted into blue Crystals, like Sapphires, of a rhomboidal Figure, flattened, and consisting of ten Sides* and that it had an acrid and austere taste.¹¹

Manufacture

Vigani observed that *water made with quicklime and sal armoniack* would turn blue in a copper vessel and produce blue vitriol if evaporated and crystallised.¹²

SALMON 1701 devoted several pages to a detailed account on how to produce artificial copper vitriol starting with the calcination of copper plates with sulphur, via a *Tincture of Venus* with repeated extraction in water and sedimentation of a residue that needed to be roasted again, until finally copper vitriol was ready to crystallise.¹³ The method was concisely summarised by GEOFFROY 1736. Unlike green vitriol, where he gave the place of manufacture in England together with the special large-scale manufacturing method, GEOFFROY's recipe for blue vitriol is more of a general nature, primarily designed on a laboratory scale:

[...] *if Copper Plates, stratified with Sulphur, be calcined in a Crucible, the Water in which this Calx is made to boil for some time, if evaporated, will leave behind a true blue Vitriol.*¹⁴

⁹ MS Quns Vig. 4.

¹⁰ SALMON 1701, p. 221.

¹¹ GEOFFROY 1736, pp. 106, 107.

¹² LECTURE-NOTES 1707, pp. 69-70.

¹³ SALMON 1701, pp. 758-760.

¹⁴ GEOFFROY 1736, p. 109.

SALMON's recipe for artificial vitriol is not the only example in art technological sources.¹⁵ In SALMON's treatise, which he wrote with the artists' and amateur painters in mind, this recipe is not linked to the product's use in painting. SALMON may have included his vitriol recipe from the perspective of him as a physician and author of medical/pharmaceutical textbooks. This phenomenon can also be observed in other painting treatises, where no direct implication was made to the use of artificial vitriol as a painting material. For example, within K.C.'s manual the link is with the chapter on glass making.¹⁶

Preparation

Apart from the manufacture no descriptions of further treatments of the natural or synthetic product in preparation for its use in art and related fields could be found.

Use

In the arts blue vitriol was mainly used for inks, for example in a black writing ink which consisted of *galls*, rainwater, *Roman Vitriol* and *Gum-Arabick*.¹⁷

Furthermore it appeared in a black colour from red rose petals.¹⁸

Blue vitriol also acted as colouring additive to glass frits to produce shades of blue or blue-green.¹⁹

Its (Vitriol of Venus²⁰) Excellencies are admirable, not only in the Art of Glass, and in Metallick Works, but in Physick also, reported SALMON²¹ 1701. The powder of blue vitriol was applied on open wounds to stop the blood flow.²²

¹⁵ A further occurrence is for example in the anonymous *Art's Master-Piece: or, A Companion for the Ingenious of either Sex*; K., pp. 67-68.

¹⁶ K., pp. 67-68.

¹⁷ SALMON 1701, p. 221.

¹⁸ See red roses *Fl.R.R.* T/6, Preparation.

¹⁹ K., pp. 67-68.

²⁰ Venus stood for copper metal.

²¹ SALMON 1701, p. 760.

²² GEOFFROY 1736, p. 110, and expressed in LECTURE-NOTES 1707, p. 53.



Fig. 1 Arsenicum Rubrum E/6, compartment empty apart from red traces

E/6 Arsenicum Rubrum

The contents of this compartment had been emptied at some time in the past. Red dust particles remain on the walls of the compartment.

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Arsenicum Rubrum may be of same or similar composition as *Red Orpiment* I/27. For further discussion see *Orpiment* I/31.



Fig. 1 Arsenicum citrinum E/18, compartment empty apart from yellow traces on the paper liner

E/18 Arsenicum citrinum

The content of this compartment had been emptied at some time in the past. Pale yellow dust particles remain on the walls of the compartment.

- listed twice in MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Arsenicum citrinum may be of same or similar composition as *Orpiment* I/31. For further discussion see *Orpiment* I/31.



Fig. 1 Praecipitatus E/19

E/19 Praecipitatus

The particles of this orange red substance are of crystalline appearance, with sharp edges and sides that scatter the light. Some particles of this precipitate are compacted into irregular shapes.

The precipitate's colour is similar to the colour of red lead.

- MS Quns Vig. 2
- MS Quns Vig. 7
- LECTURE-NOTES undated

Composition

Praecipitatus rubrum was generally associated with mercuric oxide [HgO].¹ However, detailed study of the recipe of „praecipitatus rubrum“ in Vigani's lecture notes² might reveal that it was, at least in this particular case mercuric sulphide [HgS].³

There is also a chance that the substance in the cabinet is corrosive precipitate (generally accepted as mercuric chloride [HgCl₂]), which Vigani treated in the same volume of LECTURE-NOTES.⁴

Trade

Precipitate was relatively expensive with a price of 8 pence per ounce, which Vigani paid to Porter in London in 1704 (old system: 1703).⁵

Quality / Adulteration

DOSSIE 1758 wrote on the adulteration of red precipitate:

The particular appearance of red precipitate, both with regard to its bright red colour, and the sparkling particles, it seems to be composed of, prevent it from being so frequently adulterated, as it otherwise would be: but it is, nevertheless, sometimes sophisticated with red lead, finely levigated, and mixed with cinnabar,

¹ Glossary of Alchemical Terms in the Appendix, Vol. 4 of this dissertation.

² LECTURE-NOTES undated, p. 37.

³ See also *Cinnabaris factitia* E/30, Manufacture for further evidence of a wet-process cinnabar made by a modification in the manufacture of red precipitate.

⁴ LECTURE-NOTES undated, p. 7.

⁵ MS Quns Vig. 2.

*or vermillion; which, together, imitate the colour nearly enough to deceive any, who have not an exact remembrance of the red precipitate.*⁶

Detection of adulteration with red lead could be done by heating the product to reduce the suspected red lead to metallic lead. *If another quantity be put on a red-hot poker, the immediate sublimation of the cinnabar, in copious fumes, will easily betray its presence.*⁷

Manufacture

Two short recipes for the manufacture of red precipitate for medical uses are given in the following. The first is by GEOFFROY 1736 and the second quote by BRADLEY 1730.

*Red Precipitate is made By dissolving four Ounces of crude Mercury, in a sufficient Quantity of Spirit of Nitre. The Solution is evaporated to Dryness in a Sand-heat; and the remaining Mass is of a pale yellow Colour, which by increasing the Fire to the third Degree becomes red like Coral, and is thus kept for use.*⁸

*Mercurius Praecipitatus Ruber or Red Precipitate, is made of crude Mercury and Aqua fortis, as our Professor of Chymistry will shew you.*⁹

Use

The use of red precipitate was described by GEOFFROY 1736:

*It is employed externally in eating away fleshy Excrescences, or Pustules; for being sprinkled upon any Plaister, or mixed in an Ointment it corrodes mildly and without pain. Some Chemists distill Spirit of Wine, well rectified, from this Precipitate, and this Operation being several times repeated, the Medicine becomes the Arcanum Dulcificatum; and may safely be given inwardly either with Purging or Diaphoretick Ingredients, both which it assists. The Dose is from two to six Grains.*¹⁰

⁶ DOSSIE 1758b, pp. 238-239.

⁷ DOSSIE 1758b, p. 239.

⁸ GEOFFROY 1736, p. 225.

⁹ BRADLEY 1730, p. 43.

¹⁰ GEOFFROY 1736, p. 225.



Fig. 1 Minium E/23

E/23 Minium

The pigment has a strong orange red colour. Naturally compacted lumps of pigment between less than 1mm and up to 3mm in diameter have accumulated on the surface. The white particles may be contaminations from the adjacent sample in E/22. However the red lead in I/11 also contains white granules without being surrounded by any white substance. Because of the non-interventionist approach to this research it could not be established via means of physical-chemical analysis, whether the two samples derive from the same source.

- MS Quns Vig. 4
- LECTURE-NOTES undated, p. 51

Terminology

An equivalent was the term *Minium*, which could be met with in the shops said GEOFFROY 1736.¹ According to BRADLEY 1730 *Minium*, *Read Lead*, and *Plumbum Rubrum* were synonyms.²

At around Vigani's time most writers were fully aware of the confusion about the term 'minium' in antiquity, where it was applied to native cinnabar, and the indifference in later periods, where 'minium' could denote either red lead or cinnabar³. This is for example exposed in GEOFFROY's work 1736.⁴

It remains open why Vigani chose to label this sample *Minium* whereas he used the term *Red Lead* for the sample in Drawer I.

MULLER and MURRELL 1997 supposed that minium denoted the natural occurring mineral whereas red lead stood for the artificial variety of tetroxide of lead.⁵

¹ GEOFFROY 1736, p. 244.

² BRADLEY 1730, p. 18.

³ See also *Cinnabaris nativa Persica* E/25, Terminology.

⁴ GEOFFROY 1736, pp. 214, 244.

⁵ MULLER 1997, p. 119.

This varied use of the two terms in similar recipes can be exemplified with glass making instructions by SALMON 1701, which are discussed in the chapter on use of the pigment.

SMITH 1705 was a writer who strictly adhered to the term red lead and never used the expression minium. He got by the terminological complications by referring his reader to *Mr Ray's appendix to his catalogue of hard English words*.⁶

Even though red lead and minium most certainly showed the same composition perhaps with some differences in quality at around 1700, it seemed important to adhere to the original wording for the following entrances concerning red lead and minium.

Composition

Pure minium has the chemical composition of $[\text{Pb}_3\text{O}_4]$.

Provenance

Special provenances for red lead or minium could not be established.

Trade

Colchester priced *Minium* at a halfpenny an ounce in the invoice he sent Vigani in 1704 (old system: 1703).⁷ *Ceruss* in the same invoice is double the price of *Minium*.

Quality / Adulteration

An outline on adulteration of minium and red lead can be found in DOSSIE's *Elaboratory* 1758. DOSSIE does not seem to have made a distinction between minium and red lead:

Adulteration of red lead, or minium; and the means of its detection.

The red lead is neither so frequently nor largely adulterated as the white: because of the visible effect any admixture of such ingredients as are of less value would have on its bright colour. It is, however, sometimes adulterated with red oker; which may be perceived, by comparing the sophisticated with a specimen of the true, from the foulness which will be produced in the bright

⁶ SMITH 1705, p. 20; He most likely referred to this work:

RAY, John: *A Collection of English Words Not Generally used, with their Significations and Original, in two Alphabetical Catalogues, The One Of such as are proper to the Northern, the other to the Southern Counties. With an Account of the preparing and refining such Metals and minerals as are gotten in England*. The Second Edition, augmented with many hundreds of Words, Observations, Letters &c. By John Ray; Fellow of the Royal Society. London: Printed for Christopher Wilkinson, at the Black Boy over against S. Dunstan's Church in Fleetstreet, 1691.

⁷ MS Quns Vig. 4.

*orange colour. But any adulteration may be with certainty known by reducing it to its metallic state, through the means above given for the white lead: the pearl-ashes being in this case omitted.*⁸

Properties

NORGATE 1648 warned that *Red Lead* (or *Min* as he called it in the same paragraph) lost its beauty and got greasy upon grinding and should therefore rather be washed for refinement.⁹

From SALMON 1701 we learn that *Red-Lead* was a *great dryer and binder* and that it superseded other pigments in resisting the weather.¹⁰

Read lead was a sandy harsh colour, not easily ground said SMITH 1705 adding that it was a good dryer and bound very fast and firm.¹¹

Manufacture

GEOFFROY 1736 described the manufacture of minium from the calx of lead:

*The Lead is melted over a Charcoal Fire, in a clean unglazed Earthen Platter; and the Fire continued till the melted Metal turns to a blackish or ash-coloured Powder, which is then called the Calx, or Ashes of Lead. By continuing the Fire a little longer, this Powder becomes yellow, called by the French Painters Massicot; and if calcined in a Reverberatory Furnace, it becomes very red, being then called Minium in the Shops.*¹²

He observed in this process, that *while it [lead] is turned into Calx, though it emits copious Fumes, and consequently loses a considerable Part of its Substance, yet it increases in Weight, so that an Hundred Pounds of Lead turned to Minium weigh Ten Pounds more than before; but if that Minium be again reduced to Lead, it will not weigh near an Hundred Pounds.*¹³

It is interesting to see that due to the different types of ovens the material resulting from the burning process was either massicot or red lead. Massicot was gained with the lead placed in an earthenware pot over a charcoal fire throughout the process. This means

⁸ DOSSIE 1758b, pp. 355-356; see *White Lead* La2/8, Quality/Adulteration.

⁹ MULLER 1997, p. 65.

¹⁰ SALMON, 1701, p. 181.

¹¹ SMITH 1705, p. 20.

¹² GEOFFROY 1736, pp. 243-244.

¹³ GEOFFROY 1736, pp. 242-243.

that the mass was protected from the gases and flying ashes from the charcoal. For minium on the other hand, the so-called ashes of lead needed to be further burned in a reverberatory furnace. This furnace was a metallurgical furnace, which isolated the material being processed from contact with the fuel, but not from contact with the combustion gases and ashes. Reverberatory furnaces were first applied to smelting metals in the late 17th Century.¹⁴

Preparation

SALMON 1701 described a few preparations of red lead for its application in limning and gilding. According to him red lead should not be ground fine on a stone but preferably washed to achieve a fine grain. For limning it should be ground in stiff *Gum-lake*¹⁵. The addition of saffron intensified the colour. To make a *Gold size* (presumably a gold mordant was meant) the painter was advised to add *Verdigrise* in grinding the *Red-lead* to make it dry faster.¹⁶ Red lead is already a drier in oil, and Salmon¹⁷ mentioned that himself. Therefore his last statement, namely the addition of *verdigrise*, appears somewhat illogical.

For the use in oil painting SMITH 1705 recommended that *red lead* should be washed and refined through decanting.¹⁸

This washing process was described in much detail by NORGATE 1648:

[...] washing which is done by putting a good quantity of [...] Red Lead [...] into a cleane bason of faire water then stirre alltogether with your hand, spoone, or sticke, till the water be all coloured, lett it stand a while, and you will perceave upon the superficies of the water a scume of greazy Substance or froth to arise which with the water you are to powre off. Then fill your bason with fresh cleane water, and stirring it as before, let it rest till the water and colour in it be half settled. Then powre this into another cleane dish or earthen pan reserving in the first basin the dreggs and setling, which wilbe the greatest part, yet not to be cast away, for you are not to seeke much but good, (for a little of any Colours goes farre in Limning). This troubled and coloured water being powred off into the second dish, adde more water thereto, and wash them well together as before which done, let it settle, till the water become almost cleare. But if you perceave

¹⁴ Wikipedia online encyclopaedia.

¹⁵ This *Gum-lake* contained gum hedera.

¹⁶ SALMON 1701, pp. 95, 169, 181.

¹⁷ SALMON 1701, p. 181; see also Properties.

¹⁸ SMITH 1705, p. 32.

*the scume continue to arise never leave washing till the colour be cleane. Then take the remayning grounds and wash them as before, reiterating your worke, and powring off the water into severall dishes wherein when all is settled, you will find your colour lyeing upon the sides like fine drift sand and of severall finesses. Then powre away the water reserving the Colour, which must be made dry by shelving the dishes and suffring the water to draine, or by setting them upon a few Embers to evaporate the water, and soe your colour will appeare by reason of soe many washings cleane and faire. Onely in some places of those dishes you will finde the Colour fine, and in some course. The one and the other being drayned dry in the sun or upon the Embers, you may gently take off with a cleane finger or feather, reserving the finer for your Lymning the courser for the courser worke.*¹⁹

For an experimental colour with red lead see the description of the sample of rose petals *Fl. R. R. T/6*, Preparation.

Use

NORGATE 1648 suggested a mixture of *white and Myn with a little touch of Oker* for the ground layer of a fair skin colour in limning.²⁰ For the lips he used *white, red lead, and lake*.²¹

He summarised the so-called dead colouring of the first sitting in portraiture as follows:

*Having drawne your face, with lake and white, as I said before, you may adde a little Min or red lead to those Colours, tempering them to the red and crimson of the Cheekes, lipps, &c., but gently and faintly, [...].*²²

Throughout NORGATE's treatise²³ both terms, *min* and *red lead*, were used, sometimes as in the example above in proximity to each other. NORGATE never explained the difference between the two, nor confirmed their synonymy.

SALMON 1701 told us that red lead made a perfect orange in mixture with *yellow Berries*²⁴ and added that red lead was *the only bright Color to shadow yellow garments with, to make them shew like changeable Taffety, and to colour and light Ground in a*

¹⁹ MULLER 1997, pp. 65-66.

²⁰ MULLER 1997, p. 68.

²¹ MULLER 1997, p. 70.

²² MULLER 1997, p. 73.

²³ MULLER 1997.

²⁴ SALMON 1701, p. 98.

*Picture and several other uses, as you see occasion.*²⁵ Looking at these instructions for limning we can expect this versatile pigment to be found widely in paintings.

In oil painting *red lead* could for example be combined with *white* and a little *yellow oaker* for a brick colour.²⁶ Apart from being a colouring pigment in oil painting, red lead could be an admixture to other pigments to speed up the drying process of the paint.²⁷

Fine ground *Red-lead* tempered with linseed oil made a mordant for the application of gold leaf. If glass was to be gilded, some *Chalk* should be added to the mixture. After drying the gold could be burnished.²⁸ C.K.'s *Art's Masterpiece* listed the same ingredients, with the specification of *red Chalk*.²⁹

In the industry of glass manufacture *Red Lead* could be used instead of calcinated lead³⁰ to produce glass of lead (lat.: vitrum saturni) with crystal or common frit. *Minium* was suggested by SALMON 1701 for the same purpose in the subsequent recipe.³¹ It remains unclear whether this was due to copying from different sources, where different names were given to the same substance (i.e. Pb_3O_4), or whether Salmon believed that these terms designated two different materials, or else whether *Minium* actually was different from *Red Lead*. In Salmon's case minium could not have been mistaken for vermilion, as it had been by other writers like PEACHAM in the first half of the 17th Century and WALLER in 1686³², because Salmon's *Minium* was supposed to be the source of lead as a substitute for calcinated lead.

Vigani gave instructions for the vitrification of lead using *red lead* in the LECTURE-NOTES.³³

Further indication for the similarity of minium and red lead in SALMON's glass recipes can be found in the instruction for *Rocaille*. *Minium* and fine white sand were mixed and melted into a glass of various colour which was called *Rocaille*.

Ofthese [sic!] Rocailles they make the Beads and Bracelets which they carry to America, and sell to the Indians, and may be made into all sorts of colors: it

²⁵ SALMON 1701, p. 98.

²⁶ SMITH 1705, p. 50.

²⁷ for example SALMON 1701, p. 98.

²⁸ SALMON 1701, p. 215.

²⁹ K., p. 109.

³⁰ This was oxidised lead, also called ashes of lead at the time.

³¹ SALMON 1701, p. 749.

³² HARLEY 2001, p. 123, without full record of Peacham and Waller's statements.

³³ LECTURE-NOTES undated, p. 51.

*cannot be prepared without red Lead, but it is full of Impurity. We frequently use it in Painting on Enamel and Glass, tho' it is ill qualified and full of impure Lead, yea, even that which is most clear and transparent.*³⁴

In this quote SALMON insisted that the *Rocaille* had to be prepared with *red Lead*, whereas in the initiating sentence to his *Rocaille* recipe, which listed the ingredients, the only lead-containing compound was *Minium*. Hence this indicates that *Red Lead* and *minium* were two names for the same substance, however differing in quality or purity. This is supported by another recipe for making an oriental emerald green glass, which amongst others contained *Minium or red Lead*.³⁵

Medical use of red lead was mainly externally in unguents and plasters, for example the *Emplastrum pro Fracturis*³⁶.

³⁴ SALMON 1701, pp. 754-755.

³⁵ SALMON 1701, p. 766.

³⁶ GEOFFROY 1736, p. 244.



Fig. 1 Cerussa E/24

E/24 Cerussa

Four soft rounded lumps in the shape of pebbles constitute this sample. The largest lump is 4 cm in diameter, the smallest 2.8 cm (somewhat larger than the lumps of *Cerusse I/40*). Small areas with a grey crust can be seen predominantly on the surface of the largest lump. These may be dirt deposits or a result of a chemical reaction of the pigment with the atmosphere. The white is very pure and slightly cold in hue.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

HARLEY 2001 assumed that since the late 17th Century the name ceruse had been used as a synonym for lead white, but that at an earlier period the name was used for a colour, which might have contained a proportion of lead white but did not necessarily have to do so.¹ In the present study it appears as if the confusing terminology of ceruse and the distinction to lead white had been an ongoing problem, even in Vigani's time. It would therefore be very relevant to analyse the samples in the cabinet to at least specify the composition of lead white for Vigani's collection, which would also be an indication of the composition of ceruse obtainable from druggists in London.

In SALMON's *Polygraphice* 1701 we find the term *ceruse* throughout the work, but in rare cases Salmon specified *Venice Ceruse* without any further explanation as to what the difference between the two was.² From a recipe in which *Venice Ceruse* is the

¹ HARLEY 2001, p. 165.

² SALMON 1701 and SALMON 1701, p. 106 in particular.

HERING also listed terms, which were erroneously used for lead white. This list contains 'Venedisch Weiss', in English 'Venice white' and 'bianco di Venezia' as well as 'Cerussa di Venezia' in Italian. He thought it was a pigment mixture used in the 18th Century of 1 part of lead white with 1 part of 'heavy spar' (barium sulphate) or 'blanc fixe' (HERING 2000, p. 72). HARLEY also referred to 'Venice White' as a pigment containing barites (barium sulphate) and lead white in equal parts (HARLEY 2001, p. 175). She believed that barites came into use as an

basic ingredient to produce *Saturnus Depuratus*³ we can conclude that it was a lead containing pigment.

HERING 2000 listed 'cerussa' and 'cerusa' as synonyms for lead white, and so did not consider lead white and cerussa distinct from each other with regard to their respective compositions.⁴

Among the preparations of lead, which were used in medicine, BRADLEY 1730 mentioned *Ceruse* together with *Sandyx* to be *White Lead*. In this case the first two seem to be common names for the chemical substance 'lead white'.⁵ It does not become clear from the context whether *ceruse* and *sandyx* could be used synonymously.

A substance called *Cerussa Antimonii*, which was made of regulus of antimony and spirit of nitre, was probably referred to as 'cerussa' due to the nature of the product, a white powder. There is no evidence that Vigani's *Cerussa* has anything in common with this substance, even though BRADLEY 1730 mentioned it in his lectures upon Vigani's and Addenbrooke's cabinets.⁶ Therefore it is not further considered in this entry.

Composition

Direct descriptions of what the composition of cerussa was thought to be in the opinion of 17th Century writers are very scarce. Clues can be taken from the contents within which cerusse appears, such as chemical experiments, as for example:

Recipes to make *sugar of lead* and *sulphur saturni* start from either *White Lead* or *Ceruse*. These recipes leave no doubt that both these ingredients were a source of lead. Unfortunately the recipes cannot be dated precisely enough to put them into direct relevance to the *Ceruse* in Vigani's Cabinet.⁷

artist's pigment in the late 18th Century. If SALMON's *Venice Ceruse* stood for a pigment of this mixture of lead white with barites it would be an early reference in English sources and should be the scope of further research. Lead white was evidently produced in Venice at that time (SMITH 1705, pp. 14, 15). See also *White Lead* La2/8, Manufacture.

³'Saturnus' in this composite term for a chemical substance stood for lead. *Saturnus depuratus* was used in the manufacture of glass of lead. *Sulphur saturni* (literally translated: sulphur of lead) was a substitute for *Minium* in the manufacture of glass of Lead. SALMON 1701, pp. 752-753.

⁴ HERING 2000, pp. 69, 72.

⁵ BRADLEY 1730, p. 18.

⁶ BRADLEY 1730, p. 37.

⁷ K., pp. 101, 102 and Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

Other indications are for example comparisons with other, most desirably related pigments, in terms of properties or quality, for which examples can be found below. Some of these indicate that ceruse, or good quality ceruse was just a purer form of lead white.

In the context of this uncertain field that prompts the author to make more assumptions than to propound facts, it would be very interesting to see what pigment analysis of Vigani's samples would reveal.

Trade

Vigani's sample is listed as 2 ounces *Ceruss* at 2 pence in an invoice from the London druggist Henry Colchester in 1704.⁸ This type of ceruse is very lumpy and would have required further refinement by the artist.

Good quality, finely ground *Ceruse* could be obtained readily prepared at the *Colour-Shops*, we learn from SALMON⁹ 1701 and SMITH¹⁰ 1705.

Unfortunately lead white does not occur as an item in the invoices. Its relative price to the price of *Ceruss* may have provided an indicator for a supposed higher quality of *Ceruss* over lead white, as it was said to have been a purer lead white.

Quality/Adulteration

There appears to be a differentiation in quality between ceruse and lead white, since there were *two sorts of this colour (White-Lead) at the colour shops: ceruse, which is the most pure and clean part, and the other called by the plain name white Lead*, explained SMITH 1705.¹¹

When DOSSIE 1758 analysed the adulteration and its detection of lead white he treated it equally to ceruse as a substance that was frequently extended with chalk.¹²

Properties

For some purposes *Ceruse* was too yellow, coarse and gritty.¹³ On other occasion SALMON 1701 noted that *Ceruse* was the best white next to *Spanish White* and better

⁸ MS Quns Vig. 4. It is not clear whether the invoice refers to exactly this sample or to *Cerusse* in I/40.

⁹ SALMON 1701, p. 100.

¹⁰ SMITH 1705, p. 15.

¹¹ SMITH 1705, p. 15.

¹² DOSSIE 1758b, p. 354, see also *White Lead* La2/8.

than *white Lead*, if finely ground. On the good quality *ceruse*, which could be bought from the *Colour-Shops* he added: *being only white Lead cleansed and made more pure*.¹⁴ This could be understood in the sense that good *ceruse* consisted of a pure form of lead white.

Ceruse in *Linseed* oil was recommended as a weatherproof paint for outdoor timber for reasons of beauty and preservation, recognising the durability of this combination of pigment and oil.¹⁵

Ceruse as a pigment that potentially affected the health of the painter was treated in a book dedicated to health issues of the painters' profession in 1713.¹⁶

Manufacture

Because of its unclear composition, details on the manufacture of *ceruse* cannot be outlined. Analogies may be found in the process of lead white manufacture.¹⁷

Preparation

To improve the quality of *ceruse* and prevent rusting it should be washed in the same manner as SALMON 1701 describes for lead white.¹⁸

Salmon's advice sounds a little peculiar, in that *Ceruse*, among a few other pigments, ought to be burnt before being ground with oil for oil painting.¹⁹

For more details on the preparation of this pigment, the respective section in *White Lead* La2/8 may be consulted.

Use

Painting treatises frequently mentioned the admixture of *ceruse* to lighten up other colours for limning. As already mentioned above *ceruse* in oil was also appreciated as a durable outdoor paint. Further uses may be seen in analogy to lead white, always considering that there may or may not have been differences in their composition.

¹³ SALMON 1701, p. 94.

¹⁴ SALMON 1701, p. 100.

¹⁵ SALMON 1701, p. 180.

¹⁶ RAMAZZINI 1713.

¹⁷ See *White Lead* La2/8.

¹⁸ SALMON 1701, p. 94; see also *White Lead* La2/8, Properties, Preparation.

¹⁹ SALMON 1701, p. 163.



Fig. 1 Cinnabaris nativa Persica
E/25

E/25 Cinnabaris nativa Persica

Persian native cinnabar.

This type comes in the shape of small broken, amorphous pieces, about 0.5 to 1.0 cm in length. The small fragments are of a more or less uniform dark red-purplish colour. Some possess a slightly shiny, deep purple, brown or almost black exterior.

Native cinnabar (without geographic differentiation) appears in the following invoices and lecture notes:

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- LECTURE-NOTES 1707, pp. 47-48

Cinnabar and Vermilion – Problems of terminological differentiation

Principally by cinnabar today we mean the mineral mercuric sulphide or a pigment of that mineral and by vermilion the artificial powder. However, at Vigani's time the terms were not so clearly defined.

GEOFFROY 1736 gave the most precise account on the difficulties and development of the terminology and distinction between cinnabar and vermilion:

The Name Cinnabar was in Dioscorides's Time given to several Substances; but it then properly signified a very red Substance, brought from Africa, of an astringent Quality; which, as Dioscorides relates, was believed to be the Blood of the Dragon; and Matthiolus with good Reason suspects to be the same with that Gummy or Resinous Juice, still called by that Name in the Shops. The same word was likewise applied to the Minium of the Ancients; or to that mineral Substance of a shining red Colour, from which Quicksilver was extracted; and in after-times, the two Words Cinnabar and Minium were used indifferently. At length, as the true Minium was not commonly found, and consequently often adulterated with Lead Oar calcined to Redness; that calcined Substance was

*alone called by the Name of Minium, and the Word Cinnabar appropriated to the other red Substance, from whence Quicksilver is extracted. These Names I shall here use in this common Signification, and accordingly I divide the Cinnabar of the Shops into native and factitious.*¹

At the end of SALMON'S instruction 1701 on grinding *Native Cinnabar* he said: *The same you may do with Artificial Cinnabar, which in Pouder is called Vermillion.*² This gives an accurate distinction between native and artificial cinnabar as well as vermilion. Other authors were less strict, for example BARDWELL 1756 who wrote that *no vermilion, but what is made of the true native Cinnabar, should ever be used*³, according to which the term *vermillion* covered both the native and the artificial pigment.

Native Cinnabar

Terminology

Synonyms: Cinnabaris nativa; sometimes: vermilion

Some writers⁴ in the first half of the 17th Century were aware of the confusion between the terms minium and cinnabar, which had been used indiscriminately. The chemical difference between the two substances was known at the time and the terms used accordingly, but since many writers in the field of medicine, alchemy, chemistry, and painting technique referred to past authors and copied their recipes and instructions, the incorrect use of terminology was carried forth and from that, inevitably, wrong conclusions were drawn.

PEACHAM in 1606 regarded *vermillion* as the native cinnabar, which as he said, was called *minium* in Latin. That he actually meant cinnabar becomes clear from his description that this substance could be found *where a great store of quicksilver is*.⁵ Furthermore he also used the term *red lead* and explained that it was made of burnt *ceruse*.⁶ By 1634 at the latest, he had adjusted in his writings to make the distinction

¹ GEOFFROY 1736, p. 214.

² SALMON 1701, p. 840.

³ BARDWELL 1756, p. 8.

⁴ For example GEOFFROY 1736, p. 214.

⁵ PEACHAM 1606, p. 52.

⁶ GORDON 1906, p. 53.

between *vermilion* (native or artificial, this remains unspecified) and the proper *red lead*.⁷

Composition

It was common knowledge that cinnabar consisted of mercury and sulphur. GEOFFROY 1736, for example, claimed that everyone knew about this fact, and looking at other literature gives proof to this statement.⁸ It was seen as a product of subterranean heat.⁹

It was observed that cinnabar occurred in nature in several forms:

*[...] one of a Purple Colour inclining to Red, but which, by grinding, turns to a very beautiful Red; another of a blackish or Liver Colour, resembling the Lapis Haematites; and a third of a yellowish Colour, which is commonly so rich in Quicksilver, that, when heated in the least Degree, the Metal drops spontaneously from it. The other kind of native Cinnabar is found in a fissile Stone formed of Laminae, of an Ash Colour. It has been likewise found in a white metalline Stone, and sometimes in Form of a Gold or Silver Pyrites, such as was dug up some Years ago in several Places of Normandy.*¹⁰

In order to demonstrate that cinnabar consisted of sulphur and mercury Vigani performed an experiment in which cinnabar was divided into its components by distillation.¹¹

Provenance and Trade

Vigani's samples are from Persia, Guinea, and Hungary. The two other sorts remain unknown. They are most probably the samples Vigani bought from the druggists, since in the invoices they are only specified as native cinnabar, without naming the place of origin.

Cinnabar was found in Hungary, Bohemia, Italy, Spain, and France¹², more precisely in Chemnitz, Kremnitz¹³ in Hungary, Hydria (= Idria) in Slovenia, Horowity (= Hořovice) in

⁷ GORDON 1906, p. 54.

⁸ GEOFFROY 1736, p. 215.

⁹ For example HARRIS 1704.

¹⁰ GEOFFROY 1736, p. 215.

¹¹ LECTURE-NOTES 1707, p. 46-47; This was also described by BRADLEY 1730 for small amounts: BRADLEY 1730, p. 23 and at larger scale to gain 10 ounces of mercury from 12 ounces of cinnabar: BRADLEY 1730, pp. 25-26.

¹² GEOFFROY 1736, p. 215.

Bohemia, in Kaernten, and Friaul (here apparently some of the best sorts), in Normandy near Saint-Lo, and in Peru in the mine of Guancavelica.¹⁴ The richest mine of cinnabar was in Spain, in Almaden in La Mancha. SAVARY DES BRUSLONS 1759 gave an account on these mines and how the cinnabar was gained there and then in a very efficient way treated to extract the mercury.¹⁵

BRADLEY 1730 named Cordoba in Spain as a source for cinnabar and explained that *the late Emperor being in great want of money pawned [the Hungarian mines] to the Dutch for a certain Term of Years, which raised the Price from Three Shillings and Six-pence a Pound, to Eight Shillings and six-pence. But lately we have had some bought from China, excellent good, and far exceeding the European, which has lowered the Price. The best of all we have from Persia.*¹⁶ It remains to be asked why the Dutch took over the Hungarian mines if they were the main producer of good quality artificial cinnabar in Europe at that time.¹⁷ Perhaps to protect their own product, the increase in price would account for it.

Adulteration

Adulteration of the stone seems to have been rare. Nonetheless, it must have been attempted, since the author of the following quote specifically wrote of a 'piece' of cinnabar:

*To see whether the cinnabar is pure, a piece should be placed over hot coals. If the flame is blue to violet and without odour, it is a sign that the cinnabar is pure. If the flame has a tendency to be more red, it can be taken for a sign of an adulteration with red lead, and if the cinnabar produces some bouillonnement [=ebullition?] on the coals, it could be mixed with dragon's blood.*¹⁸

¹³ Chemnitz in Germany is not known for the occurrence of cinnabar. It is possible that des Bruslons misspelled it for 'Schemnitz', a source for cinnabar south of Kremnitz. Both places are located in what is today the Slovak Republic. Details on the mines around Kremnitz can be found in RESENBERG 2005, pp. 41-42, who found evidence for these mines in German sources of the late 17th Century. Her investigation covers cinnabar/mercury mines on German and Habsburg territories.

¹⁴ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 7.

¹⁵ SAVARY DES BRUSLONS 1759-1762, Vol. 2, pp. 7-8; SAVARY DES BRUSLONS' article followed a meticulous essay on the topic by Monsieur de Jussieu to the Académie des Séances in Paris in 1719. See also *Vermilion* E/30, Trade for information on Spanish cinnabar and mercury.

¹⁶ BRADLEY 1730, p. 24-25; however, according to other sources the cinnabar imported from China to Europe was factitious: HARLEY 2001, p. 127, ROY 1993, p. 162.

¹⁷ See *Vermilion* E/30, Manufacture and ROY 1993, p. 162.

¹⁸ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 8.

For ground cinnabar was adulteration as frequent a problem as it was with vermilion and the adulterants were the same.¹⁹ If it were not adulteration that accounted for the loss in quality it could well have been impurities, which occurred naturally in the mineral.

Properties

Cinnabar was said to be a not very hard, metallic, heavy substance, found in different grades of purity. Depending on the *earthen bodies or heterogenes*, which went with the mineral, its colour could be from a lively red to a brick colour to the colour of haematite.²⁰

For SALMON 1701 native cinnabar was considered to be of better and brisker colour than vermilion.²¹

Cinnabar of Hungary or *Carinthia* (= Kärnten) was of sparkling red colour and free from all heterogeneous particles.²² According to VIGANI 1707 Persian cinnabar was the purest, and superior to the Spanish or Hungarian cinnabar. *Persian Cinnabar breaks fine like ruby*²³, which is clearly true for the sample in his collection.

Perhaps underestimating the poisonous properties of mercuric sulphide itself, GEOFFROY 1736 warned of some native cinnabar which had vitriolic or even *arsenical Particles* associated with it, because he had observed several times that those excited nausea, vomitings, anxieties and heart-burns, *even after the Cinnabar had been purged by frequent Washings; and therefore I always prefer either factitious Cinnabar, or that of Antimony, to the Native.*²⁴

In other respect, arsenical seams in particles of synthetic cinnabar (dry process) were associated with the phenomenon known as 'blackening of vermilion'.²⁵ GROUT et al. 2005 said that the historical use of native cinnabar in paintings was uncertain. Yet the author believes that historical sources like the one by GEOFFROY 1736 quoted above should give enough evidence to make it worthwhile, for the reason of arsenical impurities, further to include native cinnabars in the spectrum of pigment analysis.

¹⁹ See *Vermilion E/30, Adulteration*.

²⁰ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 7.

²¹ SALMON 1701, p. 95.

²² GEOFFROY 1736, p. 215.

²³ LECTURE-NOTES 1707, p. 47.

²⁴ GEOFFROY 1736, pp. 215-216; SAVARY DES BRUSLONS similarly has a warning of the pernicious influence of arsenic in cinnabar: SAVARY DES BRUSLONS 1759-1762, p. 9.

²⁵ GROUT 2000, p. 20.

Preparation

Native cinnabar from mines and the one found in the sands of rivers was washed and thus cleaned from impurities.²⁶ In this condition it was then traded, either in bigger pieces or granules, before reaching the artists, who then ground it the following way:

*Take Native Cinnabar q. v. [as much as you like] beat it to Pouder in an Iron or Stone Mortar, then grind it with water on a Porphyry, till it is impalpable; dry it, and keep it for Use.*²⁷

Use

The native Cinnabar, of which Painters of old were extremely fond, is now seldom used by them, because the factitious Sort is cheaper, and answers all their Purposes equally as well says GEOFFROY 1736.²⁸ In contrast to this BARDWELL some 20 years later explicitly recommends the use of native cinnabar only. It should be used with linseed oil and a drying oil, and will look particularly fine if a glaze is laid on it.²⁹

References, which explicitly recommended the use of ground natural cinnabar in painting, are very rare. Furthermore the imprecision in terminology leaves many statements ambiguous.

For a light flesh colour in oil painting a mixture of *Flake White*, *light Red* (fine burnt ochre) and some *Vermillion*, and for the middle complexion *vermilion* with *Flake White*, and also a mixture with *Lake* and *Flake White* was recommended within a wide range of shades in a three layer structure, in order to build up the flesh colour.³⁰ The colour should be quite stiff and laid with a lot of body, so it will not sink that much upon drying.³¹

For crimson coloured garments BARDWELL 1756 recommended *vermilion* for the highlights, a mixture of *vermilion*, *flake white*, and little *Indian red* for the middle tone. Reflects were painted with *light-red* (a fine burnt ochre) and *vermilion*. All these would finally be glazed over twice with *lake*.³² Vermilion also occurred in mixtures for painting skies.³³

²⁶ This process is described in RESENBERG 2005, pp. 24-26 using German sources from the 1st half of the 18th Century.

²⁷ SALMON 1701, p. 840.

²⁸ GEOFFROY 1736, p. 215.

²⁹ BARDWELL 1756, p. 8.

³⁰ BARDWELL 1756, pp. 9, 11; vermilion had to be ground native cinnabar according to his definition, see Terminology above.

³¹ BARDWELL 1756, p. 13.

³² BARDWELL 1756, pp. 29-30.

³³ BARDWELL 1756, p. 36.

PEACHAM 1606 said that for limning *you must grind it with the glayre of an egge, and in the grinding put too a little clarified hony, to make his colour brighte and perfect.*³⁴

PEACHAM 1606 also gave a recipe for a writing ink with *vermilion*, saffron and glair of egg, ground together³⁵, which was far more straightforward than SALMON's version 1701 of the same recipe.

GEOFFROY 1736 pointed out that the internal use of cinnabar was recommended *by some Physicians in the Epilepsy, Vertigo, Madness, and all spasmodick Affections.*³⁶ Some ascribed the positive effects of cinnabar to the sulphur rather than the mercury.³⁷

³⁴ PEACHAM 1606, p. 52.

³⁵ GORDON 1906, p. 61.

³⁶ GEOFFROY 1736, p. 215.

³⁷ BRADLEY 1730, p. 27 for Persian cinnabar.



Fig. 1 Cinnabari nativum è
Guinea

E/26 Cinnabari nativum è Guinea

Native cinnabar from Guinea.

What is left from this variety seems to be a very pure form of cinnabar, in its structure comparable to synthetic cinnabar. Conglomerates of aligned needle-shaped crystals, single needles, and broken or powdered remains are all of a uniform deep purple colour, which glisten through reflecting light.

Native cinnabar (without geographic differentiation) appears in the following invoices and lecture notes:

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- LECTURE-NOTES 1707, pp. 47-48

For further reference see *Cinnabaris nativa Persica* E/25.



Fig. 1 Cinnabaris nativ?
Hungaricum

E/27 Cinnabaris nativ? Hungaricum

Hungarian native cinnabar.

This cinnabar is in the form of small granules, from 1 to about 7 mm in diameter. Compared to E/25 these pieces are not only smaller, but also rounder, but are otherwise similar in structure and colour.

Native cinnabar (without geographic differentiation) appears in the following invoices and lecture notes:

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- LECTURE-NOTES 1707, pp. 47-48

For further reference see *Cinnabaris nativa Persica* E/25.



Fig. 1 Cinnabaris nativi al.
Species E/28

E/28 Cinnabaris nativi al. Species

Native cinnabar, another sort.

This amorphous piece of stone of cinnabar of about 4 cm by 5 cm displays on its outside a combination of black and purple colours with some small very bright red spots. The black looks like a crust or surface coat of the purple stone.

Native cinnabar (without geographic differentiation) appears in the following invoices and lecture notes:

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- LECTURE-NOTES 1707, pp. 47-48

For further reference see *Cinnabaris nativa Persica* E/25.



Fig. 1 Cinnabaris nativi alia
Species E/29

E/29 Cinnabaris nativi alia Species

Native cinnabar, another sort.

These three stones display a warm red colour with streaks of black intermingled. Compared to E/28 their outside is rather soft and rounded.

Native cinnabar (without geographic differentiation) appears in the following invoices and lecture notes:

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- LECTURE-NOTES 1707, pp. 47-48

For further reference see *Cinnabaris nativa Persica* E/25.



Fig. 1 Cinnabaris factitia E/30

E/30 Cinnabaris factitia

Artificial cinnabar.

The three pieces consist of very regular crystal needles aligned in parallel bundles. They are purple with a very shiny surface, sparking off the reflections of the light. The outside is very smooth, and looks as if it had been polished. The samples are similar to the specimen of sublimed dry process vermilion purchased in 1970 in Hong Kong, which is shown in GETTENS 1993¹, except that in Vigani's samples the needle structure is more pronounced.

(See I/10 for a sample of vermilion)

- MS Quns Vig. 4
- LECTURE-NOTES undated, pp. 39, 47
- LECTURE-NOTES 1707, p. 46-48

Terminology²

Throughout the literature vermilion is almost always the name for artificial cinnabar after the sublimate has been ground to powder. Problems of terminological differentiation between vermilion and cinnabar are discussed under *Cinnabaris nativa Persica* E/25.

Some French sources stated that *Vermillion*, despite being artificial cinnabar, could also be made from lead or ceruse, both burnt in fire, which should turn out to be red lead.³ Furthermore, it allocated the term kermes in the language of the dyers to vermilion, in which case 'vermilion' alludes to the kermes insect as 'small worm'.⁴

¹ GETTENS 1993a, p. 162, Fig. 3.

² See also *Cinnabaris nativa Persica* E/25, Cinnabar and Vermilion – Problems of terminological differentiation.

³ SAVARY DES BRUSLONS 1759-1762, Vol. 5, p. 1179.

⁴ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 227; assuming that vermilion etymologically derived from Latin 'small worm'.

Sinaper Lake, or *Sinaper* was artificial cinnabar in PEACHAM's *The Art of Drawing* 1634.⁵ This term was abandoned in his later writings, certainly by 1634. *Lake* in these later editions was a transparent red glaze. HARLEY 2001⁶ already pointed to this confusion in nomenclature, and descriptions of the nature of this *Lake*, but has not come to any unambiguous conclusion. *Cinnabar Lake* also appeared frequently in SALMON's treatise 1701, where it appeared to be a pigment used for glazes, but was at the same time recommended for painting sundials, which would suggest that this pigment was considered weatherproof and lightfast.⁷

There was also a cinnabar of antimony (a by-product in the making of butter of antimony) and Cinnabar Antimonii (Bradley). For both see under Manufacture below.

Composition

Mercuric sulphide [HgS].

Trade

Apparently the main reason for turning mercury with sulphur into vermilion was to transfer mercury into a more manageable form, which would be easy to pack and ship, and therefore to trade in. HARRIS 1704 explained:

*The chief design of this Operation is to make the Mercury Portable; which it is not safely when in its natural Form because of its great Weight and Fluidity.*⁸

This is why in dictionaries of commerce, and other treatises, which were not directly related to painting, the recipe for making cinnabar was immediately preceded or followed by the one on how to extract the mercury from it again.⁹

⁵ GORDON 1906, p. 52; *Sinoper*, so PEACHAM, was *in Latine called Cinnabaris, or Synopsis of the City Synope in Pontus, where it was first invented*.

⁶ HARLEY 2001, pp. 97, 132, 133, 136.

⁷ SALMON 1701, for example pp. 95, 98, 163, 165, 180, 181.

⁸ HARRIS 1704.

⁹ For example HARRIS 1704 or SAVARY DES BRUSLONS 1759-1762, p. 7; Contrasting this argument BRADLEY wrote in 1730 that *in America they have not enough mercury for their use so the Spaniards ballast their Gallons with the Quicksilver of their own country, which they tye up in Bladders, which Bladders they buy of the English and Dutch Merchants. I cannot imagine what was the occasion that Lemery had Thoughts of making a Sublimate of Mercury and Sulphur, which when finished, we call Cinnabaris Offic. Only to make it more commodius for Transportation. When this Cinnabar is in America, they distil the Mercury again from the Cinnabar, as we do from the mineral Stone at the first. This would be so laborious, as well as expensive, that it would by no means answer the Design: But the Merchants understand better, and transport it after the aforesaid manner*. BRADLEY 1730, p. 24.

For painting as well as medicinal purposes it was recommended to buy artificial cinnabar in large pieces and not as a powder because of the likelihood of adulteration with red lead¹⁰, which would turn its use in medicine into a dangerous undertaking¹¹.

In the 17th Century, Amsterdam was probably the centre for the manufacture of vermilion. HARLEY 2001 observed that the 18th Century customs records showed that *Dutch vermilion was imported [into England] regularly and in increasing quantities until it reached a peak of just under 32000 pounds in 1760.*¹² It was sold in Amsterdam in two sorts, the whole cinnabar and the powdered cinnabar.¹³

Vermilion could be bought finely ground at colour shops.¹⁴

Adulteration

Warnings of adulterated vermilion were so frequent, that it must have been a general and widely recognised problem. DOSSIE 1758 elaborated:

*The cinnabar [i.e. factitious cinnabar], designed for medical use, should be procured by those, who use it in an unlevigated state; and powdered by themselves, to prevent the sophistication, by red lead, so frequently practiced, where it is sold in the state of powder. This fraud is greatly persued by the dealers in vermilion; as it is difficult to distinguish by the appearance, or immediately even in the use of it, the adulterate from the pure; but it is very injurious to the qualities of the paint, made of it; for, whereas the genuine vermilion would retain its beauty a long time; the red-lead, on the contrary, soon turns black; and, when mixt with the other, consequently, soon destroys its brightness.*¹⁵

The many other substances, which RESENBERG 2005¹⁶ lists, were not documented in the English sources of the 17th and early 18th Centuries used for this study. RESENBERG's quotes date from the late 18th and early 19th Centuries without indication as to when these methods were introduced. Therefore it may be possible to find other

¹⁰ For example SALMON 1701, p. 181.

¹¹ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 8.

¹² HARLEY 2001, p. 127.

¹³ SAVARY DES BRUSLONS 1759-1762, Vol 2, p. 10; see here for a detailed list of prices for the import of factitious cinnabar and vermilion into France for 1757 and 1760, which shows that the products became more expensive. Prices for Dutch, and Amsterdam in particular, cinnabar and vermilion can be found in SAVARY DES BRUSLONS 1759-1762, Vol 5, p. 1180.

¹⁴ SMITH 1705, p. 99.

¹⁵ DOSSIE 1758b, p. 250.

¹⁶ RESENBERG 2005, pp. 49-50.

substances than red lead added to vermilion (red ferric oxides, brick dust, or red dyes for example) in England prior to the late 18th Century. If such adulterants did not occur in English products, they were perhaps introduced with imported vermilion.

Properties

*The factitious Cinnabar of the Shops, or Vermilion, is a red, heavy, dense Mass, friable, and marked with Silver or shining Streaks, [...] described GEOFFREY 1736 its properties.*¹⁷

SALMON 1701 explained that *it is a rich Color, and of good body, if it be fine ground, otherwise it is as bad a Color as any.*¹⁸ He also said that vermilion was too coarse and gritty to be used in watercolours unless it was purified and prepared.¹⁹ Contradicting this SALMON later in the book stated that *vermillion* was so fine that it needed no grinding²⁰ and if *ground as soft as Oyl, no Color works better.*²¹

According to SAVARY DES BRUSLONS 1759 vermilion only dried with difficulty.²² SMITH 1705 highly praised vermilion *if it be ground very fine, no colour in the world looks better, no works smoother, nor bears a better body than vermilion does, nor goes farther.*²³

Overall the darkening or blackening of vermilion seems not to have been of any concern. No particular warnings were issued concerning pigment or binding media mixtures that should be avoided.²⁴ It appears to have been considered a universal pigment in red or reddish paints, which required body. It was never recommended as a glazing pigment.

Interestingly, vermilion was treated as a pigment of concern with regard to the artist's health in a book dedicated to health issues of the painters' profession in 1713.²⁵

Manufacture

It is unknown in which way Vigani's samples of vermilion were manufactured. Once more, natural scientific analysis could provide further insight.

¹⁷ GEOFFROY 1736, p. 216.

¹⁸ SALMON 1701, p. 181.

¹⁹ SALMON 1701, p. 93.

²⁰ SALMON 1701, p. 98.

²¹ SALMON 1701, p. 181.

²² SAVARY DES BRUSLONS 1759-1762, vol. 2, p. 9.

²³ SMITH 1705, p. 20.

²⁴ See also *Vermilion* E/30, Use.

²⁵ RAMAZZINI 1713.

The focus in this section is on the manufacture via a small-scale dry process (broadly speaking: making of vermilion by sublimation), because this method probably came closer to Viganì's technique. Yet vermilion produced in factories in large amounts was at this time traded throughout Europe. Vermilion manufactured by the so-called 'wet-process' (making of vermilion by precipitation) existed but did not seem to be important in England. It will none the less briefly be touched upon for an experiment described by Vigan, which may provide new insight into old facts. Then ways of producing vermilion by sublimation ('dry-process') are discussed in more detail. Further details can be obtained in RESENBERG's study of all these processes focussing on large-scale manufacture in the second half of the 18th Century.²⁶

The so-called wet process was first recorded in Germany in 1687. This process could not be found in the sources used for this thesis in England. Either it was not known and/or used in England, or old recipes were carried further, while imported vermilion may nonetheless have come from factories, where the wet process was applied. In addition, discoveries made in the laboratory took time to be implemented in large-scale manufacture, which is another factor for delay in the practical application of latest technology. We may assume that vermilion produced by the 'wet process' was neither common practice in England at the time of the compilation of Viganì's cabinet nor had its technology been disseminated in the scientific world of the Island.

However, what may pass as an early description of some wet process, could be the special Dutch technique for the manufacture of *praecipitatus rubrum*, which VIGANI explained in *Medulla Chymiae* 1693.²⁷ *Praecipitatus rubrum* is generally in modern terms described as mercuric oxide [HgO]²⁸. VIGANI specified that the new method in Holland was to add sulphur to the heated solution of mercury and nitric acid.²⁹ The editor of the 1693-edition of Viganì's *Medulla Chymiae*, DAVID STAM, added that he produced large quantities of red precipitate this way in 1658.³⁰

²⁶ RESENBERG 2005.

²⁷ VIGANI 1693.

²⁸ See Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

²⁹ *Mercurius rerefactus dissolutus in aqua forti praecipitando, & edulcorando praecipitatum album dicitur, si tamen reverberetur usque dum revertatur in pulverem rubrum, praecipitatum rubrum appellatur. Quidam venetus in Hollandia habet novam methodum consiciendi hoc paraecipitatum admodum rubrum, & rutilans, additione sulphuris, non inferius communi.* VIGANI 1693, p. 81.

³⁰ Stam's commentary reads: *Confeci rubri praecipitati magnam quantitatem anno 1658. & frequentibus; Collegiorumque Chemicorum membris ad initio usque ad finem demonstravi.* VIGANI 1693, p. 81.

Chemical scientists should investigate these recipes further. If what was commonly described as *praecipitatus rubrum* turned out to be mercuric sulphide when prepared with sulphur, then wet process vermilion was known and used in Holland prior to 1658. So far this remains a hypothesis desiring to be solidified by chemical interpretation and analysis.³¹

VIGANI only gave a very general outline on the sublimation of cinnabar from quicksilver and brimstone, and he also added that the powdered product bore the name *vermilion*.³² Although both quicksilver³³ and samples of sulphur were contained in the cabinet he does not seem to have taken any interest in experiments in this field. Perhaps he considered this process too well understood and not worthy of further discussion or proof. The vast amount of recipes in medical, chemical, and painting treatises support this view.

In England, Venice and especially in Holland there was large-scale production of artificial cinnabar. DES BRUSLONS reported that the very particular manipulations that formed part of the manufacturing process were kept secret.³⁴

The ratio of mercury to brimstone or sulphur in the recipes varied considerably: it could be equal amounts or up to thrice the amount of sulphur or four times the amount of mercury. The cinnabar was then either won by a direct process of sublimation or via the black product, which was called 'ethiops mineral'³⁵. The process at large scale was different in that equal³⁶ quantities of sulphur and mercury were fused together over a fire. Then the superfluous sulphur was burned and the saturated mercury sublimed in a strong heat. STAHL said that the mercury was saturated when it did not contain more than 1 part of sulphur to 8 parts of mercury.³⁷ Quantitatively the composition of mercuric sulphide [HgS] is 6.25 parts weight of mercury plus 1 part weight of sulphur. However impurities within the materials as well as the manufacturing process usually required a larger proportion of sulphur in order to achieve vermilion of good quality and colour.

³¹ The sample *Praecipitatus* E/19 of the cabinet could be a start, yet its colour appears too orange to resemble vermilion.

³² LECTURE-NOTES 1707, p. 47.

³³ Invoice MS Quns Vig. 4 lists 4 ounces of argentum vivum in bottles, both unfortunately not preserved in the cabinet.

³⁴ SAVARY DES BRUSLONS 1759-1762, vol. 2, p. 8.

³⁵ Commonly described as black sulphide of mercury, or metacinnabar.

³⁶ But this also varied from author to author.

³⁷ SAVARY DES BRUSLONS 1759-1762, vol. 2, p. 8 referred to Stahl's work.

STAHL recommended melting the sulphur at a very low heat, to mix four times the amount of mercury with it until it turned into a black mass, which was then sublimed in a cucurbite³⁸ on a heated sand bath. With this gentle heat, he assured, a very beautiful cinnabar could be obtained, because superfluous sulphurous parts could be separated. With too strong a heat the cinnabar would be of a blackish colour.³⁹ The Dutch variation of preparing vermilion in the 'dry process', as it is also called, is described in ROY 1993⁴⁰ and in RESENBERG 2005⁴¹, who based her description on late 18th Century German sources.

Traditionally vermilion was prepared in small quantities in the chemist's laboratory or indeed in the workshops of those painters who followed the advice to prepare their own vermilion in order to avoid adulterated products.

Small-scale production of vermilion is described in numerous recipes⁴². The following two by SALMON 1701 and GEOFFROY 1736 are typical examples, which would have been similar to what Vigani might have taught his students, had it been on his schedule:

*Take Brimstone in powder four ounces, mix it with Quicksilver a pound, put it into a crucible well luted, and upon a Charcoal-fire heat it till it is red hot; then take it off and let it cool.*⁴³

And:

*Factitious Cinnabar is made by Mixing slowly three Parts of Quicksilver with one Part of melting Sulphur, stirring it without Intermission till all the Mercury disappears. The Mass being then cooled, reduced to Powder, and put into a proper Vessel, is sublimed with a graduated Fire, into a red-streaked shining Mass, [...].*⁴⁴

It is interesting to note that GEOFFROY 1736 dedicated only 2 out of 25 pages in his chapter on cinnabar to this substance, giving only one recipe for its manufacture,

³⁸ See Glossary of Chemical Terms, Vol. 4 of this dissertation.

³⁹ SAVARY DES BRUSLONS 1759-1762, vol. 2, p. 9 referred to Stahl 's work.

⁴⁰ GETTENS 1993a, p. 162.

⁴¹ RESENBERG 2005, p. 61.

⁴² For example HARRIS, 1704 for a recipe of the date of Vigani's cabinet.

⁴³ SALMON 1701, p. 102.

⁴⁴ GEOFFROY 1736, pp. 227-228.

whereas many other authors with interest in chemistry or medicine usually dedicated a lot of space to the manufacture of artificial cinnabar. SALMON 1701 for example in his painting treatise pointed to further recipes to be found in his *London Pharmacopoeia*⁴⁵. One might wonder why it was necessary to have so many different recipes to gain the same product. Again, most variable were the proportions of mercury to sulphur or brimstone.

Another recipe for making vermilion is given in SMITH 1705, contemporary with the cabinet, where he directed the reader to Lémery's *Chemistry* for more detailed reference.⁴⁶

A very long and elaborate account can be found in DOSSIE's *The elaboratoire* 1758, parts of which were incorporated in the *Handmaid to the Arts*⁴⁷:

Take, of purified quicksilver, twenty five ounces; of sulphur, nine ounces: melt the sulphur; and add the quicksilver to it; and, if the mixture take fire, extinguish it by covering the vessel: afterwards, let the mass be reduced to powder, and sublimed.

Note. [... .] The quantity of sulphur, here directed, is larger than has been generally prescribed, when this preparation has been intended for medicinal use: but the far greatest part of the fictitious cinnabar, being designed for the purposes of painting, where it is used under the name of vermilion, both the augmentation of the profit, from the low price of the sulphur, and the improvement of the colour, have induced the preparers to enlarge the manner of sublimation is, likewise, of great consequence, to the fine colour of the cinnabar; the producing which is a profitable secret to those, who manufacture the vermilion: it lies principally in raising the fumes of the cinnabar so quick, that no part may settle in flowers; but the whole form itself according to that specific texture, which appertains to this substance; in which particular, it corresponds with salts, that if condensed in such a degree of heat, as suffers the particles to coalesce as they would in a fluid state, form chrystals; but if, in a less, they settle without exerting their specific attraction, and become only that kind of powder we call flowers. The following method may, therefore, be advantageously persued, where cinnabar is prepared as vermilion; and, for medicinal purposes, its difference, from that of the college prepared according to the process above, will not be very material; as there are

⁴⁵ SALMON 1691.

⁴⁶ SMITH 1705, p. 19.

⁴⁷ DOSSIE 1758a.

no data, from whence we can draw any conclusions, what proportion of the quicksilver, and sulphur, would produce the most efficacious medicine.

Method of preparing cinnabar, particularly with a view to the forming vermilion of a very beautiful colour.

Take, of quicksilver, eighteen pounds, of flowers of sulphur six pounds: melt the sulphur in an earthen pot; and pour in the quicksilver, very gradually; stirring them together with a tobacco-pipe; and, if, from the effervescence on adding the last quantity of the quicksilver, they take fire, immediately extinguish it by throwing a wet cloth over the vessel: when the mixt mass is cold, powder it; so that the several parts shall be well mixed together; but it is not necessary to reduce it by levigation to an impalpable state: having then prepared an oblong glass body, by coating it well with fire lute, over the whole surface of the glass, and working a proper rim of the same round it, so that it may hang in such manner, that one half of it may be exposed to the fire within the cavity of the furnace, let the powdered mass be put into it, so as to fill the part, that is within the furnace; and a piece of broken tile be laid over the mouth of the glass: sublime the cinnabar then, with as strong a heat as may be used without blowing the fumes of the cinnabar out of the mouth of the glass; and, if there be any danger, that the sublimed cake should form itself so in the mouth, as to stop up all vent, lift up the tile at proper intervals; and, with the end of a tobacco-pipe, preserve some passage, lest, on too great an augmentation of the heat, the confined vapour should burst the glass: when the sublimation is over, which may be perceived by the abatement of heat in the upper part of the body, discontinue the fire; and, when the matter contained in the glass is cold, take it out; and separate from it, any part, which appears dissimilar to the rest: powder then the perfect part which is designed to be used, as vermilion; and keep what may be necessary for medicinal uses, in lumps of the sublimed cake.⁴⁸

Cinnabar of Antimony.

A different method of preparation was that of cinnabar of antimony as a by-product in the making of butter of antimony. This term is and was misleading as it suggests a cinnabar-like product of a red colour containing antimony, which many authors, particularly up to the end of the 17th Century, still believed to be the case. From what we find in the lecture notes VIGANI was not explicit on this point but it seems he knew that the cinnabar of antimony was identical to cinnabar from mercury.⁴⁹ But in *Medulla*

⁴⁸ DOSSIE 1758b, pp. 246-249.

⁴⁹ LECTURE-NOTES undated, p. 47.

*Chymiae*⁵⁰ he affirmed even against the opinion of other chemists that (his) *cinnabaris antimonii* was identical with common cinnabar [HgS]. BRADLEY 1730 commented that this cinnabar could seldom be found in the shops.⁵¹

Another version of cinnabar, by BRADLEY 1730 called *Cinnabar Antimonii*, which was not the same as cinnabar of antimony, was made with crude mercury, common sulphur, and antimony. This cinnabar was not as strong (presumably in its curing power) as the former, described by Vigani.⁵²

A variation of Vigani's recipe can be found in HARRIS 1704:

*Cinnabar of Antimony, is this made: Fill a retort half full of equal Parts of Powder of Antimony and Sublimate Corrosive; and setting the Vessel in Sand, proceed at first as in the making of Butter of Antimony, which will also this way be made. But when the Fire being encreased, you find Red Vapours begin to arise, fit on another Receiver, but without Luting the Junctures, and raise the Fire by degrees till the Retort be red hot, in which state it must be kept three or four Hours. Then the Vessels being left to cool, break the Retort, and you will find, if the Operation succeeded (which now and then it will not) the Cinnabar sublimed and adhering to the Neck of the Retort.*⁵³

Preparation

DOSSIE 1758 was of the opinion that *Vermilion should be levigated as finely as possible: for nothing contributes more to its beautiful colour, as well as its excellence in other respects, than the fineness of its powder. It is generally levigated by means of a hand mill, where considerable quantities are manufactured; but it may be rendered more impalpable, by the use of the muller and levigating stone, than any mill can effect.*⁵⁴

Instructions for limning suggested grinding vermilion with egg white and a small addition of honey.⁵⁵

⁵⁰ For example in this edition: VIGANI, 1693, p. 75.

⁵¹ BRADLEY 1730, p. 38.

⁵² BRADLEY 1730, p. 38.

⁵³ HARRIS 1704.

⁵⁴ DOSSIE, 1758b, p. 250.

⁵⁵ SALMON 1701, p. 95.

It was recommended to mix the cinnabar while grinding it with water of gamboge and some saffron, to enhance its colour. These two additives would also prevent it from turning black.⁵⁶

The anonymous author C.K. suggested that vermilion could be tempered directly on the palette with linseed oil, but that grinding would be better, because then it dilated and spread more easily.⁵⁷

Use

Vermilion was principally used for garments, perhaps in a mixture with a little *yellow Berries*, so SALMON 1701.⁵⁸

In oil painting vermilion occurred in almost all treatises as a pigment for red robes of satin, silk, velvet, or cloth. It is less frequently seen as a good pigment in mixtures to produce flesh colours.

PEACHAM 1634 taught the gentleman to make red velvet of vermilion in linseed oil, shadowed with *browne of Spain* and *sea-coale black*. The whole garment was finally glazed with *Lake*. For a more crimson coloured look, lead white was added at will.⁵⁹ For a garment of the same colour C.K. recommended a mixture of *burnt ochre*, *vermilion* and *Indian Red*, glazed with *lake* and heightened with *vermilion*.⁶⁰

A scarlet colour could be achieved by mixing *Lake*, *Red Lead*, and *Vermillion*, but also by deepening vermilion with *Lake* and heightening it with *Indian Red*.⁶¹ The same writer reported on a technique to paint flesh colour by mixing a small quantity of lead white with twice as much *Lake* and *vermilion* for the darkest parts, then gradually more white had to be added to this mixture to work towards the lightest colour in the face.⁶² Although not mentioned, this was probably assuming white priming, and thus may reflect a considerably earlier source from which this instruction had been copied. The same pigments were used by PEACHAM 1634 in oil painting. He suggested to heighten or deepen them as the occasion required.⁶³ This could be on any coloured ground.

⁵⁶ SAVARY DES BRUSLONS 1759-1762, Vol. 2, p. 10.

⁵⁷ K., p. 12.

⁵⁸ SALMON 1701, p. 98.

⁵⁹ GORDON, 1906, p. 133.

⁶⁰ K, p. 18.

⁶¹ K., p. 12.

⁶² K., pp. 16-17.

⁶³ GORDON, 1906, p. 131.

Shadows were composed of *ivory blacke*, *white lead*, *vermilion*, *lake*, *sea-coale black* and others. PEACHAM 1634 also mentioned the addition of vermilion to *wood colours* of the background, which were usually in more sombre tone.⁶⁴

NORGATE (1st half. 17th C) listed *vermillion* amongst the pigments, which needed to be ground to make them useful in limning, where he used *gum arabic* as a binding medium. Interestingly enough, this pigment found no further mention throughout his second manuscript, and seemed not to have been used in painting the flesh at all. MULLER and MURREY 1997 noted that - in his earlier manuscript - NORGATE even condemned *vermillion* as *unnecessary and dangerous*. They observed that Hilliard did not use it as a flesh colour either, but that PEACHAM 1612 preferred it to *Lake* for that purpose.⁶⁵ We do not know whether Norgate meant natural or artificial cinnabar when he spoke of *vermillion*, but we do know that Peacham in his early works used the term vermilion for the native cinnabar, and in his later works did not make a distinction.⁶⁶

There seems to have been more concern about the usefulness of *vermillion* in limning⁶⁷ than in oil painting. Therefore the problem with this 'dangerous' pigment arose only in connection with water-based binding media systems such as egg white or gum arabic, and here only in some cases. One could speculate whether this might be explained with the use of either native or artificial cinnabar, whereby artificial cinnabar seems to have had fewer negative effects. This can vaguely be based on MULLER and MURREY'S observation⁶⁸ that *vermillion* appears to have been used in the flesh of miniatures by Flemish illuminators and by Lucas Hornebout, and Holland was one of the main producers of artificial cinnabar. HARLEY 2001 supposed that Norgate's aversion to vermilion derived from the coarseness of the pigment, which would not make it suitable for portrait miniatures.⁶⁹ But we cannot judge whether Norgate's comment rather refers to *vermillion*'s working properties or to its deficits in quality as a stable pigment. Also adulteration could be the cause for rendering the pigment unsuitable either in terms of its painting properties or due to later discolouration. Adulteration could affect both the artificial and the native cinnabar when sold as a powder.

⁶⁴ GORDON 1906, p. 136.

⁶⁵ MULLER 1997, pp. 62, 119 and PEACHAM 1612, p. 98.

⁶⁶ As detailed under Terminology above.

⁶⁷ With the exception of DE MAYERNE'S often cited concern that vermilion was of no use in oil painting (BISCHOFF, 2002, p. 46), artists seemed to be satisfied with the quality of vermilion as a pigment in oil painting. More objections rose towards the end of the 18th Century; HARLEY 2001, pp. 127-128.

⁶⁸ MULLER 1997, p. 119.

⁶⁹ HARLEY 2001, p. 128.

In conclusion, it must be said that a clear argument as to the cause of unhappiness with vermilion amongst some limners and artists in oil painting can so far not satisfactorily be established because there are too many variables to be considered. Furthermore, sufficient evidence from the evaluated sources, which would help to reinforce one or the other supposition, is still lacking. Recent chemical and physical study⁷⁰ of the phenomenon of blackening of vermilion, which would be one reason for dissatisfaction with the pigment (though it remains unclear how quickly these changes would have become noticeable) have shed light on some possible influencing factors.

Further applications of vermilion were as follows:

Vermilion was also mentioned as a pigment used in colouring mezzotint prints, which were fixed on glass with varnish. The binding medium in this case was linseed oil with mastic.⁷¹

SALMON 1701 quoted one recipe in which vermilion was used to make a red writing ink with egg white as binding medium and one for a printing ink together with liquid varnish or pre-heated linseed oil.⁷²

For common red Japan varnish *vermillion* was mixed with *the thickest seed lac* for the first layers and with *ordinary seed lac varnish* for the following 8 layers. To achieve a pale red, lead white could be ground to the mixture.⁷³

Vermilion with thick *Seed-Lac Varnish*, and, if desired, a small quantity of finely ground dragon's blood provided the red ground in japanning works, when applied in several layers and being polished.⁷⁴ The addition of *Dragon's Blood* for a dark red Japan was also recommended in the anonymous treatise by C. K.⁷⁵

GEOFFROY 1736 claimed that in medicine *Factitious Cinnabar has the same Virtues with Aethiops Mineral*⁷⁶ [...] *and is sometimes ordered as a Fumigation to excite Salivation in the Lues Venerea*⁷⁷.

⁷⁰ GROUT, 2000.

⁷¹ K., p. 22.

⁷² SALMON 1701, p. 222.

⁷³ K., pp. 33-34.

⁷⁴ ARTLOVE 1730, pp. 7-8.

⁷⁵ K., p. 34.

⁷⁶ This was made from quicksilver, flowers of sulphur, rubbed together in a mortar until it turned into a blackish powder; GEOFFROY 1736, p. 227.

VIGANI 1707 said that both the Persian cinnabar and the artificial cinnabar had the same virtues in medicine⁷⁸, yet *aurum mosaicum* exceeded all sorts of cinnabar in its effectiveness as a remedy in epilepsy.⁷⁹

Cinnabar and cinnabar of antimony alike (in a dose from six to sixteen grains⁸⁰) were reputed to be excellent medicines in epilepsy, also in asthmatic conditions and diseases of the skin.

It was widely held that cinnabar was insoluble and inalterable in the digestive tract and therefore did not harm the body. Less favourable was its fumigation use in venereal diseases and exterior symptoms like ulcers.⁸¹

⁷⁷ A treatment during which the patient was seated naked in front of a stove. The steam of pieces of cinnabar thrown upon the coals was absorbed through the skin, which, repeated over a couple of days, caused the gums to ulcerate and the patient to spit up to three or four pints a day. GEOFFROY 1736, pp. 227-228, 231-232.

⁷⁸ LECTURE-NOTES 1707, p. 48.

⁷⁹ LECTURE-NOTES undated, p. 39; Vigani did this under the wrong assumption that *Aurum Mosaicum*, like cinnabar, was a kind of fixation of mercury by the help of sulphur. He did not realise that instead of mercury, which was an ingredient in his recipe, tin was the reactive part in the formation of mosaic gold [SnS_2], a yellow scaly crystalline powder.

⁸⁰ HARRIS, 1704.

⁸¹ SAVARY DES BRUSLONS 1759-1762, vol. 2.



Drawer F

Drawer F

36	35	34	33	32	31
30	29	28	27	26	25
24	23	22	21	20	19
18	17	16	15	14	13
12	11	10	9	8	7
6	5	4	3	2	1

No F/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Lapis Haematites	Lapis Hoematities. Hematitis
2	2 L. Amethystus	Lap. Amethytis. Amethyst.
3	3 Bezoar orientalis	Bezoar orientalis. Bezoar.
4	4 Bezoar orient. al.	Bezoar orient-al. Bezoar.
5	5 L. Topasius	Lap Topasius Topaz.

6	6 L. de Goa	
7	7 L. Smaragdus	Lap Smaragdus. Emerald.
8	8 L. Granatus	Lap Granatus Garnet.
9	9 L. Chrystallus	Lap Chrystallus. Chrystal.
10	10 L. Rubinus	Lap. Rubinus. Ruby.
11	11 L. Lazuli al.	Lap. Lazuli al. Lapis Lazuli.
12	12 L. Hyacinthus	
13	13 L. Gagatis	Lap Gagati. Jet.
14	14 Lapis Nephriticus	
15	15 L. Nephrit. al.	Lap Nephrit. alia
16	16 L. Nephrit. Laevvigat	Lap Nephrit Lerigat [later changed to Levigat]
17	17 Margaritae orient. Perlucid.	Margaritoe Orient Pearls.
18	18 L. Armenus sive L. Lazuli al.	Lap Armenius. Lap Lazuli alia. Lapis Armenius.
19	19 Margaritae Scot.	Margaritoe Scot.
20	20 L. Saphirus	Lap Saphiris. Saphire or Saphyr.
21	21 L. Judaicus	Lap Judaicus. Lapis Judaicus
22	Margaritae Orient.	Margaritoe Orient.
23	23 Lap. Contrayerva [or : Contragerva]	Lap Contrayer.
24	24 Lap. Magnetis ar.	Lap Magnetis Magnesia
25	25 Lap. Lyncis	Lap Lyncis. Lapis Luicis.

26	26 Margaritae occid.	Margaritoe occid.
27	27 Globuli Arcnae [or : Arenae] grandioses.	Globuli Apenae
28	28 Selenites	[no transcription; comment: Mica.]
29	29 Shark's Teeth.	
30	30 Magnes	
31-36	[empty, no paper boxes preserved]	

No **F/3** contains green wool and No **F/16** white wool. Of all the stones in this Drawer No **F/21** is the only one with fossils included.

No **F/22** is labelled, without number, on the inner, left side of the paper box.

The contents of No **F/24** and **F/30** seem to have been exchanged.



Fig. 1 L. Lazuli al. F/11

F/11 L. Lazuli al.

These two mineral lumps are strongly blue with white crystalline inclusions as well as small silver-grey metallic streaks. Compare with the sample in F/18.

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7

Terminology

In the second half of the 17th Century 'ultramarine' was considered the pigment (or colour, as it was called at the time), which could be extracted from the mineral 'lapis lazuli'.¹ 'Lapis lazuli in powder' was the powdered stone, containing the ultramarine, pyrites, and other minerals. SALMON 1701 used these terms in exactly that way.² HARLEY 2001 mentions the term 'lazurite' for the blue mineral after its first step in the preparation of ultramarine, when the lapis had been heated and plunged into a cold liquid.³ GEOFFROY 1736 also attributed the name *Oriental Stone* to lapis lazuli.⁴

Composition

Chemically, lapis lazuli is comprised of a very complex structure of a sulphur-containing aluminium silicate described as $(\text{Na,Ca})_8(\text{AlSiO}_4)_6(\text{SO}_4,\text{S,Cl})_2$.⁵ It typically occurs with calcite inclusions and veins of pyrites (iron sulphide). Writers in the 17th and early 18th Centuries frequently mistook the latter for 'marcasite' of gold or copper because of its metallic gold-coloured appearance and so mislabelled it in their descriptions of the composition.

BRADLEY 1730 believed the metal veins in lapis lazuli to be gold and those in azurite to be copper:

¹ For a synopsis on the early terminology and etymology of 'lapis lazuli' and 'ultramarine' see PLESTERS 1993.

² SALMON 1701.

³ HARLEY 2001, p. 44, without reference to the original source.

⁴ GEOFFROY 1736, p. 74.

⁵ PLESTERS 1993, pp. 37, 41.

*L. Lazuli, or Arm-Stone, is of two Sorts; it is hard as Marble, and of a blue Colour, which will bear the Polish; this is interspersed with Golden Strakes or Veins, which give it a noble Appearance when it has passed the Mill. The baser Sort has not pure Gold in it, but is rather a Marchasite of Copper, while the other has Gold in it. We find these in Mines where either Gold or Copper prevail; both these are valuable, though there is only one of great Use. That which I mean produces the Ultramarine Blue, as well as pure Gold. The other produces a Colour which is called Verditure, and, as if it was mixed with Lapis Calaminaris and Copper, yields a Brass-like Metal. The latter is likewise polished, and made into Tables and Toys of several Sorts; but the first is too rich for any Use of that Kind; for the very blue Part of it, when it is reduced to Powder an well prepared, is sold for four Pence an Ounce.*⁶

When BRADLEY 1730 taught on different types of marcasites he mentioned that veins of metal were mostly included in white stones (marble), but in Vigani's cabinet he discovered a form that also included blue stone like lapis lazuli:

*And there are some Specimens (of Marchasite of Gold which is like white Marble, wherein Gold appears to drop or spread it self in Branches), also, in the Collection of Materia Medica, by Signore Vigani, which are now in Queens' College [...]. But in these last I find some Veins of blue, such as are equal in Quantity to those in Lapis Lazuli. However, the true Lapis Lazuli abounds more in the fine blue Colour, than in Gold Veins. Both these Sorts are in the Collections of the University Library, and in Queens' College. What we find this way is called native, or Virgin Silver and Gold.*⁷

Unfortunately BRADLEY failed to clarify which collection held what sample, neither did he refer to Vigani's labelling, so that we cannot clearly establish which sample he spoke of. It sounds though as if he may have confused pyrites with gold.

Provenance

See *Ultramarine* I/7

⁶ BRADLEY 1730, p. 73; Bradley's baser *L. Lazuli* with *Marchasite of Copper* from which *Verditure* could be gained was probably azurite. A discussion about the terminology of verditure can be found in *Verditure* I/21. Azurite is treated under *Blew Bice* I/6, *L. Armenus sive L. Lazuli al.* F/18, and *Minera Cupri Anglicana in qua reperitur Lapis Lazuli* U/12.

⁷ BRADLEY 1730, p. 15.

Trade

Vigani bought 3 ounces *Lap Lazulae* at a price of 1 shilling per ounce from Francis Porter, druggist in London, in 1704 (1703 in the old calendar).⁸ The copy of this invoice from December of this year, a reminder to Vigani for late payment, lists only 2 ounces of *Lap Lazulae* for 3 shillings, which comes to 1 shilling and 6 pence per ounce.⁹ It is difficult to determine which of these prices is correct. Tentatively the higher price is accurate. The druggist Colchester exceeded both these prices, selling his *Lap Lazuli* at 2 shillings per ounce.¹⁰ Vigani bought 5 ounces. The question is: Were these lapis lazuli of different quality, and did Vigani prefer a higher quality? A small piece of a very pure sample is preserved in the cabinet as *L. Armenus sive L. Lazuli al. F/18*, however it remains uncertain, whether the sample represents true lapis lazuli.¹¹

Quality / Adulteration

Within a seven-page long chapter on *Preparations of Mineral Colors*, SALMON¹² 1701 reserved over six pages for lapis lazuli, and dedicated the first paragraph of this section to the quality of lapis lazuli only. Considering the length of text, this mineral received most attention among all pigments mentioned in the book. Undoubtedly, the assessment of quality of this pigment as well as the proper preparation of this precious material was an important issue at the time.

The quantities of mineral recommended for use in its preparation vary greatly depending on the source of the recipe. Sometimes astonishingly large amounts were mentioned, given the price of the mineral. However, variations of this amplitude are comparable to instructions in recipes for other pigments. In this particular case of ultramarine preparation the complex process with several cleaning, separating, grinding, and washing stages would gradually have reduced the amount probably quite drastically. The question is therefore, whether the mineral as such had to be considered a highly priced commodity or whether we can establish a dramatic rise in price for the prepared pigment. Quality of the stone (i.e. percentage of content of pure lapis lazuli compared to amount of impurities) as well as quality of the pigment need to be taken into consideration.

⁸ MS Quns Vig. 2.

⁹ MS Quns Vig. 7.

¹⁰ MS Quns Vig. 4.

¹¹ See *L. Armenus sive L. Lazuli al. F/18*

¹² SALMON 1701, pp. 833-840.

Unfortunately the invoices relating to Vigani's cabinet only give prices for the mineral lapis lazuli and not for the pigment ultramarine, so that the above consideration in terms of pricing cannot be answered at this point.

According to SALMON 1701 good lapis lazuli came from Persia and the East Indies.

To test the quality he advised *to put pieces of the Stone into a good Fire, blowing continually for an hour: if after this they have their first Hardness and Colour, they are good; but if they will crumble, they are naught. Or, Put some pieces into an Iron Ladle, into a Furnace with a strong Fire, to heat red hot, and then quench them in strong Wine Vinegar: if the Color is good and splendid as before the burning, it is good; otherwise naught.*¹³ He did not say, whether "naught" quality stones were still of any use, or whether this method only proved that one had bought a stone of poor quality. Quality seems to be defined as keeping colour and hardness under the described conditions. These conditions never really apply to painting materials. Therefore a bad quality stone could still produce a good pigment, but probably not as much pigment as a good quality stone, which yields a smaller percentage of impurities and therefore does not change under these testing conditions.

HARLEY 2001 interprets the heat test as a test for adulteration with azurite, which would turn black during the process. The heat test could likewise be applied to the pigment ultramarine to detect substitute pigments, which might change colour.¹⁴

GEOFFROY 1736 stated that the best *Lapis Lazuli* was of a deep blue colour with some *Gold Specks*, hard to break, and durable in the fire (in contrast to the *German Lapis Lazuli* and *German Ultramarine* which, according to him, were easily affected by external forces and turned green with time).¹⁵ GEOFFROY obviously was not aware of the distinction between ultramarine and azurite/bergblau, which was mined in Germany.

Properties

Properties and manufacture of the pigment ultramarine are described in *Ultramarine* I/7, as are its preparation and use.

¹³ SALMON 1701, p. 834.

¹⁴ HARLEY 2001, p. 44.

¹⁵ GEOFFROY 1736, p. 74.



Fig. 1 L. Armenus sive
L. Lazuli al. F/18



Fig. 2 L. Armenus sive L. Lazuli
al. F/18, on the side. The
break shows the intensely
blue colour.

F/18 L. Armenus sive L. Lazuli al.

This mineral sample is very pure and possesses a strong dark blue colour throughout, which becomes evident from the broken side edge. All other surfaces are blue-black. Compare with the sample of *L. Lazuli al.* F/11.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

'Lapis Armenus' used to be a common term for the mineral azurite for which an important mining area was Armenia. In an article published in the Transactions of The Royal Society, WALLER 1686, not an expert on pigments but a botanist looking for a standardization for colour descriptions in his discipline, took *the Lapis Armenius to be the blew bice sold in the shops, for it is light and friable; formerly brought out of Armenia, now from the silver mines of Germany, called Melochites, in high Dutch Bergblaw.*¹

Confusion with lapis lazuli surely happened in some instances. Vigani's label leaves scope for several possible interpretations:

The label indicates that the sample is 'Lapis Armenus or lapis lazuli'. In this case Vigani knew that they were different materials but was not sure which of the two he had in front of him.

¹ WALLER 1686.

The label could be read as 'L. Armenus or another type of Lapis Lazuli', explaining that L. Armenus was another type of lapis lazuli, which means that Vigani thought that the sample was some kind of lapis lazuli that went under the name of *L. Armenus*.

The interpretation 'L.Armenus or another Lapis Lazuli' would indicate that Vigani thought L. Armenus was in some way related to lapis lazuli, yet only similar to and not the same as lapis lazuli.

The uncertainties in the interpretation of the differences between the two minerals is well reflected in BRADLEY's observations 1730, that the only difference between the two was the nature of the metal vein included in them. The more precious lapis lazuli, according to Bradley, contained gold whereas it was copper ore in the Armenian stone. He thought this was so in a lecture on Vigani's and Dr Addenbrooke's cabinet in 1730:

L. Lazuli, or Arm-Stone, is of two Sorts; it is hard as Marble, and of a blue Colour, which will bear the Polish; this is interspersed with Golden Strakes or Veins, which give it a noble Appearance when it has passed the Mill. The baser Sort has not pure Gold in it, but is rather a Marchasite of Copper, while the other has Gold in it. We find these in Mines where either Gold or Copper prevail; both these are valuable, though there is only one of great Use. That which I mean produces the Ultramarine Blue, as well as pure Gold. The other produces a Colour which is called Verditure, and, as if it was mixed with Lapis Calaminaris and Copper, yields a Brass-like Metal. The latter is likewise polished, and made into Tables and Toys of several Sorts; but the first is too rich for any Use of that Kind; for the very blue Part of it, when it is reduced to Powder an well prepared, is sold for four Pence an Ounce.

It is reported by Paulus Ammanus, that the Confection made of it is Cordial.²

More light could be shed on the nature and terminology of this particular sample when it is analysed by an expert geologist.

Azurite and the pigment blue bice are discussed under *Blew Bice* I/6. Lapis lazuli is treated under *L. Lazuli al.* F/11 and *Ultramarine* I/7.

² BRADLEY 1730, p. 73.



Drawer G

Drawer G

100	99	98	97	96	95	94	93	92	91
90	89	88	87	86	85	84	83	82	81
80	79	78	77	76	75	74	73	72	71
70	69	68	67	66	65	64	63	62	61
60	59	58	57	56	55	54	53	52	51
50	49	48	47	46	45	44	43	42	41
40	39	38	37	36	35	34	33	32	31
30	29	28	27	26	25	24	23	22	21
20	19	18	17	16	15	14	13	12	11
10	9	8	7	6	5	4	3	2	1

No G/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Caravansa	
2	[empty, paperbox not preserved]	[no transcription]
3	[.] [paper lost] Peşa	Bean.
4	Spa[...]	Broad Bean.
5	[not labelled]	NN Dark French Bean.
6	[.] [paper lost] of Sev. Sints	Giesi [.]
7	Indian Beans	Indian Beetil
8	[...] [...]iey [ink faded]	[no transcription]

9	Large tinted [not very clear] Beans	[no transcription]
10	[...] [...] [ink faded] Beans	[no transcription]
11	[not labelled]	NN [no transcription]
12	Ceder Myrtle	Coder Myrtle.
13	[...] R[...] [ink faded]	[no transcription]
14	Smyrsca Peas	Smyric Peas
15	[not labelled]	NN. [no transcription]
16	Dwarf Peas.	
17	Rosa Peas	Rosi Peas
18	Sugar Peas	[no transcription]
19	[...]gg[...]	[no transcription]
20	[empty, no label]	Portugal Peas
21	[.]icc[...] [paper lost] F[.]l[.]f[...] [ink faded]	[no transcription]
22	Peri canthis	Pericanthis.
23	Cianus	
24	[not labelled]	NN [no transcription]
25	[paper lost]	NN [no transcription]
26	[on a separate label:] water mellons Goned Calabash mea[.]ini & Simnea	Water mellons.
27	S[...]ad[.] [ink faded]	[no transcription]
28	[paper lost]	[no transcription]
29	[...]p[.]x[...] [ink faded]	[no transcription]
30	[...] Lupini [...] [ink faded]	[no transcription]
31	[not labelled]	NN [no transcription].
32	[not labelled]	[no transcription] [Comment:] 32.-46 Garden Seeds.
33	[not labelled]	[no transcription]
34	Yew Seed	[no transcription]
35	F[...] sorrel [ink faded]	[no transcription]
36	[paper lost]	[no transcription]
37	Nuces [...]sia [ink faded]	[no transcription]

38	[not labelled]	[no transcription]
39	Indian Cressa	[no transcription]
40	[not labelled]	[no transcription]
41	Cicer[.] [...] [ink faded]	[no transcription]
42	[paper lost]	[no transcription]
43	[on a separate piece of paper:] Love is a bleeding [[.], not very clear]	[no transcription]
44	[ink faded]	[no transcription]
45	[on a separate piece of paper:] Citterne	[no transcription]
46	[...] [...] [.]arliā voc[.] [ink faded]	[no transcription]
47	[empty, not labelled]	[no transcription]
48	Portugal Peas	[no transcription]
49	Cicor alb.	[no transcription]
50-100	[empty, no paper boxes preserved]	[no transcription]

No **G/1**: shows a different handwriting.

No **G/11**: The compartment seems to contain hazelnuts.

No **G/12**: shows a different handwriting, similar to No G/1.

No **G/22**: shows a different handwriting, similar to No G/1.

No **G/23**: contains a piece of paper with some fragmentary words in Latin written on:
Recto: "icandum / *emici* vul / ti sunt", Verso: "mihi max / ciatur Atr / ione cu"

No **G/45**: The sample is labelled on a separate label; the handwriting is similar to No G/1.

No **G/26**: shows a different handwriting, similar to No G/1.



Drawer H

Drawer H

23		22	21	
20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No H/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	21 Manna	Manna. Saccharine Exudation from Fraxinus Ornus.
2	Manna in Granis.	
3	Succus Acaciae	Juiciy Acacia. Succus Acacia.
4	Succus Hypocistidos	[no transcription]
5	Terra Japonica	
6	Myrrha	
7	Succus Glucyri[...] [paper lost]	Succus Glycyrine.
8	Aloes rosat.	

9	Aloes caball	
10	Aloes Hepat.	
11	Sanguis Draconis as it drops f ^r y ^e Tree	Sanguis Draconis as it drops from Tree.
12	Sanguis Draconis in calamis brevioribus.	Sanguis Draconis in reeds.
13	Sanguis Draconis in Calamis longioribus	Sanguis Draconis in Calamis loagioribus. [later changed to longioribus] Dragons Blood.
14	[paper lost]	NN. [no transcription]
15	[paper lost]	NN. [no transcription]
16	[paper box empty, not labelled]	NN. [no transcription]
17	Opium	
18	Heliotro[.] [...] condens [ink faded]	Heliotrofor ?
19	[new paper box, not labelled]	NN. [no transcription]
20	[new paper box, not labelled]	NN. [no transcription]
21-23	[empty, no paper box preserved; No H/23 contains a separate piece of paper with 'i] manna, ii] myrrh, iii] dragon's blood.' in machine writing on it]	

No **H/1** is originally numbered '21', whereas all other samples in this Drawer are not numbered. H/1 might have been removed from another drawer to be placed here next to H/2 'Manna in Granis'.

No **H/19** contains dark purple grains, similar to H/18, but smaller. The paper box is new.

No **H/20** contains a piece looking similar to brown coal with white crystalline efflorescence.



Fig. 1 Terra Japonica H/5

H/5 Terra Japonica

This is a blackish brown mass, which breaks into shiny pieces. The surface of the clumps is dull with brown inclusions, whereas the fractured surfaces are shiny. The largest lump is ca 2.8 cm by 2.5 cm.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

It apparently happened that terra japonica was confounded with Armenian bole or attributed similar material qualities. BRADLEY 1730 treated terra japonica together with terra sigillata and Armenian bole. He said that the difference between the two former and *Armenian Bole* was that *the Armenian Sort is much the brighter coloured*.¹ It seems he, and many others, were misled by the description of this gum as being an 'earth or 'terra'.

The organic nature of the substance was first properly recognised by Schroeck (*1646-†1730, German physician) in 1687.²

In Vigani's cabinet terra japonica is in the same drawer as terra sigillata, however, it is grouped together with the gums, after *Succus Hypocistidos* H/4 and followed by *Myrrha* H/6.

20th Century herbals refer to terra japonica as pale catechu, baillon or gambier, described as *dark or pale brown cubes with a dull, powdery fracture, or sometimes in lozenge form*.³ Pale catechu is derived from the leaves of the bush *Uncaria gambier*, Roxb./Fam. Rubiaceae, which grows in India and Burma.

¹ BRADLEY 1730, p. 61.

² SCHWEPPE 1992, p. 503.

³ WREN 1975, p. 71.

Composition

It appears from historic and contemporary evidence that terra japonica was composed of the juice extracted from the leaves of pale catechu *Uncaria Gambier*. Details on the chemical composition of this extract (up to 75% catechin) can be found in SCHWEPPE.⁴ However further research needs to be carried out to determine variations of the composition specific to certain regions and periods of time. From GEOFFROY 1736 we know that medicinally used terra japonica could also contain extracts from the areca nut, more commonly but mistakenly called betel nut, from the palm tree *Areca catechu* L. – *Arecaceae*.⁵

It is analytically possible to determine the different catechu plants contained in terra japonica. It would therefore be desirable to explore analytical ways in the identification of terra japonica.

Provenance

GEOFFROY 1736 described that *one kind of Terra Japonica from Malabar*, southwest India, *and another from Pegu*, today Bago⁶, a city in Burma, could be obtained in England. This is consistent with the habitat of *Uncaria Gambier*, the tree, which is the source of today's terra japonica.⁷

Trade

Vigani bought four ounces of *Terra Japon* from the druggist Colchester, London, at a price of 3 pence per ounce.⁸

Quality / Adulteration

So far no information could be gathered on adulteration of terra japonica in Vigani's time.

Manufacture

An instruction for the preparation of medicinal terra japonica was transmitted by GEOFFROY 1736. It combined juices extracted from the areca nut as well as catechu. From his other descriptions of catechu we can assume that he meant pale catechu, *Uncaria Gambier*:

⁴ SCHWEPPE 1992, pp. 505-506.

⁵ GEOFFROY 1736, pp. 344-345, see Manufacture below.

⁶ GEOFFROY 1736, p. 344.

⁷ See Terminology above.

⁸ MS Quns Vig. 4.

The Manner of preparing it is this.

The Areca Nuts, before they are quite ripe, are bruised, and a strong Decoction made of them. This Decoction pour'd off by Inclination, having stood for some time, is mix'd with the Powder of calcined Shells, and then deposits a Faecula.

Another Decoction and Faecula is made of a Plant called Catechu; and these two Faeculae mix'd make the simple Terra Japonica. In Spain, it is prepared with Aromatics, which makes it very heating; which it is not of it self, and therefore the simple Kind is to be preferred for all Physical Uses.⁹

Use

Extracted juices from the various types of catechu plants were and still are used for dying in India and south east Asia. It produces shades of brown. A second dye with catechu over indigo produces a black colour.

The medicinal use of terra japonica is aptly described by GEOFFROY 1736:

It is a mucilaginous, astringent Substance, very proper in Inflammations and Swellings of the Tonsils, &c. It strengthens the Stomach and helps Digestion, and is very proper in Loosenesses. The Dose is from half a Scruple to fifteen Grains, repeated several times a Day. Half a Drachm boil'd in a large Quantity of Water makes likewise a very proper Drink in a Diarrhaea or Disentery, even when other Medicines have failed.¹⁰

In similarity to terra sigillata and thus adding to the confusion, terra japonica is *drying and astringent*.¹¹

⁹ GEOFFROY 1736, pp. 344-345.

¹⁰ GEOFFROY 1736, pp. 344-345.

¹¹ BRADLEY 1730, p. 60.



Drawer I

Drawer I

63		62	61	60	59	58	57
56	55	54	53	52	51	50	49
48	47	46	45	44	43	42	41
40	39	38	37	36	35	34	33
32	31	30	29	28	27	26	25
24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

No I/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Deep Smalt	
2	Suptri [.] [written on the side of the paperbox]	Suptsune ? of Smalt
3	Blew fr.	? [no transcription]
4	Calcin'd Smalt	
5	Blew Verdit.	
6	Blew Bice	
7	Ultramarine	
8	Spanish Wool	
9	Carmine	
10	Vermilion	

11	Red Lead	
12	Indian Red	
13	Spanish Red	
14	Roman Oker	
15	Bole Armon	
16	Fine Russet	
17	[paper damaged and lost, contains turquoise coloured minerals]	NN. [for 'No Name'; no transcription]
18	Green Fr.	
19	Verdigr. fine	
20	Terre Vert	
21	Verditure	
22	Gold Bronze	
23	[.] [paper lost] Gold	Water Gold [probably correct according to some letters on paper flakes in the compartment]
24	Gaponnicum At. [[.]panaish Brown written on inside of front wall of paper box]	Japonnicum Ab.
25	Deepest Orange	
26	Deep Orange Sp.	
27	Red Orpiment	
28	Masticote deep	
29	Dutch Pink	
30	Yellow Masticot	
31	Orpiment	
32	Pale Masticote	
33	Light Orange Sp.	
34	Gold fr.	
35	French Oker	
36	Gold Colour'd Sp	
37	Dutch Gold	
38	Silver Colour'd Sp	
39	White fr.	

40	Cerusse	Causse
41	Ivory Black	
42	Jamaica Indico	
43	Sap Green	[no transcription]
44	Colens Earth Terra Lemni:	Colens Earth Terra Lemon.
45	Burnt Umber	Burnt Amber [later corrected to Umber]
46	Umber	Amber [later corrected to Umber]
47	Not labelled	
48	Lem. c[.]'d Sp	Lemon.
49	Not labelled	
50	Not labelled	
51	Not labelled	
52	Lake	
53	Not labelled	
54	Copper col. Spec.	
55	Red Oker	Rose Pink Red Oker.
56	Venice Lake	
57	Not labelled	
58	Not labelled	
59	Brown fr.	
60	Ash colour fr	
61	Not labelled	
62	[.] [paper lost] fr.	[no transcription]
63	Iridicum Atramen:	[no transcription]



Fig. 1 Deep Smalt I/1

I/1 Deep Smalt

This pigment is of a strong dark blue colour with a sparkling surface. The particles are relatively large, some of them lightly compacted into lumps of up to 3mm in diameter. The sample in *Deep-Stroron (or: Strown) Smalt* La2/14 is very similar to this pigment. Vigani's differentiation of shades does not occur in the treatises, which makes it difficult to give precise description as to quality, properties, and use. The term 'oilsmalt' from the treatises does not occur among Vigani's samples.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Other smalt samples in the cabinet are: *Suptri (of Smalt) I/2*, *Calcin'd Smalt I/4*, *Super fine Calsind Smalt* La2/15, and *Deep-Stroron (or: Strown) Smalt* La2/14.

There is also a sample of the pre-product *Zaffre* La2/10.

Terminology

A form of describing smalt was by grades of fineness. For example *Oyl Smalt* was the finest smalt to be bought according to SALMON 1701 and others.¹ Yet fineness was not always a desired quality for specific painting purposes, as we shall see below.

Composition

Smalt is a glass rendered blue from the addition of cobalt.

Quality / Adulteration

There was a fine and a coarse sort, which is better, for it gives a more glorious colour, when looked at from a distance. Whereas the fine smalt, *Oyl Smalt, which is ground with white lead, may be laid in oyl, but it bears no good body, and besides works with much difficulty.*²

¹ SALMON 1701, p. 182.

² SMITH 1705, p. 26.

Properties

Smalt lost colour if ground too finely.³ SALMON 1701 was not in favour of smalt in oil painting because even if washed fine and mixed with lead white it worked poorly and was inclined to darken with time.⁴ Also, he observed, it would turn black if used as a glaze in oil painting.⁵

SMITH 1705 argued that *Smalt* was a lovely blue if it lay *at a distance*, but it must only be strewn on a white lead ground, because it had no good body and was too sandy in oil, which made it look black, and if mixed with white it made it faint.⁶

The deterioration processes in smalt were recorded and studied by PLESTERS⁷ and GIOVANOLI⁸, and were part of a recent research project on the manufacture and composition of historic smalts at the Institute of Molecular Physics Amsterdam under the direction of VAN BOON⁹.

Manufacture

Recipes for cobalt glass manufacture are very numerous in English sources from the 17th and early 18th Centuries. Standard references among these were the ever-popular works of MERRET¹⁰ 1662 and KUNCKEL¹¹ 1689 in their respective translations.

A short description of smalt manufacture can be read in GEOFFROY 1736: Two parts of calcinated cobalt ore, one part of potash and three or common sand melted together formed a vitreous bluish mass. Ground in mills to a fine blue powder it was called *Smaltum* or *Encaustum Caeruleum*.¹²

KRIEG 1704 reported, after a 2 month stay in his home country, from the smalt industry in Schneeberg in Saxony how the cobalt ore was processed and the smalt manufactured using 1 part pot ashes, 2 parts of powdered roasted cobalt ore, and 3 or

³ SALMON 1701, p. 170.

⁴ SALMON 1701, p. 182.

⁵ SALMON 1701, p. 168.

⁶ SMITH 1705, pp. 25-26.

⁷ PLESTERS 1969.

⁸ GIOVANOLI 1970.

⁹ Publication pending.

¹⁰ MERRET 1662, is an English translation of NERI, ANTONIO (1612) *L'arte vetraria distinta in libri sette*. Florence.

¹¹ English editions of KUNCKEL 1689 are commented in HARLEY 2001, p. 228, note 71.

¹² GEOFFROY, 1736 #297, p. 168.

4 parts of flint, depending on the quality of the cobalt and the deepness of colour desired.¹³

He continued that the blue glass mass was then taken out with a great iron spoon and *put into a Vessel full of cold Water, where it cracketh and grows more tender, to be the more easily powdered again: But the empty pot in the Furnace is filled up again with the aforesaid mixture. And so they continue night and day, not leaving off the fire in the Furnace. The blue Glass taken out of the Water is powdered again by the ordinary Engine; the finest, separated by a Sieve, is put into a mill, and grinded in Water into the finest powder, which by washing is still separated from the courser. The same is afterwards dried in little and warm chambers, put into barrels, and thus sent away to several countries.*¹⁴

Preparation

Nothing much was said about the preparation of the pigment for painting purposes. SMITH 1705 advised for use in oil *smalt* should be washed and refined through decanting.¹⁵

More detailed are the descriptions for the preparation of smalt and other transparent pigments used in japanning. Smalt, as well as verdigrease, ought to be ground on a Porphyri, or Marble Stone.

*Grind with a Mullet what Quantitiy you please with Smalt or Verdigrease, with Nut-oil as much as will moisten the Colours, and grind them till they are as fine as Butter, put then the Colours into Shells, and mix them with Oil of Turpentine till they become thin for use; Lay them on Silver, Gold, or any other light Colour, and they will then become transparent, altering their Lightness or Darkness, according to that of the Metal or Colours that are placed under them;*¹⁶

For opaque drawings of figures in Japanning work smalt could be mixed with *White-Lead* and *Gum Arabick Water*. C.K. stressed that the pigments mixed with the white should have no body, and that gum water was used so the paint did not become transparent.¹⁷

¹³ PETIVER 1704, pp. 1754, 1755.

¹⁴ PETIVER 1704, pp. 1755, 1756.

¹⁵ SMITH 1705, p. 32.

¹⁶ K., p. 28.

¹⁷ K., p. 28.

Use

A lot of information on the different application techniques of smalt can be found in SALMON's work, 1701. He was of the opinion that if any, then preferably *oyl smalt* should be used in oil painting. Otherwise it was better to scatter smalt on the painting, which made a *glorious* colour.¹⁸ As an adhesive layer *white Lead* stiffly tempered with *fat Oyl* was laid on those areas, which were to be covered with smalt. Then the smalt was scattered on using small fine sieves.¹⁹ Another technique was to apply the smalt with a goose quill feather and dab it firmly down with a piece of cotton. When dry, excess smalt could be wiped off with a feather or blown off with a pair of bellows.²⁰ It seems quite wrong that Salmon recommended a white ground to achieve this *glorious* colour, whereas painting practice has revealed that - like azurite - smalt gained more brilliance if applied over dark grounds.

However SMITH's version, 1705, is almost identical, and leads to assume that it must have been common practice and even desired. White lead mixed with clear drying oil to a very stiff paint was laid in one layer on the areas where smalt was intended to be scattered. When the work was placed horizontally smalt could be scattered on very thickly and *with the feather edge of a goose-quill stroke over it, that it may lie even and alike thick in all places and then with a bunch of linen cloath, that is soft and plyable, dab it down close, that it may take well upon the ground to be thoroughly dry, then wipe off the loose colour with a feather, and blow the remainder of it off with a pair of bellows*. If shadows were required, after putting on the white with thick linseed oil, the artist was advised to paint and temper the shadows with black, and then to scatter on the smalt. Yet Smith stressed the importance of a white ground so that the smalt would display true blue colour.²¹

In a different section of his treatise, SALMON 1701 recommended smalt only for *more curious Wainscotting* (that is more carefully painted panel paintings), such as with figures of men, beasts, landscapes, etc. on them.²²

Smalt was also widely used in japanning. A blue japan lacquer consisted of *Smalt* in a mixture with *Isinglass-Size* and finely ground *White-Lead*, applied in several layers and covered with *White Varnish*.²³

¹⁸ SALMON 1701, p. 182.

¹⁹ SALMON 1701, p. 187.

²⁰ SALMON 1701, p. 188.

²¹ SMITH 1705, pp. 69-71.

²² SALMON 1701, p. 173.

Another recipe for blue lacquer was reported by the anonymous C.K.:

To do this, grind white Lead very fine, add Smalt as finely ground, mix them with Isinglass Size, the white Lead grind with Gum-Water, let there be a Proportion of White and Blue, and mix them well to the Thickness of common Paint, go over your Work with it, and when it is well dry, proceed so three or four times, till the Blue lies with a fair Body, rush it smooth, and go over it again with stronger Blue, and when dry wash it with the clearest Isinglass Size, having a new Pencil for that purpose, then when it is dry, warm it by the Fire and go over it with a Pencil dipped in white Varnish seven or eight times, and so let it continue for a Day or two, then wash it as often as before, and so continue many Operations at intermitted times, for a week at least must pass before you can well venture to polish it, and when it is polished, clear it with Oil and Lamp-black.²⁴

Smalt was recommended for cleaning of paintings:

Take good wood-ashed, and searce them, or else some Smalt or powder-blew, and with a Spunge and fair water gently wash the Picture you would cleanse (taking great care of the shadows) which done, dry it very well with a clean cloth.²⁵

²³ ARTLOVE, 1730, p. 13; Artlove's *White Varnish* contained nearly all lighter gums and resins available at the time. These were dissolved in *Venice-Turpentine* and *Spirit of Wine*.

²⁴ K., p. 35.

²⁵ SALMON 1701, p. 172.



Fig. 1 Suptri (of Smalt)

I/2 Suptri (of Smalt)

The particles in this sample seem to be finer than those in *Deep Smalt* I/1. The blue is lighter and slightly milky. There is no surface reflection. A large portion of the particles is lightly compacted to lumps of up to 4 mm in diameter. Red particles are spillages from the vermilion in the adjacent compartment one row above (I/10).

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Deep Smalt* I/1.



Fig. 1 Blew fr. I/3

I/3 Blew fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The meaning of the abbreviation *fr.* could not be identified. It may stand for frit, a raw glass product, although a short word like this is almost not worth abbreviating. Another option might be freckles.

Composition

Blew fr. are situated amongst smalt samples in drawer I of the cabinet. Vigani's arrangement within this drawer is rather by colour than by related materials. However, in the specific case of smalts being vitreous, a closeness of materials may be assumed.

Not much is known about these small glass plates. Further research into the matter is greatly encouraged. Some recent published observations are detailed below.

Manufacture

The manufacture of these fine plates is not understood. A possible way might have been to blow molten coloured glass into a large sphere, which could then be shock-cooled by immersing it in cold water. As a result of the sudden temperature change the sphere would burst.

Chemical and microscopic analysis of all samples of glass plates would probably be able to reveal more details on their composition and ways of manufacture.

Use

The admixture of coloured glass particles into the paint layers of Venetian paintings from the 16th Century has recently been confirmed in a study by the National Gallery of Washington¹. In connection with this research an inventory of a Venetian colour shop from 1534 was found to list not only pigments but also a wide range of arts and craft materials, amongst which several glass powders and glass related products were identified. BERRIE et al. 2005 think that these additions of glass were intended to improve the clarity and translucency often observed in Venetian paintings. These silica particles are only a few microns in diameter. However, finds like these might be an incentive to broaden the search for the use of glass particles in works of art and decoration.

Perhaps fine plates such as the ones in Vigani's cabinet were the starting point from which to produce glass powders by grinding.

BERGER 2002 reported the presence of small blue glass plates in the paint mixture of the decorated stucco niche in the Dresden Renaissance castle.²

Small glass particles are also mentioned for decorative purposes in the 'Trierer Schablonenbuch' from 1752.³

¹ BERRIE 2005.

² BERGER 2002.

³ FUCHS 2004.



Fig. 1 Calcin'd Smalt I/4

I/4 Calcin'd Smalt

This sample consists of a light warm blue powder, which is mostly compacted to lumps of irregular shape and rough surface. The lumps are up to 6 mm in length. The particles are relatively large, but appear smaller than those of the smalt sample in *Deep Smalt I/1*.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Deep Smalt I/1*.



Fig. 1 Blew Verdit. I/5

I/5 Blew Verdit.

This sample of blue verditer presents as a finely ground light blue pigment with a distinctively greenish hue, particularly if compared to the smalt sample in the adjacent compartment I/4. The formation of larger lumps with rounded edges is quite pronounced. Visible impurities on the surface are due to the storage of the pigment.

Compare with the sample of *Verditure* in I/21.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

This item incorporates information particular to blue verditer in addition to that outlined on verditer. To complete the picture the respective chapters on *Verditure* I/21 may be consulted.

Terminology

Blew Verdit. is most likely an abbreviation for Blew Verditer or Blew Verditure, according to the spelling *Verditure* of sample I/21 of green verditer. The term is thought to be more recent than verditure, which etymologically stands for a green colour. The blue variety of verditer may have been introduced when the manufacturers strived to produce a blue tinged copper carbonate.

Composition

Blue verditer is artificial basic copper carbonate, with a chemical composition very similar to that of azurite $[2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2]$.

Provenance, Trade, Quality / Adulteration

Blue verditer does not occur under this or any other name in the invoices. None the less, it is possible that Vigani acquired the verditers and that they were not experimental products from his own laboratory.

For further information see *Verditure* I/21.

Properties

It was a very bright pleasant blue, with a greenish tinge, and the easiest to work with in water, said SALMON 1701.¹ As it was recommended for painting on wood that was kept outdoors and thus exposed to the weather², it must have been considered a durable pigment. Contradicting his own comments on the use of this pigment SALMON 1701 also wrote that *blew verditer* was sandy and tended to turn greenish, concluding that it was inferior to *Bice* or *Smalt*.³

Similarly SMITH 1705 deprecated the use of blue verditer in oil painting due to its bad body, sandiness, poor colour, and tendency to turn green, though the green became acceptable if mixed with yellow.⁴

Manufacture

See *Verditure* I/21.

Preparation

Since blue verditer was known for its grittiness it should be washed and refined through decanting.⁵

Use

HARLEY 2001 observed that references to blue verditer increased in the second half of the 17th Century as those to azurite became less frequent. She supposed that the pigment, although never popular in fine art, *may have fulfilled a certain demand at the beginning of the eighteenth century when azurite was scarce and Prussian blue was not yet available*.⁶

While incorporating green verditer in the spectrum of colours used in limning PEACHAM 1606 did not mention blue verditer at all in his treatise.⁷

In stark contrast SALMON 1701 proclaimed that blue verditer was the most common of all blues used in limning, and could even be the only blue pigment used in a painting.⁸

¹ SALMON 1701, p. 100.

² In the case of sundials, see Use below.

³ SALMON 1701, p. 182.

⁴ SMITH 1705, p. 25.

⁵ For example SMITH 1705, p. 32.

⁶ HARLEY 2001, p. 53.

⁷ PEACHAM 1606.

⁸ SALMON 1701, p. 100.

It is one of the inconsistencies of Salmon's treatise that this highly recommended pigment was not part of his list of useful pigments for limning a little earlier in the treatise⁹. He later included blue verditer among the pigments employed for painting sundials.¹⁰

NORGATE¹¹ 1648 listed *Bue Verditer* under the green colours used in limning, either because of the green cast of the pigment or because it would be mixed with yellows for green paint. *Blue Bise* though, the natural blue copper carbonate, occurs among the blues. Mixtures of fair *pincke* with *blew verditer* made a light green for landscapes and draperies. NORGATE 1648 preferred this mixture to *greene Bise* with *Sap-green*.

*Pincke ground with a little white sugar Candy and gum, workes very neat and mingled with blew verditer prepared and washt (...) makes all kind of greenes and workes as sharpe and neate as you could wish.*¹²

The foliage of trees should be dead-coloured in a middle hue and *deepned with blew Verditer, or Pincke and a little Harlem Ultramarine*¹³, and *heightned with a faire Masticot and a little of the Former Colours according to Discretion.*¹⁴

The mixture of blue verditer with pink was the most common and appeared, apart from those mentioned above, for instance in DE MAYERNE¹⁵, SALMON¹⁶ 1701, and in oil medium in SMITH¹⁷ 1705.

Both verditers were not included in the oil painting instructions in PEACHAM's *Compleat Gentleman*¹⁸ 1634 and have since never been favoured in oil media.

More than in fine arts blue verditer found application in house paints, of which several occurrences in English land houses were reported, and in the decorative arts, such as the ornamentation of musical instruments¹⁹ or sundials²⁰.

⁹ Pigment list for limning: SALMON 1701, pp. 92-93.

¹⁰ SALMON 1701, p. 180.

¹¹ MULLER 1997, p. 59.

¹² MULLER 1997, p. 64.

¹³ This was not true ultramarine but a blue earth, see MULLER 1997, endnote 177.

¹⁴ MULLER 1997, pp. 87-88.

¹⁵ MS BM Sloane 2052, f. 22.

¹⁶ SALMON 1701, p. 100.

¹⁷ SMITH 1705, p. 25.

¹⁸ PEACHAM 1634.

¹⁹ Occurrences of analysed blue verditer in paints are listed in FELLER 1986, pp. 31-32.

²⁰ SALMON 1701, p. 180.

Unfortunately neither Vigani nor BRADLEY 1730 in his lecture²¹ on the cabinet referred to blue verditer, which means that apart from the sample itself there is no further evidence of Vigani's dealings with blue verditer.

²¹ BRADLEY 1730.



Fig. 1 Blew Bice I/6

I/6 Blew Bice

Blew bice is a light cold blue, finely ground pigment, with a slight green tinge, yet less so than the sample of *Blew Verdit*. I/5. The pigment formed fewer lumps than I/5. The visible impurities such as small grey particles are accumulated on top of the pigment sample, which indicates that they collected here during storage.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Throughout the 17th Century blue bice was the common term for the pigment extracted from the mineral azurite.

Composition

Azurite is composed of basic copper carbonate $[2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2]$ and is usually associated in nature with malachite $[\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2]$ and cuprite, of which scattered particles can typically be found in the pigment.

Provenance and Trade

Germany was frequently mentioned as its place of origin, as was Hungary. In DE MAYERNE, blue bice from the Ardennes in France and the Indies is mentioned, the latter being traded through Spain.¹ Therefore it is very likely that the West Indies were meant and bice had been used in central and south America.

An English provenance and supply of azurite should be considered and further investigated. This is based on interpretation of Vigani's samples *L. Armenus sive L. Lazuli al.* F/18 and *Minera Cupri Anglicana in qua reperitur Lapis Lazuli* U/12 and an analysis of Vigani's labels.²

¹ MS BM Sloane 2052, f. 86.

² See the entries for the respective samples.

Trade

Unfortunately blue bice is not listed in the invoices relating to Vigani's cabinet. It is known that azurite was traded at a considerably lower price than lapis lazuli, but was more expensive than the artificial blue verditer. Interestingly blue verditer, even though cheaper, never became a true substitute for blue bice. Blue bice was usually listed together with blue verditer in the painting treatises. When blue bice could occur in monochrome blue paint layers and be mixed with white, blue verditer was recommended to mix with yellows for green shades in landscapes. The economic advantage of blue verditer over blue bice was tempered by its inferiority; blue verditer possesses a varying green cast and exhibits a tendency to turn green.

SALMON 1701 estimated blue bice to be too precious for ordinary uses, and recommended replacing it with smalt unless the painter intended *to bestow some costs and pains upon a piece*.³

Quality / Adulteration

When the artist bought blue bice in stones, the quality only depended on the proportion of azurite to other minerals and impurities in the sample. This way the product was free from adulterations.

Properties

Blue bice *is the most excellent Blew next to Ultramarine, and may serve instead thereof* stated SALMON 1701, who later added that it lost colour if ground too finely and would turn green if used as a glaze in oil painting.⁴ Particularly in glazes, the oil content would be high in proportion to the pigment, so that when the oil yellows, the layer would appear green to the viewer. The green cast as well as the darkening of the paint layer were generally concerns when blue bice was used in oil paintings, which caused the painters to make adaptations to the binding medium, as will be shown below.

According to SMITH 1705 *blue bice* had the best body of all bright blues used in common work, but it was the palest, a little sandy, and required good grinding on a very hard stone.⁵ Before him already NORGATE placed blue bice among those pigments that were *of so loose and Sandy a quality* and consequently advised not to grind but to

³ SALMON 1701, p. 100.

⁴ SALMON 1701, pp. 100, 170, 168.

⁵ SMITH 1705, p. 24.

wash *Blue Bise* like all other pigments of this nature.⁶ Smith's opinion that the pigment needed good grinding is somewhat solitary, since it was generally acknowledged that the pigment would lose colour if ground too finely.

Manufacture and Preparation

PEACHAM 1606 was very particular about the preparation of *Blew Bice*. The process that involved decanting water with impurities from the pigment settled at the bottom of the vessel. In the last decanting, the addition of gum arabic probably helped to lower the surface tension, so the particles could sink more easily to the bottom of the horn:

*Take fine Bice and grind it upon a clean stone, first with cleane water as small as you can, then put it into an horn and wash it on this manner: put unto it as much faire water as will fill up your horne, and stirre it well, then let it stand the space of an houre, & all the bice shall fall to the bottome, and the corruption will fleet above the water, then powre away the corrupt water, and put in more cleane water, an so use it foure or five times, at the last powr awaie all the water, & put in clean water of Gum Arabeck not to stiffe, but somewhat weak, that the bice may fall to the bottom, then powre away the Gum water clean from the bice; & put to another clean water and so wash it up.*⁷

Immediately following, PEACHAM 1606 explained four ways of tempering the pigment for use in limning. The first two are remarkable since he considered the strength of the binding medium. With a weak binding medium the paint would dry and appear pale like the pigment powder (*'if you would have it rise of the same colour it is of'*), with a matt surface appearance. As he said, the weak gum water would cause the pigment to rise and swell while drying, which may be interpreted as the binding medium sinking to the bottom of the paint layer and being partly absorbed into the ground, thus leaving the surface matt and loosely bound.

A *most perfect blue* could be achieved with a strong binding medium, which dried leaving the paint layer more saturated with binding medium, thus creating a deep blue colour.

The relevant passage reads as follows:

If you would have it (Blew Bice) rise of the same color it is of, when it is drie temper it with a weake gum water, which also will cause it to rise and swell in the driing, if a most perfect blew, and of the same color it is being wet, temper it with a stiffe water of gumme lake, if you would have it light, grind it with a little ceruse,

⁶ MULLER 1997, p. 62.

⁷ PEACHAM 1606, pp. 56-57.

*or the muting of an hawk that is white, if you will have it a most deepe blew, put thereto the water of litmose.*⁸

SALMON 1701 repeated these instructions in his work in a slightly modernised and shortened adaptation.⁹ The horn became a shell or vessel and the white hawk's mute was left out.

Another very detailed account on the preparation and manner of painting with blue bice can be found in NORGATE 1648. He specified the process of painting monochrome blue backgrounds of portrait miniatures. Such accurate accounts on a single pigment taken from real practical experience are rare and so is written out in full:

*If you desire a blew ground, take blew Bise washt, and prepared as I told you in the beginning, temper it in a shell with Gum Arabique a good quantity together, and be sure of more then enough, let it be well bound with Gum, and let the Colour be very moist, and lye in the shell like a little puddle. Then with a small pencill faintly wet, goe about the outermost line of the face, and wetting the remaine of the Carnation wipe it away, which serves for noe use, reserving only the face and apparrell. Having thus cleared the Card, take a pencill faintly wet in your Bise, of somewhat a large size, and hastily wash over all that part of the Card you would have laid with blew. And before it be dry, fill a pencill full of that Bise, and let it flow over and cover the ground, or void place of the Card. Soe let it stand till it be dry, and you will find that the wetting the Card thus before will make the blew Bise lye smooth and even as glasse, specially if you be carefull to keepe the collour moist in laying it on, that one pencill full, may as you lay it flow into the other, and mixe with it soe, as it may appeare even and all of a peece.*¹⁰

MULLER and MURREL 1997 suggested that this wet in wet technique to avoid brushstrokes originated in Flemish illuminations.¹¹

SMITH 1705 briefly stated that for use in oil painting blue bice should be washed and refined through decanting.¹² PEACHAM 1636 pointed out that *Bice* should not be ground with *Linseed Oyle* since it would lose its colour.¹³ Concerns about the fading or darkening of blue bice were resisted by the addition of spike lavender oil or by gently

⁸ Peacham 1606, p. 57; *Gumme lake*, as PEACHAM explained earlier on p. 48, was a mixture of egg white, honey, gum hedera, and *woort*. A *mute*, in falconry, is a hawk's or falcon's droppings.

⁹ SALMON 1701, p. 97.

¹⁰ MULLER 1997, pp. 76-77.

¹¹ MULLER 1997, p. 150, footnote 112.

¹² SMITH 1705, p. 32.

¹³ PEACHAM 1634, p. 133.

tempering the pigment with nut oil on the pallet. Too much grinding would result in darkening during drying of the paint. Such advice can for instance be found in DE MAYERNE's compilation.¹⁴

Use

In Limning NORGATE 1648 used *Blue Bise*, *Greene Bise* and their artificial counterparts *Blue Verditer* and *Verditer*¹⁵, of which only the first is listed among the blues. As a consequence of the pigment's properties, its sandiness and green cast, *blew bise is never used in a face, but sometimes in the ground behinde the picture where it doth well with almost any Complexion*.¹⁶ He applied *blew Bise* predominantly in monochrome blue backgrounds of miniature portraits but also allowed *faire Bise* as the foundation colour of a blue drapery, upon which to paint the shadows with *Lake* and *Indico* and to heighten with white.¹⁷

PEACHAM 1606 described mixtures of blue bice with ceruse, hawk's droppings, and litmus.¹⁸

In SALMON 1701 we find that *three parts of Bice tempered with one part of fairest pink make a good green for limning*. A little indigo could be added to deepen the colour.¹⁹

For oil painting *Bice* (or *Smalt*) tempered - and not ground - in *Linseed Oyle* are recommended by PEACHAM 1636 for the representation of skies in landscapes.²⁰ This is the only reference to bice in PEACHAM's exposition on oil painting. All the blue draperies or colours of garments, which require blue admixtures, are done with smalt.

K.C. used bice tempered in oil similarly to Norgate's technique for miniature backgrounds. In the second sitting for a portrait, the background, in the case of *Bice* representing a blue satin curtain, was composed with a large full brush working quickly over the entire space of the background while all paint was still wet.²¹ The foundations for blue garments and ornaments were laid with *bice* and then deepened with *Indico* mixed with *Lake* and lightened with white. The instructions come across as old-

¹⁴ BM MS Sloane 2052, ff. 4v, 11v.

¹⁵ MULLER 1997, p. 59.

¹⁶ MULLER 1997, p. 70.

¹⁷ MULLER 1997, p. 92.

¹⁸ PEACHAM 1606, p. 57.

¹⁹ SALMON 1701, p. 97.

²⁰ PEACHAM 1634, p. 133.

²¹ K., p. 15.

fashioned when K.C. suggested that the highlights should be mixed with gold or silver.²² *Bice* occurred in mixtures with *pink*, heightened with *massticot* and deepened with a mixture of *pink* and *indico*.²³

Even though DOSSIE 1764 in the second edition of his *Handmaid to the Arts*²⁴ still included blue bice and blue verditer next to *Prussian blue*, *Blue bice* was no longer included in BARDWELL 1756, because it had been replaced with Prussian blue.

Blue bice was widely used in colouring prints and in decorative arts.

A very common technique in the decorative arts was to scatter blue bice on sticky surfaces and brush loose particles off after drying. DE MAYERNE mentioned it for sculptures, metal work, and relief ornaments. The sticky ground in his recipe was lead white in oil. His notes also advised to brush over the dried blue bice with the glair of an egg, isinglass, or other animal glue, to let it dry, and then to coat it with a good drying varnish.²⁵

²² K., p. 16.

²³ K., p. 18.

²⁴ DOSSIE 1764.

²⁵ BM MS Sloane 2052, ff. 91v, 92, 150.



Fig. 1 Ultramarine I/7

I/7 Ultramarine

There is a little pigment left at the bottom of the paper liner. The pigment appears as light warm blue particles with some fine pigment dust but most of the particles have been unintentionally compressed to small granules. Flakes of paper from the paper liner and other dirt are mixed with it.

Terminology

Ultramarine here describes powdered lapis lazuli, cleaned and refined for use as pigment. Today's terminology where ultramarine stands for the synthetic blue pigment in contrast to the natural lapis lazuli is not applicable, since its production started only in the first half of the 19th Century.

Composition

Ultramarine before the 19th Century was the cleaned and pulverized lapis lazuli.

Provenance

HILLIARD (16th Century) said that the darkest and highest blue *ultermaryne* came from Venice, which meant that it was traded through Venice but most likely came from Afghanistan. Around NORGATE's time it was traded through the Levant Company with the same provenance.¹

Trade

Invoices relating to the cabinet mention lapis lazuli, but not ultramarine. For a more detailed discussion of prices refer to the respective chapter in *L. Lazuli al. F/11*. Ultramarine undoubtedly was one of the most expensive pigments.

SMITH 1705 who in his book is mainly concerned with painting timber consequently states that *Ultra-Marine* is very expensive and therefore only for very valuable works.² He adds later that despite being very dear, *yet small papers of it of about two shillings*

¹ PLESTERS, 1993, p. 38.

² SMITH 1705, p. 25.

*price may be bought at some colour shops, which, if carefully used, will go a great way.*³

Quality/Adulteration

It can be assumed that adulteration of ultramarine happened very frequently, because this is even easier to achieve than adulteration of lapis lazuli pieces. Their adulteration is discussed in *L. Lazuli al.* F/11.

Properties

Ultramarine was praised for its durability and exquisite colour. One author for example held: *Ultramarine is the finest Blue in the World. It is a tender retiring Colour, and never glares; and is a beautiful glazing Colour.*⁴

Manufacture

The production process remained virtually unchanged since the 13th Century. In the following a very detailed and precise account by SALMON 1701 will be reproduced in order to show the process, which other authors have treated more neglectfully.

SALMON 1701 distinguished between five steps in the process of making Ultramarine from *Lapis Lazuli*: *Calcination, Grinding, Washing, Cementation, and Cleansing.*

Calcination was a repeated cycle of breaking the stone, reuniting it in the furnace, and quenching it in Spirit of Vinegar. Finally the product had to be dried and powdered and sieved.⁵

This powder was to be ground on a porphyry stone adding *Violet Gum-Water*⁶ little by little and afterwards dried in the shade.

The dry powder was then washed with a mild *Lixivium*, which was a weak lye made from sieved *Vine Stalk Ashes* and water. To improve and strengthen the colour of *Lapis Lazuli*, SALMON also recommended washing it in the following manner:

*Take white Calx of Tartar spounds, Fair water q. s. boil, let it cool and settle, and decant the clear for Use.*⁷

³ SMITH 1705, pp. 99, 100.

⁴ BARDWELL 1756, p. 7.

⁵ SALMON 1701, p. 834.

⁶ *Violet Gum-Water* contained water, honey, and dragons blood.

In the subsequent so-called *cementation* process the lapis powder was separated into the coarser deep blue particles and the finer and less intensely coloured particles. The washed Lapis Lazuli powder was mixed with so called *cements*. These cements were resinous wax pastes, which could be prepared in two strengths.

*Note, this [the weak] Cement opens the Body of the Lapis, and draws the colour much quicker and better than the strong Cement, which ought rather to be used after the use of this weaker: The whole secret of separating the Color, consists in the right using of these Cements, for which reason, you must order your Work accordingly.*⁸

None the less, SALMON directed the use of the strong cement⁹ in his recipe. The cement, mixed with 1 pound of *Lapis Powder* was gently stirred into slightly tempered water. The mass would emit bluish streaks, which were to be decanted. This was called the first steeping and yielded four to five ounces of best ultramarine. New water was added for the second steeping, which released three to four ounces of ultramarine. Even less was recovered from the third steeping, giving fine particles of a light and pale colour. All together it took about nine hours to extract the pigment.¹⁰

Another source said that from one pound of good quality stone four to five ounces of the best, three ounces of medium, and about three ounces of the weakest ultramarine should be obtained.¹¹

The *Ultramarine* had then to be washed in the *mild Lixivium* and several times in fair water. The pigment could also be kneaded with egg yolk before cleansing it in the *Lixivium*. After that the water containing the ultramarine was strained through three sieves, one finer than the other. The dried pigment should be kept in little leather bags, rubbing them with the hands, *so will they* [the different grades of pigment] *attain a wonderful fairness, the Greasiness and Unctuousity by these means being quite taken away.*¹²

⁷ SALMON 1701, p. 835; See also Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

⁸ SALMON 1701, pp. 835-836.

⁹ It consisted of: *Pine Rosin, fine Venice Turpentine, Mastich, Bees Wax and refined Linseed Oil*; SALMON 1701, p. 835.

¹⁰ SALMON 1701, p. 838-839; Some authors cut this process short by heating crushed pieces of lapis lazuli in vinegar, which dissolved the calcite minerals. The lapis lazuli sank to the bottom. HARLEY 2001, p. 44.

¹¹ HARLEY 2001, p. 45, taken from de Mayerne BM MS Sloane 2052, f. 70.

¹² SALMON 1701, p. 838.

SALMON recommended repeating the process of cementation and cleansing so *you will have them [the colours] exceeding fine, (but a little diminished in their Quantities) one Ounce of which will go farther than three of the former.*¹³

SALMON did not rest with this, but gave three more, but very similar instructions of manufacture of ultramarine in his treatise, and this covered the topic exhaustively.¹⁴

Other writers were far less detailed as for example SMITH 1705 who instead of taking the pains of describing ultramarine manufacture simply referred his reader to a book called *Modern Curiosities* where the process of making *Ultra-Marine* from the *tincture of Lapis Lazuli* could be found.¹⁵

Preparation

Ultramarine was ground in oil (poppy oil has been recommended¹⁶ for this purpose to avoid the green effect upon yellowing of linseed oil during the ageing process) or gum arabic for use in oil painting or limning. For deeper shades of blue in limning the addition of litmus water has been suggested.¹⁷

Use

Ultramarine is frequently mentioned in the treatises, even though it might not have been used that much for its high price. A few examples are listed below.

In oil painting a garment made with indigo and white could be glazed with ultramarine. SALMON 1701 recommended this technique because it *will never fade*.¹⁸

For a blue tone used in painting the carnation BARDWELL 1756 recommended to mix *Ultramarine* with *White*, most likely lead white. About this mixture he said:

*It is a pleasant working Colour: With it we should blend the Gradations. It follows the Yellows; and with them it makes the Greens; and with the Red it produces the Purples. No Colour is so proper for blending down, or softening the Lights into keeping.*¹⁹

¹³ SALMON 1701, p. 838.

¹⁴ SALMON 1701, pp. 838-840, and Lib. 2 Cap.30 Sect. 13.

¹⁵ SMITH 1705, p. 25.

¹⁶ For example BARDWELL 1756, p. 7.

¹⁷ For example SALMON 1701, p. 96.

¹⁸ SALMON 1701, p. 168.

¹⁹ BARDWELL 1756, p. 10.

BARDWELL also recommended using a mixture of ultramarine ashes (the weakest variety of ultramarine) with white as one of the so-called *teints* in painting linen draperies.²⁰

In medicine it was very rarely used, only as an ingredient in the *Confectio Alkermes*, a strengthening cordial.²¹

²⁰ BARDWELL 1756, p. 33.

²¹ GEOFFROY 1736, p. 75.



Fig. 1 Spanish Wool I/8

I/8 Spanish Wool

These are two round pads of wool shavings dyed red. The top pad has darkened on the surface to a dark purple. The area underneath the detached patch of wool (see light stripe in top centre of Fig. 1) is very pale, as if faded, even though this area could not have been exposed to light. The second pad, which was covered by the top pad, displays as dark ruby red with a purplish hue.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Pads, enriched with dye, could be used as a carrier for dyes. When needed, small amounts of dye could be drawn from the patch. Pieces of rags used as dye carriers were known as 'pezzetti'.

The dye in Vigani's sample is prone to discolouration on the exposed surface, even in the protected environment of the cabinet. The following figure shows the second wool pad, which had remained covered, in comparison the top pad, which was lifted to the right for this purpose:



Fig. 2 The top pad of the "Spanish Wool" is lifted to the right, thus revealing the intensely red colour of the covered pad at the bottom of the compartment.

Analysis of the type of dye is highly desirable in order to attribute the correct dye to this sample of *Spanish Wool* and thus close a gap in terminology. SCHWEPPE 1992 mentions 'Spanisch Rot' (Spanish red) as a name for carmine-red dye gained from safflower.¹

¹ SCHWEPPE 1992, p. 186.



Fig. 1 Carmine I/9

I/9 Carmine

The sample is a deep red pigment with a purple tinge. Compared to vermillion in the adjacent compartment I/10 this sample appears less finely ground and the particles tend to stick together and form small crumbs. No fading of colour can be determined. Visible impurities such as small whitish particles seem to be part of the pigment's original composition.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The terminology of carmine is very complicated and has always confused writers. A brief etymology may suffice here.

Carmine comes from the Latin 'carminus', a shortened form of 'carmesinus', a compound adjective meaning '(red dye) produced by a worm'.

Composition

The pigment is composed of the red cochineal dye and its substrate. Because recipes of its manufacture are lacking the definite composition cannot be described. Analysis of the sample may provide further insight.

Provenance

For information on the provenance of carmine see *Cochinella* R/12.

DOSSIE 1758 explained that the best carmine was produced in France and some was made in England.¹

Trade

Carmine does not occur in the preserved invoices, however the cochineal insects do.²

¹ DOSSIE 1758a, p. 54.

² see *Cochinella* R/12.

SMITH 1505 justified that *Carmine is [...] very dear, yet about half a crowns-worth will go a great way in uses to which it is put.*³

Quality / Adulteration

According to DOSSIE 1758 high quality carmine of outstanding colour, durability, and light-fastness came from France, the good results being attributed to the air and water of France, which DOSSIE doubted to be true. He thought that the water might have been altered artificially.⁴ The English carmine was *of good hue and brightness before it be used, yet it flies on its commixture with white; and turns purple with the sweat of the skin, if rubbed on the hands or face.*⁵

Properties

Apart from the usual comments that carmine was of an outstanding red colour, BARDWELL 1765 stated that *Carmine is the most beautiful Crimson that can be: It is a middle Colour between Lake and Vermilion; is a fine working Colour; and glazes delightfully.*⁶

Manufacture

While the process of extracting the dye from cochineal insects was often described, instructions on how then to make the pigment are very rare, which was also noted by HARLEY 2001⁷. Dossie 1758 himself admitted ignorance on the topic.⁸ Further research into the lake making process for carmine around 1700 should be undertaken.

Preparation

For use in oil painting carmine *should be ground with Linseed Oil, and used with drying Oil.*⁹

SMITH 1705 was of the opinion that in limning carmine *needs only to be tempered with gum-water, and gives several degrees of colour according as it is thicker or thinner tempered; for if it be very thin, it resembles in colour the crimson made from cochenele,*

³ SMITH 1705, p. 100.

⁴ DOSSIE 1758a, pp. 54, 55.

⁵ DOSSIE 1758a, p. 54.

⁶ BARDWELL 1756, p. 8.

⁷ HARLEY 2001, p. 137.

⁸ DOSSIE 1758a, p. 55.

⁹ BARDWELL 1756, p. 8.

*and may be used instead thereof, by the gentry, to whom the price will not be considerable.*¹⁰

Use

*Carmine mixed with lead white in oil painting is of all Colours the most beautiful Red that can be for the Cheeks and Lips: It is one of the finishing Colours, and should never be used in the First Painting, but laid upon the finishing Colours, without mixing.*¹¹

DOSSIE 1758 on the other hand was of the opinion that carmine did not mix well with oil in order to produce good effects. However he said that it was *of great advantage in painting as well in water as varnish, both on the account of its beauty and standing well.*¹²

Carmine was also widely used as a face powder by the ladies.¹³

¹⁰ SMITH 1705, p. 100.

¹¹ BARDWELL 1756, p. 9.

¹² DOSSIE 1758a, p. 54.

¹³ DOSSIE 1758a, p. 55.



Fig. 1 Vermilion I/10

I/10 Vermilion

This sample of vermilion presents as an intensely bright red powdered pigment with the formation of a few lumps. Contamination with blue particles from the compartments below is visible.

- Does not occur in the invoices
- LECTURE-NOTES undated, pp. 39, 47
- LECTURE-NOTES 1707, pp. 46-48

A detailed description of vermilion can be found under *Cinnabaris factitia* E/30.



Fig. 1 Red Lead I/11

I/11 Red Lead

The finely ground pigment is of intense orange red colour. Some particles are naturally compressed to minute granules, which have accumulated on the surface. There are white particles and a few brown transparent sharp edged fragments as possibly later contaminations. White particles also appear in the sample of *Minium* in E/23.

- Red lead does not appear under this name in the invoices relating to the cabinet.
- LECTURE-NOTES undated, p. 51

Red lead is treated together with *Minium* E/23.



Fig. 1 Indian Red I/12

I/12 Indian Red

The lumps of up to 2cm in diameter with small cavities are of an intense dark rusty red colour. The biggest lump has small inclusions of grey matter.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Composition

The colouring component in this pigment was red ferric oxide. HARLEY 2001 suggested that in the 18th Century Indian red was an artificial pigment because the native red ochre was hard to find and rarely imported.¹ According to DOSSIE 1758 the colourmen started to stock the cheaper artificial product, so painters discontinued using the natural type.²

Quality / Adulteration

According to DOSSIE 1758 the natural Indian red was very valuable because there was *no other uncompounded purple colour in use with oil*. He regretted that the artificial type however was of *broken orange* colour instead of a purple.³

On adulteration DOSSIE 1758 said:

*The true Indian red [...] may be easily distinguished from any fictitious kind, by its being more bright than any other oker which can be made so purple; and if it be rendered artificially purple by any addition, the fire will soon betray it; into which the genuine may be put without any hazard of change.*⁴

Properties

The colour is very coarse. Therefore SALMON 1701 recommended replacing it with a mixture of umber with *Lake*.⁵

¹ HARLEY 2001, p. 119.

² DOSSIE 1758a, p. 112.

³ DOSSIE 1758a, p. 112.

⁴ DOSSIE 1758a, p. 113.

⁵ SALMON 1701, p. 98.

BARDWELL 1756 however observed that *Indian Red is a strong, pleasant, working-Colour; but will not glaze well; when mixed with White, falls a little into the Lead.*⁶

Preparation

Natural Indian red only needed to be ground and washed over because of its outstandingly good quality.⁷

Indian Red *was ground and used as the Lake*⁸, which meant that it had to be ground with linseed oil and used with drying oil.

Use

In oil painting BARDWELL 1756 recommended its use in colour mixtures for shades in the flesh, in opaque layers with *Lake*, ivory black and white, and as a glaze just with lake.⁹

In Japanning works *Indian Red* is the main colouring ingredient for a *Chesnut colour-Ground*. This ground is made up with size (from vellum) and can be brightened up with *White-Lead* or darkened with *Lampblack*. Before the painted design can be laid on, this ground has to be polished and varnished with *Seed-Lacc Varnish*.¹⁰

⁶ BARDWELL 1756, p. 8.

⁷ DOSSIE 1758a, p. 113.

⁸ BARDWELL 1756, p. 8.

⁹ BARDWELL 1756, p. 9.

¹⁰ ARTLOVE 1730, p. 9-10; This recipe can also be found in K., p. 34.



Fig. 1 Spanish Red I/13

I/13 Spanish Red

These lumps are of a intensely warm red colour, much like the *Indian Red* in the adjacent compartment I/12, but slightly lighter. Compared to the other red earths these lumps are very pure and homogenous. One lump is about 2 cm long, whereas the others are relatively small.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Spanish red could not be traced in the treatises examined for this study. Spanish brown appears in SMITH¹ 1705 and DOSSIE² 1758, a red earth from Spain. Analysis of this sample needs to be carried out in order to establish its composition.

¹ SMITH 1705.

² DOSSIE 1758a.



Fig. 1 Roman Oker I/14

I/14 Roman Oker

This sample of Roman ochre is a red earth. It appears to be the untreated and unrefined earth with lumps containing lighter and darker shades with white inclusions. The flat cake of 1.5 cm thickness broke in half.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

A second sample of Roman ochre, which may be identical with this one, is preserved in a wooden box labelled *Roman Oaker* in drawer La2/15.

Neither *Roman Oker* nor an equivalent is listed in the invoices relating to Vigani's cabinet. For more information on ochres see *French Oker* I/35.



Fig. 1 Bole Armon I/15

I/15 Bole Armon

This sample of Armenian bole has a uniform warm red shade. The bole has not been ground, but was kept as lumps from a few millimetres to about 2 cm in diameter. The edges are round. A few thin white streaks can be observed in some lumps. The sample is quite different in terms of shape and colour from the *Bolus Armenia* sample in M/9.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

In pharmacy the official term was *Bolus Armena vera officinarum*¹. GEOFFREY 1736 doubted that Armenian bole mentioned by Galen and the one in the Greek and later Arab writings were the same, because the former was described as being of a pale colour and the latter tending towards saffron. He speculated that bole originating from one area might have been of different colour, as it could be observed in the varieties of red shades in common bole.²

BRADLEY 1730 informs us that *it has been call'd with us, Bole Armoniac, by the Vulgar*.³

Composition

BRADLEY 1730 conjectured *that most of our chalybeate Waters pass through a Body of this [Armenian bole] Sort. It is certain this Earth has some Particles of Iron in it*.⁴

Provenance

Armenian Bole was a very widely available earth. BRADLEY 1730 knew that *Bolus Armena* is (...) *brought chiefly from Armenia, though we have of its Kind in Europe, and*

¹ GEOFFROY 1736, p. 61.

² GEOFFROY 1736, p. 61.

³ BRADLEY 1730, p. 66.

⁴ BRADLEY 1730, p. 66, 'chalybeate' means 'containing iron', from Lat. 'chalybs' = steel.

even in England, in many Places.⁵ Earlier links had been made to a substitute earth found in Hungary.⁶

GEOFFREY 1736 warned, that only very little of the Armenian bole came from Armenia to the western part of Europe.⁷

Trade

Vigani bought 1 ounce of *Bol Armen* for 2 pence from Henry Colchester, a London druggist, in 1704 (1703 in the old system).⁸ He received 2 ounces of *fine bole* from Porter in London at a price of 1 pence per ounce⁹, but it is not clear, whether this refers to Armenian bole. *Fine bole* as it were, is not an item in the cabinet.

Quality / Adulteration

A very precise description of the testing of Armenian bole was outlined by GEOFFROY 1736:

*The best Armenian Bole is that which is most easily reduced to a fine Powder in a Mortar, or dissolved in any Liquor; which is without Grit, and when held in the Mouth, seems to melt like Butter, leaving an astringent Taste on the Tongue.*¹⁰

He added that this bole was usually mixed with sand and had to be cleaned by sedimentation.

The author C.K. thought that *that Bole-Armoniack is most fit for your Purpose that is free from Grittiness or Gravel, and is of a blackish Red-colour, commonly called French Bole.*¹¹ This terminological link and therefore also material link between Armenian bole and French bole has not been observed elsewhere. Usually they were treated as two earths of distinctively different kind.

Properties

BRADLEY 1730 stated that Armenian bole was a ponderous, fat, brittle earth, of an astringent taste, and of red to yellow or pale red colour, oily to the tongue, or viscous.¹²

⁵ BRADLEY 1730, p. 66.

⁶ PHILOSOPHICAL TRANSACTIONS, Vol. 1, 1665, p. 11.

⁷ GEOFFROY 1736, p. 61.

⁸ MS Quns Vig. 4.

⁹ MS Quns Vig. 2 and the copy of this invoice MS Quns Vig. 7.

¹⁰ GEOFFROY 1736, p. 61.

¹¹ K., p. 26.

¹² BRADLEY 1730, p. 66.

Preparation

One of the important uses of Armenian bole was in the size layer in preparation for gilding. Many recipes can be found, probably with a long tradition, of which one is outlined here as an example:

Take fine Bole-Armoniack three drams, fine Chalk one dram; grind them as small as you can together with fair water, three or four times, letting it dry after every time: then take glair, and strain it as short as water, with which grind the Bole and Chalk, adding a little Gum-Hedera, and a few blades of Saffron: grind all as small as possible, and put them into an Oxhorn (I judge a glass vessel better) and set it to rot in horse-dung for six weeks; then take it up, and let it have air, and keep it for use.¹³

Use

Its chief use is for making size as a preparation for burnished gold (or silver) in gilding parchments, book covers, and leather.¹⁴ It is not to be confused with the similar sounding term 'Gold-Armoniack', which appears in the literature.¹⁵ It could easily wrongly be associated with a gilding technique that used Armenian bole, or 'Bole Armoniack', as it was sometimes spelled.

To gild on stone or wood it was recommended to mix *Bole Armoniack* with *Oil of Ben*, to smear the wood with this paste, and when almost dry, to lay the leaf gold on and to burnish it when dry.¹⁶ So far there is uncertainty as to what *Oil of Ben* was, a single occurrence in this treatise by C.K.

The same author presented another gold size, apparently *the best Gold Size at present in Use*:

Take an equal Quantity of the best French and English Bole-Arrmoniack, grind these fine on a Marble Stone with fair Water, then scrape into it a little Candle-Grease, incorporate and grind these well together, then mix a little Quantity of Parchment Size with a double Proportion of Water, and the Business is done.¹⁷

¹³ SALMON 1701, p. 108; Salmon's comment in brackets clearly showed that the recipe was copied from a book by another writer.

¹⁴ For instance SALMON 1701, pp. 95, 108.

¹⁵ Gold-Armoniack was a special preparation of gum ammoniac, of which a sample is preserved in *Ammoniacum A/29*.

¹⁶ K., p. 109.

¹⁷ K., p. 37; note that C.K. wrote the treatise probably prior to 1700 and somewhat relied on old traditions.

In medicine, externally applied Armenian bole was thought to stop the flow of blood from fresh wounds, while, through ingestion, it has also been recommended for relief of the symptoms of spitting of blood, catarrhs and ulcers of the lungs. It was often mixed with common bole and terra sigillata and was an ingredient in official compositions like *Gordonius' Troches*, *Ceratum Santalinum*, *Plaister for Fractures*, and many others.¹⁸

BRADLEY 1730 was a critical judge in saying:

*It is a fine Astringent, and a Vulnerary. It is prescribed in Diarrhaea's, Haemorrhages, Catarrh's, and all Kinds of Defluxions. They use it likewise in strengthening Plasters; but any of the sigillated Earths, I believe, would be as useful.*¹⁹

¹⁸ GEOFFROY 1736, pp. 61, 63, where some recipes are given.

¹⁹ BRADLEY 1730, p. 66.



Fig. 1 Fine Russet I/16

I/16 Fine Russet

In this sample most of the pigment is compressed into small lumps of up to 5 mm in diameter. The clumps are of irregular shape with a rough surface. The mass is off-white with a slightly yellowish pink tint. Small dark particles are noticeable with the naked eye.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Etymologically 'russet' comes from Latin 'russus' for red. It has been associated with a strong reddish brown colour.¹

A second sample in the cabinet is labelled *fine-Roset*, kept in a wooden box in La2/15.

HARLEY 2001 suggested that roset was made from brasil.² However, investigation showed that SALMON 1701 used *Brazil* to enhance the colour of *Roset*.³ The difference between the two could be seen as one being a lake precipitated onto a substrate to form a lake and the other a solution of the same lake in water.

Also the terms 'roset' and 'russet' need to be differentiated. HARLEY 2001 described 'russet rubiate' as a madder brown (from *rubia tinctorum*), which was a popular water colour pigment in the 19th Century.⁴ However, in SALMON's *Polygraphice* 1701 the term *russet* appears only to be used to specify a colour and not a certain pigment. He said: *A color like to a dark Russet will be an Ash-color*.⁵ And according to him an ash-colour was mixed with *charcoal black* and *white-lead*. Another indirect description of the colour is given as follows:

¹ Merriam Webster Online Dictionary <http://www.m-w.com>.

² HARLEY 2001, p. 145.

³ SALMON 1701, p. 95.

⁴ HARLEY 2001, p. 156.

⁵ SALMON 1701, p. 166.

*For Pearls. Temper Charcoal-black with white-lead, till it be a perfect russet; then make the Pearl with it, and give it a speck of White-lead only to make it shine.*⁶

Composition

It is understood that roset was extracted from brasil wood, mixed with alum and gum water. This thick liquid could be used in miniature painting. HARLEY 2001 gave several recipes for this.⁷ Such descriptions appear to be in stark contrast to the material in Vigani's cabinet, a light coloured powder! Could the colouring component have degraded over time to such an extent? What is the substrate of this powder?

Analyses are almost inevitable to solve these problems and align the terminology with the material in the cabinet and the contradicting sources in the literature of Vigani's time.

A few examples from painting treatises may illustrate the incompatibility of the red painting material in the literature and the sample in the cabinet:

NORGATE 1648 excluded *Rosett* together with others from the list of pigments used in limning for its coarse body and dangerous quality.⁸

Although it was suggested to use *roset* rather for washing prints than for limning⁹, SALMON 1701 later treated it amongst the pigments recommended for limning.¹⁰ *Roset* could be ground with *Brazil-water* for a deep purple colour, or with *Litmose* for a fair violet¹¹, mixed with *Spanish brown* and *Ceruse* it presented a *horse-flesh Colour*.¹² Black-coal was shadowed with *Roset*.¹³

For opaque drawings of figures in jappanning work *Russet* may be mixed with *White-Lead* and *Gum Arabick Water*. C.K. stressed that pigments mixed with the white should have no body, and that gum water was used so the paint did not become transparent.¹⁴

⁶ SALMON 1701, p. 169; Further indication for 'russet' as a grey colour is given when Salmon advised the painter to lay *verdigrise* over *Russet* to achieve a sea-green and to produce a *Russet Velvet* with *Lamp-black* and *White-lead*. SALMON 1701, pp. 165, 166.

⁷ HARLEY 2001, pp. 144, 145.

⁸ MULLER 1997, p. 59.

⁹ SALMON 1701, p. 93.

¹⁰ SALMON 1701, p. 95.

¹¹ SALMON 1701, p. 95.

¹² SALMON 1701, p. 95.

¹³ SALMON 1701, p. 111.

¹⁴ K., p. 28.



Fig. 1 turquoise coloured minerals, not labelled I/17

I/17 turquoise coloured minerals, not labelled (paper damaged and lost)

These turquoise coloured minerals are in the shape of naturally grown rhomboid crystals. Conglomerates are evident where several crystals grew from a smaller crystalline base. The crystals are up to 1cm long.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

These unknown green minerals are strongly suggested for chemical analysis, considering the range of green pigment substances in the cabinet and the resulting good opportunities for comparison.



Fig. 1 Green Fr. I/18

I/18 Green Fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 Verdigr. Fine I/19

I/19 Verdigr. Fine

These are light turquoise coloured clumps with a very rough surface. Small granules appear to rub off easily. Splits are noticeable in one of the larger lumps. Many surfaces show a grey crust, which may be part of the original formation of the lumps, or a later change due to exposure to air/moisture, or dirt.

- Does not appear in invoices
- LECTURE-NOTES undated, p. 53
- LECTURE-NOTES 1707, p. 71

Terminology

PEACHAM 1606 listed the synonyms *vertgraece*, *vert-graece*, *vertgrease*, *Aerugo*, *Vert de gris*, and *hoary greene*.¹ Treatises of natural scientific background often referred to the synonymous term *Aerugo*.²

Next to the crude verdigris there existed a refined sort, often under the terms *fine* or *distilled* verdigris, after it had undergone some sort of (acetic) acid treatment. This type shows a slightly different chemical structure. Vigani's sample most likely falls into this category.

Solutions of verdigris in acid liquids usually passed under the name 'copper green'. But there are recipes, which indicate other types of dissolved verdigris under the same name of copper green. These green solutions were mostly applied in print washes.

There are various recipes commonly grouped under verdigris or in proximity to a verdigris recipe. They have headings like a *beautiful green*, or a *good green for glazing*, a *green for emeralds*, etc.

Today we are familiar with the expression 'copper resinate' for a pigment formed of copper salts of resin acids. There is no evidence from these recipes whether this transition of verdigris into copper resinate was understood chemically. Perhaps it was just

¹ PEACHAM 1606, p. 54

² For example GEOFFROY 1736, p. 269 and BRADLEY 1730, p. 19.

considered a variation in the application and use of verdigris, which could account for the lacking of a specific terminology in the 17th and early 18th Centuries.

Yet another synonym for verdigris may be Spanish green. But documentary evidence cannot entirely support this fact. HARLEY 2001, however, noted that what appeared under the name of *Spanish green* in a late 16th Century source was indeed verdigris.³

SALMON 1701 usually used the term *verdigrise*, but on one occasion⁴ he referred to *Spanish green* as a pigment which could be used for a printing ink, if ground in linseed oil or liquid varnish. He did not outline any further specification of the properties of this pigment. One can speculate whether his *Spanish green* and *verdigrise* designate the same pigment or not and whether Salmon was aware of this fact. It could also indicate that Salmon copied the ink recipe from some other source without realising its proper meaning. Or else, the two terms, *verdigrise* and *Spanish green* were so familiar with the reader that it did not seem necessary to aim at congruency in terminology. An analogous situation can be found in PEACHAM 1606.⁵

A term that also frequently appears in connection with or close textual context to verdigris is 'green copperas'. So far the author has not been able to demonstrate clearly what material hid behind this expression.

Composition

The artificial pigment verdigris is composed of one example or mixtures of basic copper acetates, which are blue or green in colour. The refined product, verdigris dissolved in acetic acid and re-crystallised, is green neutral copper acetate $[\text{Cu}(\text{CH}_3\text{COO})_2 \cdot \text{H}_2\text{O}]$.⁶

In 17th and early 18th Century sources verdigris was often described as a rust of copper. The refinement or distillation was understood as a purely mechanical cleansing and not as a change in the chemical structure. A description of the composition of crude verdigris at the beginning of the 17th Century can be found in PEACHAM 1606 who simply said that *vertgreace* was *nothing els but the rust of brasse*.⁷ Contemporary with Viganì's cabinet SMITH 1705 wrote that verdigris was *the rust [of copper] produced with*

³ HARLEY 2001, p. 80.

⁴ SALMON 1701, p. 222.

⁵ PEACHAM 1606, p. 69.

⁶ KÜHN 1993.

⁷ PEACHAM 1606, p. 54.

the fumes of sour wine and the rape of grapes, a process performed in Montpellier.⁸ Nearly 30 years later BRADLEY 1730 taught on Vigani's cabinet that *this [Verdigrease] is only the Rust of Copper made by the Corrosion of an Acid, such as one may press from unripe Grapes, or of the Verjuice made of Crabs*.⁹

Verdigris dissolved in resins produces copper salts of resin acids. Today, copper resins are seen as a separate pigment.

Provenance

Verdigris was manufactured on a large scale, and Montpellier was frequently mentioned to be the centre of high quality verdigris production. Montpellier in the middle of French vineyards was predestined because of its abundance of grape products.

Other places are not as frequently mentioned and less well localised in the reports. Often the provenance of the material was not referred to in the treatises, perhaps because it was a common commodity in the druggist's shops, being also used in chemistry and for pharmaceutical purposes. Private production may have happened in chemical laboratories.

BRADLEY 1730 stated that the copper used to make copper products, amongst which he listed *Verdigrease*, was *plentifully found in Mines in Great Britain and in great abundance brought to us from Norway and Sweden*, the latter esteemed to be richer.¹⁰ Later he added that *the best [verdigrase] comes from France, it produces the gayest green Colour, but not durable in Painting unless well corrected*.¹¹

The refinement process to make *distilled* verdigris was most likely also carried out by the manufacturer, thus trading products of different levels of quality. Many treatises advised the artist to refine the pigment and instructed him in various methods.¹²

Trade

Vigani's sample of fine verdigris does not occur in the invoices. He may still have bought it. His courses of lectures and other documents do not indicate that he used to make it himself.

⁸ SMITH 1705, p. 23.

⁹ BRADLEY 1730, p. 40; Verjuice is a very acidic juice made by pressing unripe grapes or crab-apples.

¹⁰ BRADLEY 1730, p. 19.

¹¹ BRADLEY 1730, p. 40.

¹² See Preparation.

Both verdigris and fine verdigris were traded through druggists, fine verdigris being the more expensive of the two, and as we learn from SMITH 1705 also through colour shops:

*At the colour shops there is a sort of it that they call distilled Verdigrease, being a sort that is wholly purified from dross and filth, of good use in fine work, but too dear in vulgar painting.*¹³

Quality / Adulteration

The quality of the pigment was a minor topic among the 17th and early 18th Century writers. Usually it sufficed to say that the best quality verdigris was produced in Montpellier in France and that fine, or distilled verdigris was superior to the crude, basic verdigris. No commentary could be found concerning adulteration of the pigment. A typical example, contemporary to Vigani's cabinet is SMITH 1705 who in referring to *Mr Ray's Travels*, p. 454 stated that the best *verdigrease* came from Montpellier¹⁴ and that all other *verdigrease* faded according to his opinion.¹⁵

Properties

Unrefined, basic verdigris is subject to considerable colour change from cold bluish green into a warm green colour when applied as oil paint. Fine, neutral verdigris, which is already green, does not change as dramatically. The colour changes are a result of the formation of copper oleates with the acids in the oil medium. In the presence of resins in the binding medium green copper resinsates may also form. Studies have shown that the pigment is otherwise very stable, particularly when coated by a varnish. The main concern has been the discolouration of green glazes involving copper resinsates.¹⁶

Reports by 17th and early 18th Century critics have not always been very favourable. DE MAYERNE's notes, for example, reflect a very negative picture concerning the properties of verdigris, namely that it spoiled all other pigments, which even meant that it needed its own palette, brush and oil to paint with. These comments relate to earlier sources from the end of the 16th Century. However, DE MAYERNE also included appraisals of distilled verdigris as having been one of the best and permanent glazes over pink, mas-

¹³ SMITH 1705, p. 24.

¹⁴ SMITH 1705, p. 23; the source for Mr Ray's travels is unknown.

¹⁵ SMITH 1705, p. 95.

¹⁶ See the discussion in KÜHN 1993 and the study of verdigris in VAN EIKEMA HOMMES 2004.

ticot, or blue ashes, which never faded, particularly if covered by a varnish after drying.¹⁷

Verdigris was too coarse and gritty to be used in watercolours, which is why NORGATE banned its use in limning.¹⁸ SALMON 1701 only accepted it for this purpose if it had been purified and prepared. If thus prepared, he said, one ounce would be worth ten of the coarse verdigris, *or that which is bought in the shops*.¹⁹ As a drawback SALMON 1701 reported that verdigris was subject to decay and faded, when dried upon paper. *Therefore to preserve it from that fault, dissolve Sap-Green in it, and it will keep its Color*.²⁰

SMITH 1705 was of the opinion that *Verdigrease* was the best and most useful green, inclining to blue, but best grass green if tempered with a little *Pink-yellow*. It ground very fine with some effort, was of a good body, and worked well.²¹ BRADLEY 1730 said it was not durable in painting unless *well corrected*.²²

The sources do not always indicate whether their statements are based on the properties of crude, basic verdigris or refined, neutral verdigris. Since basic verdigris could occur in varying composition its properties may varied accordingly and probably have lead the authors to gain good or bad experiences with what they all called the same verdigris.

Verdigris was universally reported to be a good drying agent in oil and particularly recommended as an additive in black oil paints.²³

Manufacture

From the lecture notes we know that Vigani used *verdigrease* in his experiments. It appears to have been an ingredient readily available to him rather than a substance that would have to be made in preparation for the experiment.

¹⁷ BM MS Sloane 2052, ff. 4 r., 4 v., 6 r., 85 r., 92 r., cited after BISCHOFF 2002.

¹⁸ MULLER 1997, p. 59.

¹⁹ SALMON 1701, pp. 93, 95; SALMON referred to his medical opus, the *Doron Medicum* lib.3, cap.4, sect.13, § 2, for the purification process of verdigris. One edition of this work is SALMON 1683.

²⁰ SALMON 1701, p. 99.

²¹ SMITH 1705, pp. 23, 24.

²² BRADLEY 1730, p. 40.

²³ For instance SALMON 1701, p. 183.

GEOFFROY 1736 reproduced an elaborate account of the manufacture of the highly esteemed verdigris from Montpellier:

*[...] the Method of raising [Verdigrease], taken from the Memoirs of the Philosophical Society of Montpellier, is as follows. The Husks, Stones, &c. of Grapes, being first dried, and after dipped in some strong Wine, are laid for nine or ten Days in wooden or earthen Vessels, till they begin to ferment. Then being squeezed together with both Hands, they are formed into Balls, which being put into proper earthen Pots, and Wine poured upon them, till about half is covered, the Vessels have a straw Lid thrown over them, and are set in Wine Cellar; where the Balls are left in Maceration for twelve or fifteen Hours, being turned every four Hours, that the Wine may penetrate every Part of them. Afterwards the Balls being raised about a Finger's breadth above the Surface of the Wine, and set upon wooden Bars, the Vessels are shut again, and left in that State for ten or twelve Days more. After which time, the Balls emit a strong and penetrating Scent, and are then fit for dissolving Copper. For this purpose, they are broke and bruised with the Hand, that the outer Part of them, which is driest, may be exactly mix'd with the inner, which is still moist with Wine; then they are stratified with Copper Plates in the same Vessels upon wooden Bars, the Plates making always the lowest Stratum, and the Balls the uppermost. The Plates are four Inches long and three broad; and if the Copper be new, they must be previously buried for four and twenty Hours in Verdigrease, and then heated a little in the Fire. The Vessels being filled in this manner and shut close, are left without any further Management till the Verdigrease is made, which happens sooner or later, according to the Nature of the Copper. Some Copper yields its Rust in six or seven Days. The Verdigrease being completely extracted, the Plates covered therewith are taken out of the Vessels; and their Edges being moistened with the strongest Wine, they are wrapped up in Linnen Cloths, dipped in the same, and laid in a Wine Cellar for three Weeks. By this, the Makers tell us, the Verdigrease is nourished, and then it is scraped off from the Plates with Knives, and kept for use.*²⁴

Preparation

In the preparation of verdigris as a paint, five ways can be distinguished:

The preparation of paint:

- a) from crude, basic verdigris, ground and mixed with the medium and additives.
- b) via refined, neutral verdigris:
 - dried, ground and mixed with the medium or

²⁴ GEOFFROY 1736, pp. 269-270.

- in direct combination with the binding medium
- c) from an acidic solution of verdigris (known as copper green)
- d) from verdigris dissolved in resins and thus turned into copper resinate:
use of the heated and diluted solution of copper resinate
drying of the copper resinate mass and use of the ground product in medium
- e) from experimental pigment formulations using verdigris

There were always mixtures, variations and cross-overs of these preparation techniques.

The following recipe may exemplify the preparation of verdigris as such in limning.

SALMON 1701 in repeating or perhaps rather copying PEACHAM²⁵ 1606 instructed:

*Grind it with the juyce of Rue and a little weak Gumwater, and you will have a most pure green: if you will Diaper with it, grind it with Lye of Rue (or else the decoction thereof) and there will be a hoary green.*²⁶

Many sources mention a refinement process for verdigris, which included a treatment with vinegar or other acid substances. It has been shown that such a treatment turns basic copper acetate into neutral copper acetate, which is more consistently green and less prone to colour changes after application of the paint. This fine verdigris could be used in watercolours or in oil media.

One method was, to dissolve the verdigris in the acid, to evaporate the liquid and to grind the re-crystallised product. For instance, DE MAYERNE noted that verdigris should be ground in vinegar, then dried and afterwards ground with oil of turpentine for a glazing colour.²⁷ SALMON 1701 instructed to make *verdigrise* fine by extracting its tincture with *Spirit of Vinegar* and then evaporating to dryness.²⁸

Another method was to grind crude verdigris with an acidic substance after which the binding medium was directly added. Advice for such a procedure was as follows:

²⁵ The equivalent passage in PEACHAM 1606, p. 54 on limning reads: *to teper it as you ought, you must grind it with the juice of Rue, and a little weak gum water, & you shall have the purest greene that is; if you will diaper with it, grind it with the lie of Rue, (that is, the water wherin you have sod your Rue or Herbgrace [i.e. Herbygrass, a synonym for Rue, the author]) and you shall have an hoary greene.*

²⁶ SALMON 1701, p. 95.

²⁷ BM MS Sloane 2052, f. 103 v. cited after BISCHOFF 2002.

²⁸ SALMON 1701, pp. 99, 183.

For another *perfect green* SALMON 1701 recommended grinding verdigris with *white Tartar* and tempering it with *Gum-water* for use in limning.²⁹ A variation was the *pear green* which was achieved by tempering *verdigrise* with white tartar and strong white-wine vinegar, in which *gum arabick* had been dissolved.³⁰

A more unusual recipe of this type was a *pure Green*, which was enhanced by the addition of sap green:

*Take Verdigrise, bruis it, and steep it in Muscadine for twelve hours, then strain it into a shell, to which add a little Sap-green: (but put no gum thereto).*³¹

The clear, transparent liquid of verdigris dissolved in acids according to HARLEY 2001 was known as ‘copper green’ and used for colour washing of prints.³² It appears though as if the term copper green was more widely used for green pigments or solutions that were formed using verdigris and an acidic substance. Unfortunately even that must be questioned when we look at the admittedly sketchy note by SALMON 1701. SALMON’s *Copper Green* for washing prints, treated on the same page as *verdigrise*, is described as of excellent transparent colour of a shining nature *if thickened in the Sun, or over a gentle Fire*.³³ It cannot be determined whether the copper green described in HARLEY is of the same nature as Salmon’s *Copper Green*.

A recipe to make *Copper-green* for colouring prints was given by SMITH 1705. In this example cream of tartar provided the acid:

*1 pound French Verdigrease from Monpeliar (...) plus 3 ounces of cream of tartar, beat them to powder (don't inhale the verdigrease) and boil in 2 quarts of water til 1 quart is boiled away, put the liquor into a glass stopped, and let it settle, to have a delicate green. If the verdigrease wasn't good it will be too pale. Then it can be heated gently over a fire to evaporate more liquid and tried out, whether when dry it is of a better green, but it shouldn't shine too much. If so, it is better, instead of evaporating more, to add more verdigrease, and boil it again until it becomes a deep transparent willow green. It will keep a year or more, if the glass is well stopped*³⁴.

²⁹ SALMON 1701, p. 95.

³⁰ SALMON 1701, p. 103.

³¹ SALMON 1701, p. 105.

³² HARLEY 2001, p. 81.

³³ SALMON 1701, p.183.

³⁴ SMITH 1705, pp. 95, 96.

This recipe seems to point to the fact though, that the green product was a precipitate, which settled at the bottom of the flask.

In the fourth method of preparation of verdigris, the formation of copper resinsates played an important part. Copper resinate was appreciated as a green glaze in oil paintings and over gilding. Verdigris dissolved in a resinous liquid was either used directly as a glaze, further diluted with oil, or the transparent mass was dried, ground and used as a pigment. Not all the directions given to prepare this solution seem to work in reality. It was found that verdigris does not, for instance, dissolve in Venice turpentine, as DE MAYERNE took down in a recipe.³⁵ The author would like to refer the reader to the works of KÜHN 1970 and 1993, WOULDHUYSEN-KELLER 1998, and VAN EIKEMA-HOMMES 2004 for further discussion.³⁶

Experimental preparations of Verdigris play with the change of the colour from green to blue depending on the pH-value of the solution. Unfortunately the writers of such instructions did not indicate whether such pigments actually made their way onto the painter's palette.

SALMON 1701 has the following experimental observations:

*A good quantity of oyl of Tartar, put into a strong solution of Verdigrise, gives a delightful blew, which may be variously changed by adding spirit of Urine, or Hartshorn.*³⁷

To change ground *Verdigrise* into a *glorious blew* it should be digested together with *Sal-Armoniack and the like in a dunghil* for a while.³⁸

Use

Verdigris was used in limning as well as in oil painting. It could appear in mixtures, typically with pink, massicot, or sap green, which would compensate the blue hue of the pigment. A layer build-up is also mentioned, namely in the imitation of black cloth, where verdigris was used to emphasise the shadows. As a glaze it appeared over greens in the imitation of foliage or in draperies, and as a decoration on gold or silver leaf. However it is not a very frequently used pigment, and could to greater satisfaction be replaced with mixtures of yellow and blue pigments. Some authors absolutely refused to use verdigris.

³⁵ BM MS Sloane 2052, f. 31 v., examined by WOULDHUYSEN-KELLER 1998.

³⁶ KÜHN 1970, Kühn 1993, WOULDHUYSEN-KELLER 1998, VAN EIKEMA HOMMES 2004.

³⁷ SALMON 1701, p. 203; the recipe does not say what the verdigris was dissolved in.

³⁸ SALMON 1701, p. 207.

Occasionally verdigris appeared in other applications, as writing ink, in glass painting, in gold size, as well as in mixtures to paint on iron. Its use in Japanning is not surprising in view of its translucency in resin/oil mixtures.

Details on the historic use of verdigris in green glazes can be obtained from an exhaustive study that has recently been published by VAN EIKEMA HOMMES.³⁹ In the following other aspects of the use of verdigris will be illustrated, including its claimed value as a drug in medicine.

Verdigreace was the only green pigment, which PEACHAM 1634 listed for oil painting apart from mixtures of yellow and blue pigments. One purpose of the pigment was, according to his treatise, to act as an additive to speed up drying of for example *lampe-blacke*.⁴⁰ The pigment could also act in mixtures, for example with *pinke* as a glaze over modulating layers of *lampe-blacke* and *white lead* to imitate green velvet.⁴¹ Similarly mixtures with massicot and white lead occurred for more opaque layers.⁴²

Directions in limning are controversial. Where PEACHAM 1606 recommended going over a layer of *vertgreace* with the *water of sapgreene*,⁴³ NORGATE banned *Verdigreece* from the limner's palette all together with some other pigments, which were *fitter for those that wash prints or colour Mapps then to be admitted into our Company*.⁴⁴ However, when it comes to imitating emeralds in miniatures on a layer of burnished liquid silver, he admitted *Verdigreece* in a special preparation. The composition was a glaze of

*Turpentine, Verdigreece, and a little Turmericke root scrapt, with Vinegar. Let it dry, grind it into fine powder, and temper it with Turpentine then take a needle or such like small iron Instrument, heated in a Candle, and laid upon the ground of silver, fashioning the stone round, square, oval, or how you please, with the point of your Instrument. This must rest a day or two to dry and you will find it faire, and transparant. If it be long in drying, adde to it a little Powder of clarified Masticke.*⁴⁵

³⁹ VAN EIKEMA HOMMES 2004.

⁴⁰ PEACHAM 1634, pp. 131, 132 133.

⁴¹ PEACHAM 1634, p. 133.

⁴² PEACHAM 1634, pp. 133, 134.

⁴³ PEACHAM 1606, p. 54; for *sapgreene* see *Sap green* I/43 and La2/15.

⁴⁴ MULLER 1997, p. 59.

⁴⁵ MULLER 1997, p. 81.

SALMON 1701, again after PEACHAM 1606, recommended to *diaper* upon *verdigrise* with *Sap-green*.⁴⁶

Green writing inks could be produced when verdigris was made into a paste with strong vinegar and the infusion of *green galls*, in which *gum arabick* had been dissolved. Such printing inks could go under the name of *Spanish green*.⁴⁷

A similar instruction to prepare green writing ink can be found in PEACHAM 1606.⁴⁸

BRADLEY 1730 described that *we may make a Liquid Colour of it for staining or washing of Prints, or to be used as a Water Colour, by boiling it in strong Vinegar, and adding to it a little white Argil*⁴⁹, *which opens the Parts of the Verdigrease, and makes it a free writing Ink*.⁵⁰

Verdigris was one of the pigments used in glazes for the fashionable art of japanning. In the following recipe the anonymous author recommended *distilled Verdigrease* in combination with nut oil diluted with oil of turpentine:

Grind with a Mullet what Quantity you please with Smalt or Verdigrease, with Nut-oil as much as will moisten the Colours, and grind them till they are as fine as Butter, put then the Colours into Shells, and mix them with Oil of Turpentine till they become thin for use; Lay them on Silver, Gold, or any other light Colour, and they will then become transparent, altering their Lightness or Darkness, according to that of the Metal or Colours that are placed under them.⁵¹

In DOSSIE's time 1758 it was very fashionable to paint coaches with *Distilled Verdigrease* in varnish, which created a great demand for this pigment.⁵²

Other applications of verdigris were in the glass industry and in glass painting. In glass staining, *verdigrise* acted as chemical reagent in the preparation of *Crocus Veneris*, a colouring addition to the glass mass.⁵³ The transformation of verdigris to copper resi-

⁴⁶ SALMON 1701, p. 95.

⁴⁷ SALMON 1701, pp. 221, 222.

⁴⁸ PEACHAM 1606, p. 61.

⁴⁹ Argil is a synonym for tartar.

⁵⁰ BRADLEY 1730, p. 41.

⁵¹ K., p. 28.

⁵² DOSSIE 1758b, p. 303.

⁵³ SALMON 1701, p. 763.

nate could be followed in a recipe for a green to be used on glass. *Vertgrease* should be ground very well with *turpentine* and be warmed on the fire whenever used.⁵⁴

Verdigris has also been reported as a drying agent in silver size made with ochre and fat drying oil.⁵⁵

To write upon iron PEACHAM 1606 directed to *take vertgrease, greene copperas, vinegar, and roch Alome: and temper them together: and melte wax upon your sword or knife, upon which draw or write what you will.*⁵⁶

Recipes in which verdigris acted as a source of copper for the production of blues named 'azure' pigments (usually in connection with ammoniac, sulphuric acid, and calcium carbonate) were passed on in treatises like DE MAYERNE'S⁵⁷. HARLEY 2001 demonstrated that such cuprammonium blues had become obsolete by the early 17th Century.⁵⁸

Verdigris also had its place in medicine, even though it seems to have been more important as an artists' pigment, if we believe GEOFFROY 1736 who said that *Verdigrease is used by Painters and other Artists, but is seldom prescribed inwardly by Physicians.*⁵⁹ He continued that verdigris was applied outwardly to deterge ulcers and eat away fungous flesh, as an ingredient in *Unguentum Aegyptiacum* and *Unguentum Apostolorum*, both preserved in Vigani's cabinet⁶⁰

Finally, verdigris was used and its reactions observed in chemical experiments and demonstrations, as Vigani did not fail to document. He used *verdigrease* as the copper source in an amalgamation of copper with mercury.⁶¹ In the 1707 lecture notes⁶² *verdigrease* is mentioned in comparison with preparations of copper vitriol: Vigani produced

⁵⁴ PEACHAM 1606, p. 67.

⁵⁵ SMITH 1705, p. 41.

⁵⁶ PEACHAM 1606.

⁵⁷ B.M. MS Sloane 2052, ff. 65, 70, 70v.

⁵⁸ HARLEY 2001, p. 50.

⁵⁹ GEOFFROY 1736, p. 270; BRADLEY 1730 taught similarly, amending the list by tincture of copper: *The Physical Use is in external Compositions, and is an extraordinary Cleanser of foul Ulcers. We have another Preparation of it called Tinctura Veneris, or Tincture of Copper. Take Verdigrease one Dram, Spirit of Sal Ammoniak and rectified Spirit of Wine, of each half an Ounce, let 'em stand till they are of a deep Sky Colour. This preparation of it makes an admirable Injection for a Gonorrhea, but it should only be used when the Infection is in the Urethra, and when it is only there, a Person may soon be cured with it. This is used by many Physicians of the first Rank, and was first introduced amongst us by Doctor Cockburn.* BRADLEY 1730, p. 41.

⁶⁰ *Ung^t Aegyptiacū* Y/13 and *Unguent : Apostolor :* Y/20.

⁶¹ LECTURE-NOTES undated, p. 53.

⁶² LECTURE-NOTES 1707, p. 71.

Spiritus Veneris (spirit of copper, probably a volatile acid) in the *distillation of verdigrease*. We learn that *verdigrease* in his eyes was *nothing else but the rust of copper*. In the distillation of verdigris as noted in his *Medulla Chymiae* Vigani showed that a metallic calx (the residue in the flask) always combined with the same amount of a given acid. In this case the volatile acid collected in the receiver converted the residue into verdigris again.⁶³

⁶³ VIGANI 1683, p. 13 and COLEBY 1952, p. 55.



Fig. 1 Terre Vert I/20

I/20 Terre Vert

The three lumps look like milky green stones with dark bluish-green particles included. The largest is 2.8cm long and 2.3 cm wide. A few white crystalline inclusions can be observed.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

So far in modern terminology the expression 'green earth' has been applied to the minerals celadonite and glauconite since their first formal study, of which early descriptions date to the late 18th Century.¹

Recent studies point to a complication of terminology in the application of the equivalent Italian, Spanish, or French terms like terra verde, tierra verde, verde tierra, terre verte, verd de terre, verditure, etc. There is evidence that certain such terms of Latin origin also cover a green copper pigment that was collected particularly in Hungary from waters running from copper mines.² An investigation of Spanish painting treatises from the 17th and early 18th Centuries suggests that tierra verde and verde tierra were different pigments in the said period.³

'Verditure' and related spellings usually point to the use of verditer⁴, however it can cover green earth in particular cases. This said, it may not always be possible to make a clear attribution from the textual sources.

Vigani's *Terre Vert* appears to be a natural mineral, or 'earth' upon macroscopic inspection. This concurs with the rare references to green earth in English art technical sources of the 17th and early 18th Centuries, which relate to terms of Latin origin and

¹ GRISSOM 1986, p. 142.

² BURMESTER 2003.

³ Ph.D.- dissertation of Corinna GRAMATKE, HfBK Dresden, publication pending.

⁴ See *Verditure* I/21.

never to the English expression. Where it occurs in the written sources it is consistent with the opinion, that terre vert was an earth pigment. Only DOSSIE 1758 noted that the pigment owed its green colour to copper.⁵

Green earth does not appear to have been a topic of interest in English sources of the natural sciences in this period. Nothing could be found that would prove an artificial nature of what was described as or looked like green earth. Therefore the following continues to be based on the descriptions by GRISSOM⁶ and HARLEY⁷ of *Terre Vert* as green earth, a green clay mineral, until chemical analysis might prove otherwise.

Composition

In GRISSOM's article 1986 which has long served as the concise monograph description of green earth it is defined as prepared principally from two closely related clay minerals: celadonite (of altered volcanic origin) and glauconite (of sedimentary origin), and other siliceous minerals.⁸

Provenance

Green earth can be found in several places across Europe, for example in the Tirol, Saxony, Bohemia, Silesia, Moravia, Poland, Hungary, France, Cyprus, and the Mendip Hills of England as well as in Cornwall.⁹

Each place shows deposits of slightly different types of minerals or mineral compositions. We have no indication as to where Vigani's sample originated. Analysis of Vigani's sample would in the first place establish if the material can be counted as green earth. If so, it may be possible to localise the source through analysis of the mineral type. Should it turn out to be a material other than green earth, it would further indicate that historic pigments with names referring to green earth should be closely examined again as for their source, use, and specification in treatises.

Trade and Quality / Adulteration

Terre vert does not occur as an item in the invoices to Vigani's cabinet. Since no other of Vigani's documents highlights the pigment, nothing can be said about the sample's acquisition.

⁵ DOSSIE 1758a, p. 110.

⁶ GRISSOM 1986; Grissom left a gap in the history of the terminology of green earth between the mid 16th Century and the 20th century.

⁷ HARLEY 2001, pp. 76-77.

⁸ GRISSOM 1986.

⁹ GRISSOM 1986, p. 149.

Other sources are no more specific regarding trade or quality of this commodity. Overall the pigment received very little attention.

Properties

DE MAYERNE (17th Century) noted in the margin to *Verddeterre*, most likely verditer, that there was a sort of green earth-like bole, which was of a dirty green and was used in oil painting.¹⁰

Manufacture and Preparation

The mineral was ground and probably cleared of impurities. Within the scope of this research no descriptions from Vigani's time about how this process was carried out and by whom could be found.

Use

As already noted, not much attention was paid to green earth in English treatises on painting, which leads us to assume that it was not widely used nor was it appreciated as a pigment in England. Important works do not mention green earth under this or any other name: For example looking for it in PEACHAM¹¹ 1606 on limning, or in PEACHAM¹² 1634 on oil painting, in NORGATE¹³ on limning, in SALMON 1701, and in SMITH 1705 will prove in vain.

In the DE MAYERNE manuscript in only one instance can one unanimously point to green earth. This marginal note under a reference for *verddeterre* says that there was a green earth-like bole used in oil painting.¹⁴ All other spellings of *Verd de terre* (*verdeterre*, or *verddeterre*) in DE MAYERNE's manuscript appear to cover the pigment, which is today known as green or blue verditer.

Terravert is initially listed for oil painting as well as for limning in C.K.'s treatise, yet it does not appear on a single occasion later on through the book.¹⁵

Terraverte is the only green pigment BARDWELL 1756 used in oil painting. All his green shades were mixtures of yellow and blue. *Terraverte* played a minor part as a pigment used to weaken brown pink in the colouring of the carnation, but when he actually

¹⁰ BM MS Sloane 2052, p. 4, cited after BISCHOFF 2002.

¹¹ PEACHAM 1606.

¹² PEACHAM 1634.

¹³ MULLER 1997.

¹⁴ BM MS Sloane 2052, p. 4, cited after BISCHOFF 2002.

¹⁵ K., p. 11.

explained each step in the painting of faces the pigment did not occur any more. It received attention again in the treatment of landscapes. Here *Terra-vert* was used either on its own or in mixtures with *Prussian* (blue). Together with *Brown Pink*, *Prussian*, and *Lake* BARDWELL recommended it in this context as one of the *most useful glazing colours*.¹⁶ He added that

*because these principal glazing Colours themselves are often too strong and glaring, they should therefore be a little changed, and softened with such Colours as are of near Resemblance to themselves and the Objects. Thus, if it is in the Distances, the Terra-vert and Azure, which are their principal glazing Colours, may be improved and made lighter with some of the Sky Tints: And as the Distances come nearer, with the Purple. As we get more into the middle Group, the Terra-vert and Prussian may be changed with some of the Green Tints, such as are made without White; for White is the Destruction of all glazing Colours.*¹⁷

It was suggested that the increased use of oil instead of water-soluble media accounted for the absence of green earth in paintings from the late Renaissance onwards.¹⁸ The pigment was however used as a substrate for dyes and in wall painting.

¹⁶ BARDWELL 1756, p. 38.

¹⁷ BARDWELL 1756, p. 39, apart from *Terra-vert* and *Prussian*, the other colour names were descriptions of the hues of mixtures of pigments chosen from the range of 14 pigments suggested by BARDWELL in landscape oil painting.

¹⁸ GRISSOM 1986, p. 144.



Fig. 1 Verditure I/21

I/21 Verditure

This pigment is of strong light blue colour with a turquoise hue. It appears finely ground with compacted, mainly irregular shaped lumps of up to 8 mm in diameter.

Two pieces of paper from the paper tray lie on the sample's surface.

Compare with the sample of *Blew Verdit.* in I/5.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The terminology of 'verditure' is complicated and has always led to confusion about the composition of the pigment behind the name. The reason for this lies in the different spellings and combinations of today's words 'green' and 'earth'. In 17th and early 18th Century sources anglicised spellings taken from Roman languages, mainly from French (*vert de terre*) or Italian (*terra verde*), occur as well as variant spellings of the English 'green earth'. A manual may contain different versions of the term either because the author wanted to differentiate between different pigments, or because he copied from several sources, usually without specifying this circumstance. This aside, there was no formally agreed system of spelling in place.

In Vigani's cabinet there are labels for:

Terre Vert I/20

Verditure I/21

Blew Verdit. I/5

Each of these contains a material sample, which means that the terms distinguish between different materials. These terms unfortunately do not appear in the invoices related to the cabinet.

Generally, in the more recent English standard works on painting technique¹ the expression 'green verditer' stands for the artificial basic copper carbonate, whereas 'malachite' denotes the natural mineral composed of basic copper carbonate. It has also been acknowledged that in some cases the term 'green verditer' was used synonymously with 'malachite'. A substance labelled 'malachite' is not contained in the cabinet.²

BRADLEY 1730 considered Vigani's *verditure* powder as of natural origin.³ This attribution is doubtful, though, as will be shown below.

GRAMATKE⁴ discovered that Spanish painting treatises from the 17th and early 18th Centuries seemed to indicate the existence of two different materials behind the two Spanish expressions 'tierra verde' and 'verde tierra'. In today's Spanish terminology they are used synonymously for the pigment that is known under 'green earth' in English.

The different materials under *Terre Vert* and *Verditure* in the cabinet would support this theory of two similar terms for two different materials.

DE MAYERNE⁵ used *Verdeterre*, *verddeterre* as well as *Verd de terre*, and in cases, which need specification, *verd de terre verd* and *verd de terre bleu* for green and blue verditer, respectively.

Without further evidence, the article in the following is based on the assumption that Vigani's *Verditure* is consistent with the 'green verditer' of the current terminology, specifying a green basic copper carbonate. This may be supported by the fact that Vigani has a *Blew Verdit*, which could be seen as a blue version of *Verditure*, consequently the 'blue verditer' of today. However, analysis of the samples would be highly desirable.

¹ ROY 1993, HARLEY 2001.

² However, both, *blue verdit*., known as artificial azurite, and *blue bice*, natural azurite, are represented (samples I/5 and I/6 in the cabinet). The terms blue and green bice were usually applied to the natural minerals azurite and malachite respectively.

³ BRADLEY 1730, p. 73.

⁴ Personal communication; Ph.D.- dissertation of Corinna GRAMATKE, HfBK Dresden, publication pending.

⁵ BM MS Sloane 2052.

Composition

Verditer is an artificial basic copper carbonate $[\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2]$ with a globular structure, which distinguishes it from its natural occurrence as the mineral malachite.

Past research on green verditer was based on literary sources and the analysis of green-pigmented areas in paintings, where x-ray diffraction showed a pattern identical to that of malachite but a particle morphology consistent with a precipitate. Reference material other than from paintings was only available from samples of modern chemical supplies and shows definite structural differences between different forms of artificial basic copper carbonate.⁶ Detailed analysis and descriptions of the chemical structure have not been published in connection with the sample of green verditer, which was found in the early 19th Century Hafkenscheid collection, Amsterdam (here as *Bremergroen*).⁷

Hence, should Vigani's sample of *Verditure* indicate artificial origin in analysis, it would provide the basis for the scientific description of the chemical structure of an early authentic sample from around 1700, which may be used for later reference.

However, BRADLEY 1730 in his lecture on Vigani's and Addenbrooke's cabinets, referred to *Verditure* as a natural mineral. What he described as the less valuable Lapis Lazuli, containing a brass-like metal, corresponds better with the typical picture of azurite. Azurite is very often associated with malachite in nature:

L. Lazuli, or Arm-Stone, is of two Sorts; (...) The baser Sort has not pure Gold in it, but is rather a Marchasite of Copper, while the other has Gold in it. We find these in Mines where either Gold or Copper prevail; both these are valuable, though there is only one of great Use. That which I mean produces the Ultramarine Blue, as well as pure Gold. The other produces a Colour which is called Verditure, and, as if it was mixed with Lapis Calaminaris⁸ and Copper, yields a Brass-like Metal. The latter is likewise polished, and made into Tables and Toys of several Sorts.⁹

⁶ GETTENS 1993b, pp. 194-195.

⁷ PEY 1998, p. 486.

⁸ Lapis Calaminaris is zinc ore.

⁹ BRADLEY 1730, p. 73.

Provenance and Trade

The pigment is unfortunately not listed in the invoices. It is known that gold and silver refiners in London produced green and blue verditer. Since it was a by-product of the refining industry it was cheap, particularly the green verditer which was more easily obtained than the blue.¹⁰

Quality / Adulteration

Nothing is known on the adulteration of this pigment in Vigani's times. Since production costs were low, adulteration seems to be unnecessary for this reason. However, it may have been adulterated to compensate for its negative properties of weak colour and relative coarseness, which were mentioned in the treatises.

Properties

Green verditer was the faintest of all greens used in limning, said PEACHAM 1606 and after him SALMON 1701.¹¹ Perhaps the pigment became very pale once it was ground so finely **to be** of suitable size for watercolours. This may have been a reason for why it was not used widely in fine arts. Opinions about the pigment in an oil medium were no better. According to SMITH 1705 *green verditer* was of sandy nature and poor body, and was seldom used in oil painting, except for more variety in landscapes.¹² This tendency is supported by the fact that the occurrences of artificial basic copper carbonate were reported in paintings where egg glair was used as a binding medium.¹³ The colour would be more dominant in this medium.

In DE MAYERNE¹⁴ we read that green verditer faded, whereas DOSSIE¹⁵ 1758 criticised the pigment for darkening in oil.

Manufacture

In the 17th century it apparently proved to be easier to manufacture green verditer than blue verditer¹⁶. Both were by-products in the separation of silver and copper, a process

¹⁰ MACTAGGART 1980.

¹¹ PEACHAM 1606, p. 54; SALMON 170, p. 96.

¹² SMITH 1705, p. 24; he said the exact same about *Green Bice* on the same page.

¹³ GETTENS 1993b, p. 197.

¹⁴ BM MS Sloane 2052, f. 122v.

¹⁵ Dossie 1758a.

¹⁶ This difference was noted in HARLEY 2001, p. 80, footnotes 61 and 62, drawing on treatises by Boyle and Merret, and has been investigated from modern chemical point of view by MACTAGGART 1980.

described by DE MAYERNE¹⁷ and others after him, and similarly in the separation of silver from gold in the gold refining process, documented by HARRIS¹⁸ 1704 and later by CHAMBERS¹⁹ 1738. To produce the pigment, copper nitrate solution was poured onto calcium carbonate (chalk or whiting). DOSSIE 1764 likewise described the manufacture. However, according to him, the chalk was gradually added to the solution of copper rather than the solution being poured over the chalk.²⁰ Then the pigment was drained, washed, and dried.²¹

It was not understood how the process could be influenced in order to predetermine whether the resulting product would turn out as green or blue verditer or any shade of greenish blue or bluish green on the scale between. Experimental studies by MACTAGGART 1980 suggested that the outcome was, among other factors, temperature dependant.²² The production was inexpensive, but the green verditer, more easily obtained, was pale in colour and less valuable than the blue variety.

Preparation

NORGATE 1748 listed *verditer* among the pigments that needed to be washed, which incorporated cleansing of the pigment and a gradation in particle fineness, before it was good enough to be used in limning, with *gum Arabic* as binding medium.²³ According to PEACHAM 1606 and SALMON 1701 green verditer simply ought to be ground in *Gum-Arabick water* for limning.²⁴

For use in oil painting green verditer should be washed and refined through decanting, thought SMITH 1705.²⁵

Use

There is evidence for the use of both green and blue verditer in painting in England in the first half of the 16th Century.²⁶ It is thought though, that green verditer came into

¹⁷ BM MS Sloane 2052, f. 6 v, 22 v, 122 v. DE MAYERNE's notes show a great degree of insecurity about the ingredients and the actual manufacturing process.

¹⁸ HARRIS 1704, vol. II under 'Refining'.

¹⁹ CHAMBERS 1738.

²⁰ DOSSIE 1764, p. 89.

²¹ GETTENS 1993b, p. 194.

²² MACTAGGART 1980.

²³ MULLER 1997, pp. 62, 65-66; Interestingly, *verditer* does not appear later on in the treatise when describing pigment mixtures and painting technique, whereas blue verditer occurs relatively frequently (see *Blew Verdit* I/5).

²⁴ PEACHAM 1606, p. 54, SALMON 1701, p. 96.

²⁵ SMITH 1705, p. 32.

²⁶ MACTAGGART 1980.

use before its blue counterpart, because of the etymology of the word verditer as denoting a green substance.

Occurrences of basic copper carbonate, which appeared to be artificial, have been reported for some 15th Century paintings, all of which used egg glair as the binding medium.²⁷ Later examples are the use of green verditer in Laurent de la Hyre's 'Allegorical Figure of Grammar' (National Gallery, London, NG 6329) and, with a yellow lake, in Anthony van Dyck's 'Lady Elizabeth Thimelby and Dorothy, Viscountess of Andover' (National Gallery, London, NG 6437).²⁸ The pigment seems to have been used less widely than blue verditer. It was thought that green verditer, still mentioned in 17th Century painting treatises, had disappeared from the artist's palette by the 18th Century and was replaced by more easily workable and more colourful green pigments. However, PEY 1998 listed green verditer, represented in the Hafkenschied collection, as a 'standard green' in 19th Century Holland, mentioning that it could be found on the painter's palettes as early as the 17th Century.²⁹

By comparison, green verditer was seldom mentioned or recommended in painting treatises, even less so than blue verditer, which was the more difficult to manufacture. After having dealt with the preparation of verditer, the pigment does not appear later on in NORGATE'S treatise when describing pigment mixtures and painting technique, whereas blue verditer occurs relatively frequently.³⁰ Similarly, C.K. in *Art's masterpiece* listed *Verditer* among the greens used in oil painting without ever referring to it thereafter.³¹

DE MAYERNE'S notes recommend mixtures of green verditer with pink in oil painting.³² SMITH 1705 mixed a sea-green for garments with verditer, pink and lead white.³³

Among the authors of Vigani's time SALMON 1701 described green verditer generally as a good green to be laid on black parts of draperies and suitable to colour distant landscapes because of its bluish hue.³⁴

²⁷ GETTENS 1993b, p. 194.

²⁸ KIRBY 1998.

²⁹ PEY 1998, p. 486.

³⁰ MULLER 1997, compare *Blew Verdit* I/5.

³¹ K., p. 11.

³² BM MS Sloane 2052, f. 96.

³³ SMITH 1705, p. 93.

³⁴ SALMON, 1701, pp. 96, 99.

In limning, PEACHAM 1606 said, *verditure (...) is good to veluet upon black in any manner of drapery*.³⁵ Verditer does not appear in his instructions on oil painting³⁶ 1634, probably for the reasons explained above in the discussion of properties.

³⁵ PEACHAM 1606, p. 54.

³⁶ PEACHAM 1634.



Fig. 1 Gold Bronze I/22

I/22 Gold Bronze

This fine to medium size metal powder is similar in particle size to the metal powder in I/51. It is, compared to Dutch gold in I/37 and shell gold in the adjacent compartment I/23, rather of a copper colour with a distinctively red hue, than a gold or bronze colour. The particles lie tightly but have not become compressed.

Compare I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, and La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

The use of bronze powders has been thoroughly described by SCHIEBL 1998.¹

¹ SCHIEBL 1998.



Fig. 1 [...] Gold I/23

I/23 [...] Gold

This compartment contains three oval shaped halves of shells. In each half there is a small portion of golden powder mixed with a binding medium. Particularly on the surface of the mass there are grey streaks, which may be dirt deposits but could also be seen in connection with discoloration of the binding medium. To a lesser extent these streaks are also noticeable on the edges, where some of the shell gold broke off. In these areas of losses the shell is greyer, with a fine dark grey line marking the level of the gold. Again this could be dirt adhering to residues of binding medium or a discolouration of the medium due to ageing processes.

The label cannot entirely be read due to partial loss of the paper.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Shell gold was more widely used in the decorative arts than in fine arts, even more so when miniature painting lost its favour to oil paintings on canvas. A relatively late mention of shell gold and its manufacture can be found in NORGATE's manuscript 1648.¹ However, MULLER and MURRELL 1997 point to the fact that this recipe has probably not been standard practice, because of its unusual addition of mercury sublimate (mercuric chloride), when earlier treatises mention common salt (sodium chloride) or saltpetre (ammonium chloride).²

NORGATE 1648 was of the opinion that the best shell gold came from Holland, which also may have been outdated by Vigani's time.³ Further research into this subject is necessary.

¹ MULLER 1997, p. 104.

² MULLER 1997, pp. 201-202; with reference to respective manuscripts.

³ MULLER 1997, p. 80.



Fig. 1 Gaponnicum At. I/24

I/24 Gaponnicum At.

Only the paper tray is preserved and no trace of the actual sample left.

[.]*pannaish Brown* is written on the inside of the front wall of the paper liner.



Fig. 1 Deepest Orange I/25

I/25 Deepest Orange

The metal powders in Vigani's Cabinet are of three different particle sizes, further described as 'fine' (samples in I/37, I/47, I/50, I/57, I/61, and shell gold in I/23), 'medium' (up to 0.5mm in diameter, for samples in I/22, I/25, I/26, I/33, I/48, I/51, I/53, I/58, La2/15), and 'large' (samples in I/36, I/38, I/49, I/54). The larger the particles are the stronger they reflect the light. The powders, with only two exceptions, do not appear tarnished but display vibrant colours of all shades. The particles are flat flakes of irregular shape. The sample in this compartment is of a warm deep orange and medium particle size.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

Terminology

Five of the medium sized and 3 of the large sized powders are described as *Spekels*. Eight samples, with representatives in each of the three groups, have not been labelled. Therefore it is not clear, whether the term 'spekels' would also apply to powders of fine particle size. However there is a tendency for large metal particles to be referred to as *Spekels* whereas the smaller ones have more particular names like *Dutch gold* or *Gold bronze*. The colour is not indicative of this distinction, since there are golden, or brown samples in all three categories.

Trade and Quality

Painting treatises in England of the 17th and early 18th Centuries do not normally mention metal powders (apart from shell gold), neither do the works from the natural sciences. However, because spekels were used to be scattered onto varnish layers in

japanning, descriptions of the material can be found here, of which an extensive account was given by the anonymous author C.K.:

Of Silver Dust, Brass Dust, Green Gold, dirty Gold, Coppers, Powder, Tinn, &c.

The Silver Dust, the best is brought from beyond the Seas, and is known from the Counterfeit by being squeezed between your finger and Thumb, giviug [sic!] a glorious Lustre, as indeed it does in the Work.

Brass Dust, by Artists called Dust Gold, is the best made in Germany, the best is of a fine bright Colour nearest resembling Gold, try it as the Silver Dust; as for the coarse Sort, tho' it will work pretty well with Gold Size, yet it will not do so with Gum Water.

Green Gold, is a corrupt Metal so called, is very good in this Work, for casting a fading Green Colour.

Dirty Gold is a corrupt Metal, casting a dark, dull, tho' slverish [sic!] Colour, bearing pretty well a Resemblance to dirty drossy Gold.

Coppers are of three sorts, Natural, Adulterate, and Artificial; as for the Natural, being cleansed, it may be ground without any Mixture. The Adulterate is most fit for a Ground, and serves commonly to lay other Matals on, as in hetching or heightning Gold or Silver on; but the Artificial is of higher and brighter Colour than either: These are also used in this Art [Japanning], those called Speckles of Copper, Gold, and Silver, and divers other Colours differing in fineness, which may be worked as the Artist fancies, wither on the Out-sides if Boxes or Drawers, or on Mouldings, and may be purchased ready done.¹

This passage confirms that 'speckles' was a common name for such coloured metal powders. The differing grade of fineness is confirmed. It also shows that there were distinctive names for other types of metal powders, as *Silver Dust*, *Brass Dust*, *Green Gold*, *dirty Gold*, *Coppers*, *Powder*, *Tinn*, and *Silver Dust*, all of these golden or silvercoloured in appearance. The three sorts of coppers seem to be copper leaves, which could either be laid on as an underground or could be ground to powder to be strewn on.

It would be very interesting to analyse the metal powders in the cabinet to learn what metals they were made of, how they were coloured, and why these colours were preserved so well without apparent tarnishing.

¹ K., p. 27.

Use

C.K.'s account continues with the description of the application techniques of such speckles:

Of Speckles, for the Adorning Japan'd Wood.

Mix so many Speckles as you have occasion for, with ordinary Lac-Gum-Varnish, so much as when they are put into a Gally-pot, will fit them for working with a convenient Pencil, but not so thick as Colours, keep them stirring very well with a Brush, and generally warm by the Fire: This continue till you perceive the Speckles lie thick and even to your Mind, so beautify them with three or four Washes of Varnish, mixed with Turpentine, and this, unless you intend to Polish, will be sufficient, but then you must give it after all this, eight or ten Washes with the prime Lac Varnish, drying between whiles, and then Polish; and on this manner you may lay on all colour'd Speckles; but Silver requires Seed Lac Varnish, and the best white Varnish, e'er it can be brought to a good Polish, but if not to be Polished, you may spare your Varnish.

To lay on Speckles in Japan Work, &c.

If you design to adorn your Work with Flowers, Rocks, or Garment, &c Varnish the Places intended with a fine Pencil, and through any small Sieve shake the Colours you design, whilst the Varnish is wet, and sweep up in Rock-work all Speckles that straggle on the Edges, with a new dry Pencil lodge them on the sides of top of the Rock, which sticking, will render the Work more beautiful, and give it a Shadow or Reflection.

This must be done with all diligence, and no intermission had till finished, till once covered, and being once dry, operate again, and so one upon another successively, to shape it to your Mind; and in sweeping the Speckles, intermix not one portion of scattered parts with the other, that are of a different Colour, but every parcel in the proper station to beautify the better: At first when laid, it will look dull and heavy, but the securing Varnish in a little time will add to it a pleasant beautiful Colour; and so you may do Flowers, Trees, Garments, and many pleasant things to adorn your Work.²

Similar instructions can be found in SALMON'S work³, 1701, however they were probably copied from a work like this.

² K., pp. 36-37.

³ SALMON 1701.

Further information may be obtained from SCHIEßL's study 1998 of metal powders used in the polychromies of Baroque sculptures.⁴

⁴ SCHIEßL 1998.



Fig. 1 Deep Orange Sp. I/26

I/26 Deep Orange Sp.

This metal powder is of a warm orange and medium particle size.

Compare I/22, I/25, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Red Orpiment I/27

I/27 Red Orpiment

The pigment is of a distinctively warm yellow orange colour. It appears free from visible impurities. Some pigment particles are naturally compacted to oval shaped spheres of up to 6mm in diameter.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

The terminology of red orpiment, an arsenic sulphide [AsS] of natural or synthetic origin, is covered in *Orpiment* I/31.

It is very difficult to give reliable information on its preparation and use as a painting material since it is hardly ever mentioned in painting treatises. Analyses from samples taken from paintings suggested that it was used, possibly more so in Venetian and Dutch paintings than in other regions.¹

Vigani's cabinet not only holds a sample of red orpiment but also some *Arsenicum Rubrum* (Lat. red arsenic) E/6, which is closely related to the former.

Similarly² to *Orpiment* I/31 and *Arsenicum citrinum* E/18, chemical analysis and comparison of the two may help to establish whether artificial arsenic sulphide was known and used in England around 1700.

The *Arsenicum Rub*, or *Red Arsenick*, a name under which it is also listed in the invoices, cost Vigani 2 pence per ounce from Porter in London and under 1 penny per ounce from the druggist Colchester in London, both in 1704 (1703 in the old calendar).³

As in the case of *Orpiment*, these prices more likely refer to the sample *Arsenicum Rubrum* E/6 than to the pigment *Red Orpiment* I/31. The pigment may have been more expensive due to the difficult grinding process⁴ and perhaps refining of some sort.

¹ RÖTTER 2003, p. 410.

² See *Orpiment* I/31, Terminology.

³ MS Quns Vig. 2, MS Quns Vig. 4, MS Quns Vig. 7.

⁴ See *Orpiment* I/27, Properties.



Fig. 1 Masticote deep I/28

I/28 Masticote deep

The pigment is of a milky warm orange colour. The few dark orange particles on the surface appear to be material spilled from the adjacent compartment I/27 containing red orpiment. Some of the pigment is compressed to small balls or oval shaped lumps. Since disturbance of the sample was ruled out it could not be established whether the streaks of black material were later impurities or formed part of the original pigment portion.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Massicot may have covered various lead containing yellow substances, as HARLEY 2001 suggested¹, and was not necessarily the lead oxide [PbO] understood by this name today. Hence analysis of these samples would be very helpful in supporting this theory.

Lead-based yellows have generally proved difficult to research because of a confusing terminology and only few samples available. An in-depth study project of these pigments would be welcome.

Properties

SALMON 1701 regarded massicot as a very stable pigment by saying that it *endures to lie upon all colours and metals* in limning.²

Manufacture

GEFFROY 1736 explained the very common way to produce massicot was as a calcination of lead, which in a similar way produced red lead and litharge:

¹ HARLEY 2001, pp. 95, 96.

² SALMON 1701, p. 96.

*The Lead is melted over a Charcoal Fire, in a clean unglazed Earthen Platter; and the Fire continued till the melted Metal turns to a blackish or ash-coloured Powder, which is then called the Calx, or Ashes of Lead. By continuing the Fire a little longer, this Powder becomes yellow, called by the French Painters Massicot;*³

Preparation

For limning it should be ground with a little saffron in gum-water, recommended SALMON 1701, probably with the intention of intensifying the hue of the colour.⁴

Masticot was included in NORGATE 1648 amongst the pigments that needed to be washed before use in limning⁵

Use

Massicot was useful for a light ground, to be shadowed with umber or red lead water in limning wrote SALMON 1701 and added that it also served good purpose in the yellow parts when painting a fire in oil.⁶

SMITH 1705 did not distinguish between different sorts of massicot, but from his description he must have used a light shade: *good light yellow for most uses, particularly for mixing greens, grinds fine, has a good body.*⁷

A treatise on japanning differentiated between different hues of massicot: *Yellow Masticot* made up with size from vellum makes a *bright Yellow Ground* in Japanning works, but with *Pale Masticot* it inclined towards a *good Buff Colour*. Before the painted design could be laid on, this ground had to be polished and varnished with *Seed-Lacc Varnish*. The size could be replaced with *White Varnish*, which contained nearly all lighter gums and resins available, dissolved in *Venice-Turpentine* and *Spirit of Wine*. This combination was said to improve durability and was easier to polish.⁸

³ GEOFFROY 1736, pp. 243-244; compare with the similar process as one way of manufacture of litharge, described by the same author, see *Lithargyrus argenteus* U/8, Manufacture.

⁴ SALMON 1701, p. 96.

⁵ MULLER 1997, p. 62.

⁶ SALMON 1701, pp. 100, 170.

⁷ SMITH 1705, p. 23.

⁸ ARTLOVE 1730, pp.10, 11.



Fig. 1 Dutch Pink I/29



Fig. 2 The top right piece of Dutch Pink I/29, turned upside down, is darker yellow on this protected side.

I/29 Dutch Pink

The three lumps of Dutch pink are of a light cold yellow colour. The intensity of the colour varies throughout the piece, from saturated yellow to increased paleness. In this case the pigment faded even under the good storage conditions inside the cabinet. The exposed sides facing upwards are almost white. The sides towards the bottom of the compartment, which are more protected from light, kept their yellow colour.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

On some occasions SALMON 1701 made a distinction between *Pink* and *Florence Pink*, for examples in mixtures for shadowing hair *Pink* is tempered with *the best Rust* and *Gall-stone*, whereas *Florence Pink* with *Lake* and *burnt Ivory*.¹

Concerning the discussion when pink started to be used for a red instead of a yellow colour² it is interesting to see that in 1756 BARDWELL listed the technique for painting a *pink-colour* drapery immediately after the red and followed by the yellow drapery.³ While the yellow drapery was kept entirely within the palette of yellow shades, the pink drapery consisted of a ground of yellow and white for the lights and *Indian Red*, *Lake* and white for the shades. Mixtures of vermilion with white were used as reflecting high-lights and everything glazed over with lake. The pigment 'pink' was neither used for this

¹ SALMON 1701, p. 111.

² HARLEY 2001, p. 107.

³ BARDWELL 1756, p. 30.

garment, which must have shown a colour range between yellow, light purple, and red, nor is it mentioned anywhere else in the treatise. Only *brown pink* was listed.

Composition

Pink-Yellow was a tincture of some vegetable matter, reduced to *mucilage* and dried, is as much as we can learn from SMITH 1705.⁴ Details on the nature of pink are rare in the literature. Sometimes unripe buckthorn berries but also other raw materials were mentioned.⁵

Trade

Dutch Pink does not appear in the invoices relating to Vigani's cabinet.

Quality / Adulteration

Since the majority of pink recipes listed buckthorne berries as colorant, DOSSIE's advice regarding the substitution of these berries may bear some importance:

The buckthorn berries being one of the most common cathartic medicines, and consequently used in a considerable quantity, it is very frequent for those, who collect them, to put off in their place, ad intermix with them, the berries of other trees and plants; particularly those of the frangula, or black alder, which greatly resemble them in their appearance.

As this ought to be carefully guarded against, on account of the error it may occasion in the strength of the syrup of buckthorn, which is a medicine frequently much depended upon, it is proper to examine well such parcels of berries, as are not had from the hands of those who can be well confided in: and the true buckthorn berries may be distinguished, by their three cornered seeds, with a purplish juice intermixed with green.

*The juice of the buckthorn berries, which is sometimes bought of those who gather them, and express it to save the carriage of the berries, where they are to be disposed of at a distance, is very liable, also, to be adulterated by the admixture of water, or any other fluid which may resemble it. Against this there is no means of security, but the avoiding being concerned with the juice already extracted from the berries; and using them alone, as they may, generally, be as easily procured, as the juice, with a small difference in the proportion of the price.*⁶

⁴ SMITH 1705, p. 22.

⁵ HARLEY 2001, p. 107.

⁶ DOSSIE 1758b, pp. 366-367.

Properties

Pink-Yellow is a good light yellow inclining to green, grinds easily and has a good body.⁷ Dutch pink was, at least from the second half of the 17th Century considered to be of better quality than English pink, which was paler and coarser.⁸

Manufacture

A very detailed recipe for the manufacture of pink is the one that NORGATE 1648 annexed to his treatise. This recipe was devised by the limner Nathaniel Bacon for want of good quality pink, which apparently had been difficult to obtain in the shops.⁹

To make Sir Nathaniel Bacons Pinke

About midsommer take as much greene weed called in Latin Genestella tinctoria (widow weed), as wilbe well boyled and covered in a pale of water, but let the water seeth well and be scumed before you put it in. You will know that it is well sodde, when the leaves and barke will strippe from the stalke drawne through your fingers, then take it from the fire, and powre it into a woodden bowle or pale through a cloth, till all the water be strained through, then cast the weed away.

Take this water and set it on the fire againe, and when it begins to seeth, put into it the quantity of halfe an egshell of ground chalke, or else the powder of egshel finely ground, mingle this chalke with a little of the water of your kettle in a dish after the manner of thickning the pot, then put into it a handful of powdered Alome and take it from the fire when it begins to seeth, then put to it a little jelleyd size, broken small with your hand and as it were strewed all over the superficies of your colour and soe let it stand. This size is put in to make the water seperate from the Colour, then take off the scume and put it into a Jarre glasse, and set it where noe sun comes and it wilbe an excellent yellow.

But the maine colour is that which sinks to the bottome, from which you must (after it hath stood shelving an howre or twoe) draw away the water by philter. Then powre out the rest into a thicke Linnen bagge, setting a dish underneath because the first drayning will carry colour with it, which you may after put into the bagge againe and soe let it hang twenty four howres, or twice soe long if need bee. Then take it out of the bagge and slice it, and lay the slices upon Cap paper in a

⁷ SMITH 1705, p. 22.

⁸ HARLEY 2001, p. 112.

⁹ MULLER 1997, p. 63.

*dish, and dry it in an Oven after the bread is drawne, and keepe it for your use, at Midsomer the herbe is in Flore.*¹⁰

Since the dye was mordanted on chalk it cannot count as a true lake pigment. The implications of this procedure are discussed in HARLEY 2001.¹¹

Without allusion to the pigment pink SALMON 1701 stated that green buckthorn berries steeped in *Alom-water* produced a good yellow.¹²

Preparation

For use in limning it should be ground in gum-water. SALMON 1701 cautioned the painter not to grind it too swiftly, since the resulting heat would cause the colour to lose some of its lustre.¹³

Use

Pink was much more important in limning than in oil painting and is mentioned in all the relevant treatises from the 16th to the early 17th Centuries.¹⁴

Pink was chiefly used to mix with other colours, particularly to make greens, but also occurs in mixtures with saffron or ceruse.¹⁵ Other mixtures were with *Cologne Earth* and *Lake* for shadows in dark complexions, or with *lake* and *Ivory* for the same purpose.¹⁶

Yellow Pink was recommended for painting sundials and thus considered a weather-proof, durable pigment.¹⁷

NORGATE 1648 reported that the limner Peter Oliver used Bacon's pink with *Indian Lake* and *made such expressions of those deepe and glowing shadowes in those Histories hee Copied after Titian, that noe oyle painting could appeare more warme and fleshy then those of his hand.*¹⁸

¹⁰ MULLER 1997, p. 99; origin and reception of this recipe in footnote 241.

¹¹ HARLEY 2001, p. 111.

¹² SALMON 1701, p. 103.

¹³ SALMON 1701, p. 96.

¹⁴ Its applications were already detailed by HARLEY 2001, pp. 107-112.

¹⁵ MULLER 1997, p. 63, 88; SALMON 1701, pp. 96, 183.

¹⁶ MULLER 1997, p. 91.

¹⁷ SALMON 1701, p. 180.

¹⁸ MULLER 1997, p. 64.

English Pink together with *White Lead* and *Lamp-black* made up with size from vellum produced an *Olive-Ground* in Japanning works, the amateur was told in ARTLOVE's treatise 1730: if it was too green, *raw-umber* should be ground with it. Before a painted design could be laid on, this ground had to be polished and varnished with *Seed-Lacc Varnish*.¹⁹

¹⁹ ARTLOVE 1730, p.10; the same recipe appears omitting the correction with umber in K., p. 34.



Fig. 1 Yellow Masticot I/30

I/30 Yellow Masticot

This sample is a light yellow pigment, very similar in hue to the sample of orpiment in I/31, yet slightly warmer and less intense. It is finely ground with some granules accumulating on the surface. The particles seem to be inconsistent in colour with darker and lighter variations. Black and red impurities are traceable.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Masticote deep* I/28.

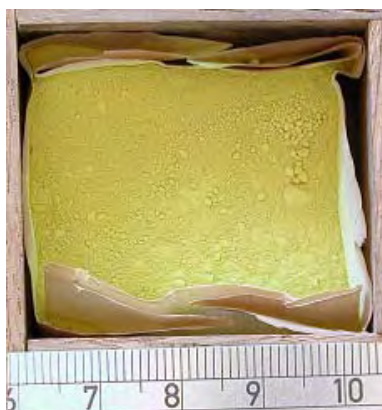


Fig. 1 Orpiment I/31

I/31 Orpiment

The pigment is of a light yellow colour, inclining slightly towards green if compared to *Yellow Masticot* and *Pale Masticote* in the adjacent compartments I/30 and I/32. The pigment appears to be finely ground at the bottom, with clusters and tightly packed pigment conglomerates on the surface layers. Occasional black granules can be observed.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The terminology of the substances, which are today known by orpiment and realgar has never been entirely clear. Classifications were attempted by HARLEY 2001¹, in FITZHUGH 1997² and more recently for German by RÖTTER 2003³. Yet authors around 1700 did not have a clear definition and made up their own definitions to the best of their knowledge. A few passages may exemplify this:

GEOFFROY 1736 said that the name *orpiment* derived from its use by painters as a pigment to imitate gold colour.⁴

One classification of arsenical substances around and shortly after 1700 is given in GEOFFREY 1736:

The Moderns, taking Arsenick in a more limited Sense, understand by it only Auripigmentum, or Orpiment. The White and Red Arsenick they sometimes name Realgar, and the latter they likewise call Sandaracha^{5, 6}

¹ HARLEY 2001.

² FITZHUGH 1997.

³ RÖTTER 2003.

⁴ GEOFFROY 1736, p. 162.

⁵ This was, as GEOFFROY explained earlier on, due to the fact, that the Greeks used a red arsenical, poisonous substance, which Dioscurides described as resembling sandarac in the outer appearance, but which was redder than sandarac, more like the colour of cinnabar. The Arab, confusing the arsenic of Dioscurides with his sandarac, termed the red one of their two

He distinguished further between orpiment and yellow arsenic, the latter being gained through sublimation of sulphur with the whitish soot, which is produced in the calcination of cobalt ore.⁷

SALMON 1701 used the terms *Orpiment*, *Arsenicum* or *Auripigmentum* synonymously in his painting treatise⁸, and SMITH 1705 added that orpiment was also called *Yellow Arsenick*⁹. Hence the former differentiation between the natural and the artificial pigment was not universal.

As already HARLEY 2001 noted, artificial orpiment is not mentioned in English sources prior to the 18th Century. She believed that both the natural and the artificial arsenic sulphide were called orpiment.¹⁰

In this respect it is very interesting to see that Vigani included samples of *Orpiment* and *Red Orpiment* in the “colour drawer” I, whereas he grouped samples of *arsenicum album*, *arsenicum citrinum*, and *arsenicum rubrum* with vitriols, sulphurs, artificial and natural cinnabars, and lead based products in drawer E, which reflects a material difference of some sort in the two types.

We do not know whether Vigani distinguished between them as two different materials or whether he was aware of their chemical relation. If so, did he want to distinguish between the more chemical sounding, perhaps artificial arsenical products and the perhaps natural¹¹ pigments in drawer I?

The invoices list the three types of arsenicum¹², but neither orpiment nor red orpiment.

At this point analysis could support the discussion and may show that artificial orpiment was known, used, and terminologically distinguished from the natural mineral.

kinds of arsenic Realgar, which was the gum of the juniper shrub. GEOFFROY 1736, pp. 159, 160.

⁶ GEOFFROY 1736, p. 160.

⁷ GEOFFROY 1736, p. 167.

⁸ All three terms from SALMON 1701, p. 96.

⁹ SMITH 1705, p. 23.

¹⁰ HARLEY 2001, p. 94.

¹¹ RÖTTER demonstrated by experiment that prepared natural orpiment (melting process or sublimation) contained crystalline orpiment particles, crystalline arsenic trioxide [As₂O₃], as well as melted yellow transparent globules. RÖTTER 2003, p. 411-412; see also Preparation.

¹² MS Quns Vig. 2 , MS Quns Vig. 4, MS Quns Vig. 7.

In the 18th Century King's yellow was introduced as a term in English sources for artificial orpiment. It was supposed that the term derived from alchemy, where orpiment and realgar were called 'the two kings'. Should Vigani's samples of *arsenicum citrinum* and *arsenicum rubrum* prove to be artificial, it would be another indication that Vigani did not take over alchemical terms but chose the more scientific name.

Composition

Orpiment is a yellow sulphide of arsenic [As₂S₃]. This, however, was not always understood:

From the chemical reactions commonly observed with this *arsenical Juice* GEOFFROY 1736 concluded that it

*must consist of the same Parts as common Sulphur, with some Minerals Particles mixed with them; or, it is composed of an acid Salt intangled in Particles of Mercury, and of a bituminous¹³ Substance. Its corrosive Quality arises from the acid Spicula stuck into the Particles of Mercury; but it has that Quality in less Degree than Corrosive Sublimate, because of its bituminous Part. It is less inflammable than Sulphur, because the Energy of the acid Salts contained in it is weakened by the Mineral Parts; and from its Corrosive Quality it is deservedly reckoned among the Poisons.*¹⁴

The natural mineral often occurs with the mineral realgar [AsS].¹⁵ Synthetic orpiment was produced since early times and played an important role in alchemy.

Provenance and Trade

Natural orpiment occurred in several places in Europe as well as in Asia. Information on provenance as well as the trading places for the material is very scarce in the treatises. Also, it was not specified whether the synthetic pigment was produced in England or whether it was imported. More recent studies on the pigment do not refer to this either.

Vigani bought yellow arsenic (*Arsenicum citrinum*, lat. lemon coloured arsenic) at under 1 pence per ounce from the druggist Colchester in London.¹⁶ This price probably refers

¹³ *By Bituminous Juices we mean such Mineral Substances as are inflammable, soluble in Oil, and which may be mixed therewith. These may be divided into Bitumens properly so called, whether Liquid or Solid, into Sulphurs and Arsenic.* GEOFFROY 1736, p. 133.

¹⁴ GEOFFROY 1736, p. 161.

¹⁵ See *Red Orpiment* I/27.

rather to the sample *Arsenicum citrinum* E/18 than to the pigment *Orpiment* I/31. The pigment may have been more expensive due to the difficult grinding process and perhaps refining of some sort.

Adulteration

References to deliberate adulteration of the pigment could not be found. The natural mineral could include impurities, which influenced its colour and may have made it coarser, so that the mineral had to be refined before use as a pigment.

Properties

GEOFFREY 1736 informed that it was an

*arsenical Juice, in squammous or foliaceous Glebes and is to be had in three colours: a golden colour, a deeper red (like cinnabar with yellow) and greenish, the latter being mixed with a large proportion of earth and therefore the least valuable.*¹⁷

Orpiment was also described as of an acrid taste, soluble in oil, inflammable by fire, and very poisonous, a circumstance, which was often warned of in the sources¹⁸.

For example SMITH 1705 explained that this mineral of stony substance was very troublesome to grind and poisonous: *therefore take care that the fumes of it don't offend the brain in the time of grinding.*¹⁹

The problem in the grinding of natural orpiment lies in its structure of small, layered foils, which, once separated, are difficult to break into smaller particles. This is why some orpiment was too coarse and gritty to be used in watercolours unless it was purified and prepared.²⁰ NORGATE banned *Orpiment* and other pigments from his list of recommended pigments for limning

as not worthy the naming, nor by reason of their course and grosse Body, their dangerous qualitie (some being minerals) nor their Cheapness and Community to

¹⁶ MS Quns Vig. 4.

¹⁷ GEOFFROY 1736, p. 160.

¹⁸ For example SALMON 1701, p. 96, SMITH 1705, p. 23, and KRIEG 1704. KRIEG described how arsenic fumes affected the health of workmen, cattle, and vegetables who fed and lived around places that entertained cobalt ore refining and manufacture of smalt, like in Schneeberg in Saxony.

¹⁹ SMITH 1705, p. 23; DE MAYERNE also stated that both orpiments never ground nicely in oil. DE MAYERNE BM MS Sloane 2052, f. 152, cited after BISCHOFF 2002, p. 30.

²⁰ SALMON 1701, pp. 93, 96.

*be used at all in this cleanly, neat, and exquisite Art, being indeed fitter for those that wash prints or colour Mapps then to be admitted into our Company.*²¹

It was observed that orpiment was not compatible with certain pigments and turned dark in paint mixtures. For example, according to SALMON 1701 all greens, white lead, red lead, and ceruse stained orpiment. He advised to only use it by itself and not in mixtures²², as already van Dyck had recommended in his communication with DE MAYERNE²³.

The binding medium was also thought to have an influence on the pigment's stability in paintings. BARDWELL 1756 for instance warned:

*Remember [...] that the King's Yellow should be ground with good drying Oil; for the longer it is drying, the more it will change and grow darker: And the sooner it is used, the better it will stand [...].*²⁴

Manufacture

One of the first definite references of the artificial process for the manufacture of orpiment/King's yellow in England can be found in DOSSIE's *Handmaid* 1758, where DOSSIE described the specific set-up of the sublimation vessels in this procedure.²⁵

Preparation

For use in limning it is to be ground with stiff gum-lake water.²⁶ For oil painting drying oils were preferred. Interestingly, lead or copper containing driers, that were often used to improve the drying properties of the oil, seemed not to cause darkening as was observed in mixtures with some pigments that contained lead or copper. DE MAYERNE recommended to grind both orpiment and red orpiment in water and to let them dry, which would make them mix easily with oil.²⁷ Small portions could be ground directly on the palette, larger amounts on a stone. In the first half of the 17th Century and in earlier sources glass can be found as a recommended drier in combination of orpiment with oil, which also improved grinding. Also nut oil, thickened in the sun with lead white, was suggested to be an efficient drying oil particularly with orpiment.²⁸

²¹ MULLER 1997, p. 59.

²² SALMON 1701, p. 96.

²³ BM MS Sloane 2052, f. 152, cited after BISCHOFF 2002, p. 30.

²⁴ BARDWELL 1756, p. 31.

²⁵ DOSSIE 1758a, p. 31.

²⁶ Salmon 1701, p. 96.

²⁷ MS BM Sloane 2052, f. 152, cited after BISCHOFF 2002, pp. 29-30.

²⁸ MS BM Sloane 2052, f. 19 v, cited after BISCHOFF 2002, p. 161.

To achieve a *marigold* colour SALMON 1701 recommended burning orpiment.²⁹ The burning process has mainly been described in Italian and Spanish sources of the 17th and early 18th Centuries.³⁰ PEACHAM 1606 referred to a certain Prince Caius who burned orpiment to achieve a colour similar to gold, yet in *so small a quantity, that it would not quite the cost in refining*.³¹ DE MAYERNE (17th Century), without describing the process, reported that burnt orpiments made for a beautiful yellow-orange colour, but that they dried badly in oil.³²

A preparation of orpiment by SALMON 1701 misleadingly called *Aurum Musicum*³³ was probably applied in decorative arts. The same quantities of orpiment and crystal were beaten into fine powder and then finely ground together with egg white.³⁴

Use

Orpiment was used in limning and recommended with certain restrictions: PEACHAM 1606 for example said that *it should best be used by itself because of the staining with all greenes, white lead, Red lead, and Ceruse*. Therefore it was necessary to deepen the other colours so that orpiment could be the highest, *in which manner it may agree with all colours*.³⁵ NORGATE deprecated its use in limning, because of its coarseness, saying that it was only good enough for washing prints.³⁶ Red orpiment was neither mentioned in NORGATE's manuscript³⁷ nor in the earlier treatise by PEACHAM 1606 on limning.

In oil painting the different shades in which the pigment apparently was to be had were used to produce various hues of yellow in a drapery. This was particularly important since mixtures with lead white in the highlights should be avoided because of the incompatibility with the lead.

²⁹ SALMON 1701, p. 106.

³⁰ RÖTTER carried out experiments with three different burning methods and determined the components of the resulting products via X-ray diffraction analysis XRD. RÖTTER 2003; Her studies show that the product differs depending on the time span and the degree of heat that the orpiment was exposed to. It seems to be a lot more complex than Salmon's simple and short statement would suggest.

³¹ PEACHAM 1606, p. 59.

³² BM MS Sloane 2052, f. 92 v, cited after BISCHOFF 2002, p. 29.

³³ In the same chapter SALMON gave instructions to make *Aurum Musicum* using *English Tin*, *Spanish Quicksilver*, *flowers of Sal Armoniack* and *flowers of Sulphur*. The final product was to be ground in egg white. SALMON 1701, p. 108; A similar recipe existed for *Argentum Musicum* and the reader was referred to further recipes in the second edition of SALMON's translation of the *Pharmacopoeia Bateana*. SALMON 1701, pp. 107, 109.

³⁴ SALMON 1701, p. 108.

³⁵ PEACHAM 1606, p. 59.

³⁶ MULLER 1997, p. 59.

³⁷ MULLER 1997.

Ground with clean drying oil *King's Yellow* was recommended in BARDWELL 1756 to paint the lights on a yellow satin drapery: *It is proper to have two Sorts of King's Yellow: I mean one to be very light, which will do best for the High Lights of Velvet.*³⁸

In imitation of gold coloured dresses in oil painting a layer of orpiment could be laid on yellow ochre, according to DE MAYERNE³⁹ preferably *English ochre*, which was darker and had more body. Orpiment was particularly appreciated by itself in accentuating highlights.

Interestingly orpiment appears happily and quite frequently in more “curious” recipes of craftsmanship and decorative arts.

SALMON 1701, for example, gave several variations to make *Mineral Yellow*, what he called it:

*Auri pigmentum 10 ounces, Leaf Silver 1 ounce. Mix, and grind them upon a Porphyry to an impalpable Pouder, with water: which dry, and keep for use. If leaf gold half an ounce. or 2 dram. be ground with it, it will yet make two other differing sorts of Yellows: So also if pure red Crocus Martis be added, in place of the Gold. But as to the proportions of these things, Reason and Experience must teach you.*⁴⁰

It seems that the metals were used to brighten up the colour and add lustre. In the case of silver the pigment would have had to be used quite soon to prevent corrosion. Red crocus martis would have added some vibrancy to the colour. To the author's knowledge, pigments like these have not been confirmed to occur in works of art of the period. SCHIEßL 1998 described mixtures of brass powder ('Messingfeilicht') with orpiment and red ochre. The technique of mixing metal powders with pigments was used in the decoration of sculptures, which can be traced back to the 17th Century in German sources, particularly those related to Nuremberg.⁴¹

To achieve a special viper-coloured glass in glassmaking, SALMON 1701 gave the following advice: *Orpiment* together with *Sal Armoniack* could produce a green *viperine* colour in glass via a special method of manufacture. The workman was cautioned not

³⁸ BARDWELL 1756, p. 31.

³⁹ BM MS Sloane 2052, f. 152, cited after BISCHOFF 2002, p. 30.

⁴⁰ SALMON 1701, p. 840.

⁴¹ SCHIEßL 1998, pp. 151-152.

to inhale the poisonous vapours, but to leave the laboratory during the melting process.⁴²

Orpiment came also in handy if one wanted to decipher a secret letter in invisible ink, as GEOFFREY 1736 disclosed:

*Of the Lixivium of Orpiment and Quick Lime is made a Sympathetick Ink, by the Effluvia of which alone, Letters written with Vinegar of Lead become visible.*⁴³

Physicians⁴⁴ were not afraid to recommend some surprisingly large dosages taken orally and through inhalation of the fumes in tuberculosis accompanied with expectoration, and in asthmas. They were prescribed even though the high toxicity of arsenical substances was well known and medicinal recipes were accompanied by warnings.

Last but not least, barbers used yellow arsenic in a mixture with quicklime as a depilatory.

⁴² SALMON 1701, pp. 745-746; a very similar recipe, if not derived from the same source, is included in K., p. 85-86.

⁴³ GEOFFROY 1736, p. 162.

⁴⁴ GEOFFROY 1736, pp. 161-162.



Fig. 1 Pale Masticote I/32

I/32 Pale Masticote

This sample is of a pale light yellow colour. The pigment appears homogenous in size and colour. Some particles have compressed to oval clumps between less than 1 and up to 2mm in diameter.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Masticote deep I/28*.



Fig. 1 Light Orange Sp. I/33

I/33 Light Orange Sp.

This metal powder is of a warm yellowish orange and medium particle size.

Compare I/22, I/25, I/26, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Gold fr. I/34

I/34 Gold fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 French Oker I/35

I/35 French Oker

The four lumps of yellow earth of irregular shape vary only slightly in intensity of colour and appear to be a more or less homogenous mass. The surface appears to be partly covered with dirt. The greyish streaks noticeable on the surface may protrude into the interior of the mass and thus can be considered a natural impurity.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Another sample of Roman ochre, which may be identical with this one, is preserved in a wooden box labelled *French Oaker* in drawer La2/15.

Terminology

Apart from different spellings of the word ochre, the name often occurs with attributes that inform of the colour and shade of the earth, its provenance, or its quality. A geographical name could stand for a certain quality associated with the earth from that region. The geographical name could also stand for a type of ochre (of different provenance) that shows similar qualities typical to those gained in that region.

Composition

Ochres are natural earth pigments with various ferric oxides as colouring component.

Provenance

The provenance of ochres may be drawn from their name, as in the case of Roman ochre. This may as well be misleading though, see above, and denote a type of ochre like the one that can be found near Rome.

Some manuals name places where high quality ochres occurred naturally, so for example SMITH 1705 on *Yellow Oaker*:

*It's found among stiff clays, most of it form Shotover Hills near Oxford, "from whence most of the Yellow-Oaker, that is sold in England, is dug out."*¹

Famous French ochre mines up to the present day are in Roussillon/Provence, where both, yellow and red ochres occur.

Trade

Neither French ochre nor an equivalent is listed in the invoices relating to Vigani's cabinet.

Properties

English ochre, according to SALMON 1701, was of a wheat straw colour whereas *Foreign Yellow Oker* was somewhat deeper.² Yellow ochre lay even in the shell and was of great use if well ground.³

The painting properties of ochres very much depend on their quality and purity. Hence the descriptions in manuals really relied on the experience the author had with that particular ochre he used.

Preparation

SMITH 1705 informed that *Yellow Oaker is not easily ground, but when fine of a good body and weather-resistant*.⁴ It should be washed and decanted to gain the fine particles if it was intended for use in a gold size⁵ and was then prepared with *fat drying oyl* only. If for a silver size, some added a little verdigrease *to make it bind*.⁶

Use

Ochres were very frequently used in all types of painting, as long as they could be ground finely enough and did not contain too many impurities.

Just to mention two examples, yellow ochre, preferably *English ochre*, so DE MAYERNE, was the underground layer in oil painting, when a golden coloured dress should be imitated with orpiment.⁷ Ochres were also frequently used in sizes for gilding and the application of other metal leaf.

¹ SMITH 1705, p. 22.

² SALMON 1701, p. 183.

³ SALMON 1701, p. 97.

⁴ SMITH 1705, p. 22.

⁵ SMITH 1705, p. 32.

⁶ SMITH 1705, p. 41.

⁷ BM MS Sloane 2052, f. 152, cited after BISCHOFF 2002, p. 30.



Fig. 1 Gold Colour'd Sp I/36

I/36 Gold Colour'd Sp

This metal powder is of a golden brown colour. The flakes appear larger and very similar in size to those in I/38.

Compare I/22, I/25, I/26, I/33, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Dutch Gold I/37

I/37 Dutch Gold

This metal powder is of a warm brown bronze colour. Some flakes are compressed and form irregular lumps. The powder is finer than the particles of the metal powders described as 'Spekels' (for instance samples in I/25 and I/26). Their size is comparable to the fine metal powders in I/47, I/50, I/57, and I/61.

Compare I/22, I/25, I/26, I/33, I/36, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707



Fig. 1 Silver Cololur'd Sp

I/38 Silver Colour'd Sp

This metal powder is of a cold silver grey. The flakes appear larger and very similar in size to those in I/36.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 White fr. I/39

I/39 White fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 Cerusse I/40

I/40 Cerusse

The *Cerussa* appears in small oval pebbles of up to 8 mm in diameter, which are soft, cold white, and greyish on the outside. This discolouration can either be dirt or be caused by chemical changes due to contact with the atmosphere. The size of the individual lumps is a lot smaller than in sample *Cerussa* E/24.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For more information refer to *Cerussa* E/24.



Fig. 1 Ivory Black I/41

I/41 Ivory Black

The large lumps of irregular shape and rounded edges are of uniform warm black colour and are up to 2.5 cm in diameter. Some flakes of metal powder from the compartment above I/49 are noticeable on the surface of the lumps. Small fractured lumps have accumulated at the bottom of the compartment. The pieces of this sample, however, are generally a lot bigger than those of ivory black in La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Ivory black was the customary name in treatises concerned with painting. In texts relating to pharmacy or medicine, ivory is classified according to the burning process. GEOFFROY 1736 explained the analogy to the use of hartshorn in this respect:

*The Qualities and Ways of using Ivory, are the same with those of Harts Horn. Ivory is likewise calcined as a good Antidysenterick. This goes by the Name of Spodium Eboris, and Ebur Ustum.*¹

Composition

SMITH 1705 informed that ivory black was made from *charred raspings from combmakers or other waste fragments of ivory*.²

Trade

Unfortunately ivory black does not occur in the invoices relating to Vigani's cabinet. A very good picture of what the customer could expect to receive in the shops regarding ivory black is recorded in SMITH 1705:

¹ GEOFFROY 1736, p. 375.

² SMITH 1705, p. 18.

(...) you have it at the shops well prepared, and levegated or ground very fine with water on a marble-stone, and then dried in small lumps; thus prepared, 'tis the more easily ground in oyl.³

He added that ivory black was *something dear*, and therefore not used in common work.

Properties

Ivory black was greatly appreciated for its fineness and good mixing properties as for example, SMITH 1705 praised the *very delicate black when ground very fine*.⁴ BARDWELL 1756 remained equally positive when saying that *Ivory-Black is the best Black we have; It is a Colour which sympathizes and mixes kindly with all the other. It is a true Shade for Blue. [...] Black is a cold retiring Colour*.⁵

Manufacture

Again it is Smith 1705 who gave an account on the charring process of bone material:

Ivory must be burnt also to make a black as thus: fill two crucibles with ivory-shavings, then clap their two mouths together, and bind them fast with an iron wire, and lute the joints close with clay, salt, and horse dung, well beaten together, then set it in a fire, covering it all over with coals, and let it remain therein, till you are sure the matter inclosed in the crucibles be thoroughly red hot, then take it from the fire, but open not the crucible till they are perfectly cold, for if you should open them while hot, the matter would turn to ashes; the same will be done if the joints are not luted close, for 'tis only the exclusion of all air that prevent any matter whatever that's burnt to a coal, from turning to a white ash, and preserves the blackness.⁶

Preparation

C.K. recommended burning *Ivory* before grinding, taking care not to over burn it so that it retained its *tincture*.⁷

SALMON 1701 suggested grinding it with a little sugar-candy to prevent the paint from cracking in the shell.⁸

³ SMITH 1705, p. 18.

⁴ SMITH 1705, p. 18.

⁵ BARDWELL 1756, p. 7.

⁶ SMITH 1705, p. 30.

⁷ K., p. 12.

⁸ SALMON 1701, p. 98.

Others described the addition of drying oil, for example BARDWELL 1756:

*Ivory-Black and a little Indian Red make the best general Shadow-colour that can be. It is ground with Linseed Oil, and used with drying Oil.*⁹

Use

Ivory black was recommended for use in both oil painting and limning.

In oil painting BARDWELL 1756 used *Ivory Black* in some tones of the carnation, for a grey together with *fine White* and for a shade in a mixture with *Lake*, *Indian Red*, and *White*.¹⁰

Ivory black was also used to enhance the colour of black varnish in japanning. Such a recipe is listed in C.K.'s treatise:

To make Japan or Shining Ink.

*Take Gum-Arabick and Roman Vitriol, of each an ounce, Galls well bruised a pound, put them into Rape Vinegar, or Vinegar made of clear Small-Bear; let them remain in a warm place, often stirring, till the Liquor becomes Black, then add to a Gallon, an ounce of Ivory black, and a quarter of a pint of Seed Lac-Varnish, and it will be a curious Black Shining Ink.*¹¹

⁹ BARDWELL 1756, p. 7.

¹⁰ BARDWELL 1756, p. 10.

¹¹ K., p. 64.



Fig. 1 Jamaica Indico

I/42 Jamaica Indico

The cubic compact lumps of blackish blue colour are between 1 and 2 cm long. A thin crust on the outside appears grey. They are dusted with metal powder most likely originating from the sample of metal powder I/50 in the adjacent compartment in the row above.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Composition

The *Indigo* from *Guatemala* is the *Faecula* of a Plant termed *Emerus Americanus siliquia incurva*, J.R.H., knows GEOFFROY 1736.¹

Modern terminology classifies Wild Indigo as *Baptisia tinctoria*, R. Br, Fam. Leguminosae.²

A sample of indigo plant was included in Samuel Brown's *Second Book of East India Plants*, kept at the Royal Society. PETIVER 1700, who produced an overview of the collection's contents, however had concerns whether the sample represented true indigo.³

Should Vigani's sample get analysed it might be worthwhile comparing the results with the analysis of indigo found on some 16th- and 17th Century textiles excavated in London as a dated reference of aged material.⁴

Provenance

According to SMITH 1705 *Indigo* was made from Indigo leaves, which grew in both the West and the East Indies.⁵

¹ GEOFFROY 1736, p. 343.

² WREN 1975, p. 320.

³ PETIVER 1700.

⁴ PRITCHARD 1991.

This provenance was confirmed by GEOFFROY 1736 who said that *this juice is brought both from the East and West-Indies, made up in three different Forms*.⁶ He did not specify how the three forms differed.

Travel reports, for example that from Hans Sloan's journey, recorded the growth of indigo in Jamaica.⁷

Trade

Indigo was an expensive commodity. SALMON 1701 stated that for this reason many painters chose to replace it with *Blew Balls, which are almost like it, but not so good a color either for beauty or lasting*.⁸

Indigo was sold at *colourshops*.⁹ Unfortunately it does not appear in the invoices relating to Vigani's cabinet.

Quality / Adulteration

GEOFFROY 1736 said that the most esteemed *indigo* was the one from *Guatimala*.¹⁰

GRIERSON 1988 described contaminants in indigo dyeing.¹¹

Properties

Indigo was a dark blue, usually mixed with white, which could be ground finely (the longer the more beautiful it looked), had a good body, and was much used in *vulgar painting*.¹² SMITH's 1705 remark that the colour was used in more common, ordinary painting is somewhat contradictory to the fact that it was a relatively expensive commodity. However investigations of paintings confirm its frequent use and SALMON 1701, who said that it was expensive, later in his treatise recommended indigo for painting outdoor timber, such as doorframes, windows, and sundials.¹³ This range of uses demonstrates that it was considered a durable and stable pigment.

⁵ SMITH 1705, p. 25.

⁶ GEOFFROY 1736, p. 343.

⁷ SLOANE, 1707; but also BLOME, 1672.

⁸ SALMON 1701, p. 182; blue balls may be woad, but this assumption lacks conclusive evidence.

⁹ SMITH 1705, p. 98.

¹⁰ GEOFFROY 1736, p. 343.

¹¹ GRIERSON 1988.

¹² SMITH 1705, p. 25.

¹³ See Use below.

In a case study at the National Gallery London reconstructed paint samples of indigo (and other blue and green pigments) were artificially exposed to light to understand the fading process.¹⁴

Manufacture

The *indigo leaves* were put in water in tanks and then stirred until a mucilage was produced, which was separated from the water and dried. This *produces that substance which we call Indigo*.¹⁵ SMITH 1705 apparently in writing this had no idea how the leaves turned into a blue pigment.

Preparation

For limning it should be made up with *Gum-Arabick*. SALMON 1701 cautioned the painter not to grind it too swiftly, since the resulting heat would cause the colour to lose some of its lustre.¹⁶

Use

Indigo is frequently mentioned in mixtures to produce purple, crimson, or violet colours and to make green with, for example, *yellow Berries*. It was mostly used in mixtures with white unless applied to shadow. In linseed oil indigo was popular as the last colour on doors, windows, and other timberwork.¹⁷

SMITH 1705 specifically recommended it for grey lead colour in a mix with *white lead*.¹⁸

In limning NORGATE 1648 preferred *Indico* over blue bice to paint the delicate shadows in the face in a mixture of indigo with white and English Oker. He also used it for painting black satin robes¹⁹

Indigo was also used in colouring prints.

Some recipes stated indigo to be an ingredient in shining Japan or China-Ink.²⁰

¹⁴ KIRBY, 1998; the discolouration of indigo in oil paintings was also described by VAN EIKEMA HOMMES, 2004.

¹⁵ SMITH 1705, p. 25.

¹⁶ SALMON 1701, p. 96.

¹⁷ SALMON 1701, pp. 100-102, 182.

¹⁸ SMITH 1705, p. 49.

¹⁹ MULLER 1997, pp. 70, 79.

²⁰ K., p. 119, here with *Lamp black* and *Peach-black*.

As universal as the use of indigo in painting was, it is interesting to find that half a century after Vigani the painter BARDWELL 1756 did not mention it at all in his treatise. His only blues were ultramarine and Prussian blue.²¹

GEOFFROY 1736 let us know that *some Physicians have recommended Indigo in the Jaundice, taken in the Quantity of a Drachm; but others look upon it as a Poison, and in Saxony the internal Use of it is prohibited.*²²

Modern pharmacopoeias describe the root and leaves of indigo as antiseptic, stimulant, and purgative emmenagogue. In small doses it is a mild laxative; in large doses a powerful cathartic. Used in rheumatism, scarlatina, etc., and as an antiseptic douche in foul discharges.²³

²¹ BARDWELL 1756.

²² GEOFFROY 1736, p. 343.

²³ WREN 1975, p. 320.



Fig. 1 Sap Green I/43

I/43 Sap Green

The sample consists of nearly black cake shaped lumps, which show a surface similar to broken glass masses where fractured. These surfaces are very shiny and reflect the light. Compare to *Sapph Green* La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The following terminological distinction can be found in SALMON 1701:

*Buckthorn Berries being gathered green and dried are called Sap-berries, [...] being gathered when they are black, they are called Sap-green [...].*¹

Composition

Although commonly known to be made of buckthorn berries, a study of recipes from the late 16th and 17th Centuries revealed that a whole kaleidoscope of plants were used to make greens of the translucency and tar-like consistency of sap green: fleur-de-lys, pansies, violet and rose leaves, white roses, and lilies.²

Trade

The Sap-green manufactured as described below is put into bladders and hung up until dry.³

Quality / Adulteration

From the point of view of a physician DOSSIE 1758 gave a detailed account on the likelihood of adulteration of buckthorn berries as such and the expressed juice, which could be bought ready-made:

¹ SALMON 1701, p. 204.

² MULLER 1997, pp. 120, 121.

³ SALMON 1701, p. 204.

*Substitution for the **buckthorn berries**.*

The buckthorn berries being one of the most common cathartic medicines, and consequently used in a considerable quantity, it is very frequent for those, who collect them, to put off in their place, ad intermix with them, the berries of other trees and plants; particularly those of the frangula, or black alder, which greatly resemble them in their appearance.

As this ought to be carefully guarded against, on account of the error it may occasion in the strength of the syrup of buckthorn, which is a medicine frequently much depended upon, it is proper to examine well such parcels of berries, as are not had from the hands of those who can be well confided in: and the true buckthorn berries may be distinguished, by their three cornered seeds, with a purplish juice intermixed with green.

The juice of the buckthorn berries, which is sometimes bought of those who gather them, and express it to save the carriage of the berries, where they are to be disposed of at a distance, is very liable, also, to be adulterated by the admixture of water, or any other fluid which may resemble it. Against this there is no means of security, but the avoiding being concerned with the juice already extracted from the berries; and using them alone, as they may, generally, be as easily procured, as the juice, with a small difference in the proportion of the price.⁴

Properties

SALMON 1701 observed that the pigment was shining but fading. He recommended replacing it with *green Pink* or *Indico* mixed with *yellow Berries*.⁵

Manufacture

SALMON 1701 remarked, that, black ripe *buckthorne berries* steeped in *Alom-water* contained a good green without in this case referring to sap-green in particular.⁶

But *Polygraphice* shows two ways of producing *Sap Green*:

*Black buckthorn berries make a green colour being put into a Brass or Copper vessel for three or four days; or a little heated upon the fire, and mixed with Alum in powder, and pressed fourth.*⁷

⁴ DOSSIE 1758b, pp. 366-367.

⁵ SALMON 1701, pp. 96, 99.

⁶ SALMON 1701, p. 103.

⁷ SALMON 1701, p. 204.

Dossie 1758 gave a recipe for *Sap green* as follows:

*Take any quantity of buckthorn berries before they be ripe; and press out the juice in such a press as is used for making cyder or verjuice; or by any other method. Strain this juice through flannel, and then let it stand to settle; and, when it has stood a proper time, decant off the clearer part of the fluid from the sediment. Put this juice into a stone or earthen vessel; and evaporate it till it begins to grow of a thick consistence; then put it into the pewter vessel described p. 24; and finish the evaporation in balneo mariae; collecting the matter into one mass as it acquires a proper consistence.*⁸

Preparation

*Lay it [Sap green] in sharp vinegar all night; put into it a little Alom to raise its colour, and you will have a good green to Diaper upon other greens.*⁹

Use

NORGATE included *Sap Greene* in his list of pigments suitable for limning, but he remarked that *Sap-green [...] is soe thin and transparent, as in many things it wilbe unserviceable wher as Pincke ground with a little white sugar Candy and gum, workes very neat and mingled with blew verditer [...] makes all kinds of greenes and workes as shapre and neate as you could wish.*¹⁰

SALMON 1701 held that sap green was only to be used as a glazing pigment for other greens in limning as it was a dark dirty green.¹¹

⁸ DOSSIE 1758a, p. 108.

⁹ SALMON 1701, p. 96.

¹⁰ MULLER 1997, pp. 59, 64.

¹¹ SALMON 1701, p. 96 and 99.



Fig. 1 Colens Earth
Terra Lemni I/44

I/44 Colens Earth Terra Lemni

This pigment is kept in un-ground condition with the fibres and lignite structure still visible. This is particularly pronounced in two square lumps with nearly wooden structure within bundles of grain. Single fibres (from plants?) as well as small stones can be recognized, which, if ground as such, would impair the purity of the pigment. The sample is of deep brown colour.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For another sample see *Cullens Earth* La2/15

Terminology

It is not clear why the term *Terra Lemni* was written on the same compartment with Colens Earth, since it was generally understood that the earth from the island of Lemnos was sold as a substitute for red bole.¹ However BRADLEY 1730 also mentioned the terminological synonymy of *Cologne's Earth* with *Terra Sigillata Lemnia*.²

The term Cologne earth was known in England from the early 17th Century and became associated with Kassel earth in the late 17th Century and with Vandyke brown not until the late 18th Century.³

Composition

Earth of Cologne is usually associated with a complex organic material of fossil plant origin. 17 different Kassel earth preparations were shown to differ substantially in aliphatic and aromatic character upon chemical analysis.⁴

¹ HARLEY 2001, p. 119.

² BRADLEY 1730, p. 60, see also *Terra Sigill. Lemnia* M/13.

³ HARLEY 2001, p. 150.

⁴ LANGURI, 2002.

Trade

This product does not appear in the invoices related to Vigani's cabinet. Hence not much can be said of its true provenance.

Use

Cologne earth was usually mentioned for painting shadows in portrait and landscape painting. A brief overview can be found in HARLEY 2001.⁵

Collin's Earth was suggested besides dragon's blood to be used with *Gum Water* in the imitation of tortoiseshell over a silver leaf layer, which would then be covered with several layers of *Seed Lac Varnish*.⁶

The medicinal value attributed might have been similar to terra sigillata: drying and astringent. This is based on the terminological proximity that was created between the two substances, as mentioned above.

⁵ HARLEY 2001, p. 150.

⁶ K., pp. 41-42.



Fig. 1 Burnt Umber I/45

I/45 Burnt Umber

These warm dark brown lumps appear to be pieces broken from a cake shaped lump. The sample is evenly brown throughout the thickness of the mass. The material looks very similar to the one in *Burnt Umber* La2/15. The largest piece measures ca 1.8cm by 2.3cm.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Burnt umber is described together with *Umber* I/46.



Fig. 1 Umber I/46

I/46 Umber

This is a light greenish brown. The hue varies a little from piece to piece. The surface appears dull and somewhat grey. The largest pieces are up to 2.5cm long. The lumps are of irregular shape, with the sides broken off from a larger nugget.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The terminology of umber and burnt umber is quite clear in that it described the earth pigment umber after it had been burnt to achieve a darker brown tone.

Composition

The colouring components in this earth pigment are iron oxides and manganese.

Provenance

SMITH 1705 reckoned the origin of the earth to be a Mediterranean island.¹

Trade

Upon investigation of the custom records HARLEY 2001 came to the conclusion, that umber was mainly imported from Turkey, including Cyprus.²

Properties

NORGATE 1648 gave a good summary of umber's properties:

*Umber is next a course greasy and foule colour yet very usefull for shadowes, haire, perspective and almost any thing. It is extreamly dry and as you find it in the shopps troublesome to worke, but burnt in a Crusible, works neatly and well.*³

¹ SMITH 1705, p. 26.

² HARLEY 2001, p. 148.

³ MULLER 1997, p. 64.

In terms of its colour SMITH 1705 must have seen it rather as a “non-colour” when he wrote that it was of a *Hair colour, has no affinity with the colours mentioned above, being neither white, black red, yellow, blue or green.*⁴ He added that umber could be ground very fine, had a body as any earth colour, and that when burnt it was the most natural shadow for gold, and with white it resembled very much new oaken wainscot. He added that it dried quickly and with good gloss.⁵

In oil painting, BARDWELL 1756 concluded that *Burnt Umber is a fine warm Brown, and a good working strong Colour: it is of great Use in the Hair, and mixes finely with the warm Shade.*⁶

Umbre was generally appreciated and appears in all major sources from the 17th and early 18th Centuries.

Preparation

In order to cleanse the pigment SALMON 1701 recommended burning umber before grinding. However there were a few exceptions to this rule as is shown under Use.

For limning it ought to be ground with either gum-water⁷ or gum-lake⁸. The addition of one or two drops of onion water to the shell, where the paint was kept in, would prevent the paint from cracking.⁹

For use in linseed oil it may be ground very fine. In this media it apparently dried and bound *exceedingly* and resisted the weather very well.¹⁰

Use

In oil paintings, according to SALMON 1701, *burnt umber* was recommended for posts, bodies of trees, timber-work, in any dark ground in the picture, but not for garments unless they were *old Men's Gowns, or Caps standing together, so that they must not be all of a colour.*¹¹ *Burnt umber* in linseed oil was recommended as a good colour to

⁴ SMITH 1705, p. 26.

⁵ SMITH 1705, p. 26.

⁶ BARDWELL, 1756, p. 9.

⁷ Which contains gum Arabic.

⁸ Which contains gum hedera.

⁹ SALMON 1701, p. 96.

¹⁰ SALMON 1701, p. 182.

¹¹ SALMON 1701, p. 99.

shadow gold whereas raw umber made a perfect hair colour.¹² Also the painter should not burn it when he wanted to use it to colour *Hare, Horse, Dog, &c.*¹³

SMITH 1705 reported that burnt umber was used as a transparent brown with *gum arabic* in colouring prints.¹⁴ However, he did not recommend umber for delicate paintings but said that it was *of great use in vulgar painting*.¹⁵

¹² MULLER 1997, pp. 70, 75 and SALMON 1701, p. 182.

¹³ SALMON 1701, p. 99.

¹⁴ SMITH 1705, p. 101.

¹⁵ SMITH 1705, p. 26.



Fig. 1 [metal powder, not labelled] I/47

I/47 [metal powder, not labelled]

This is a fine metal powder of dark brown colour. Some particles appear to be darker than others. These may have been tarnished since they were exposed at the surface. However, it is possible that the powder originally consisted of particles of varying shades.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Lem. c?'d Sp I/48

I/48 Lem. c?'d Sp

This metal powder is of a pale gold colour and of medium particle size. The abbreviation on the paper liner may have stood for 'Lemon coloured speckels'.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 [metal powder, not labelled] I/49

I/49 [metal powder, not labelled]

This metal powder is of a warm, light brownish pink colour with large flakes.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/50, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 [metal powder, not labelled] I/50

I/50 [metal powder, not labelled]

This metal powder is of a warm brown colour with relatively small particle size, which makes it less reflecting.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/51, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 [metal powder, not labelled] I/51

I/51 [metal powder, not labelled]

This metal powder is of a purplish pink colour with small to medium sized particles and a surface shine. Pieces of paper from the paper liner lie on the surface of the powder.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/53, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Lake I/52

I/52 Lake

This sample consists of small cone-shaped hats with a flat circular base between 3 and 5 mm in diameter. They are of a milky red-purplish colour. They are paler and less compact than the Venice lake sample I/56. Minute air bubbles are included in the mixture.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

DOSSIE 1758 assumed that *Lake* was first made from the colouring substance in *stick-lac*, from whence it seems to have taken its name.¹

Composition

DOSSIE 1758 described very comprehensively:

*Lake is a white earthy body, as scuttle-fish-bone, the basis of alum, or chalk, tinged with some crimson vegetable dye, such as is obtained from cochineel, or Brasil wood dissolved or taken up by means of some alkaline salt, and precipitated on the earth by the addition of some acid. [...] It may be made from a great variety of substances which afford a crimson tinge; tho' at present it is seldom prepared from any other than cochineel, scarlet rags, and Brasil wood.*²

Probably this lake pigment derived from the red exudation of *coccus lacca*. However also other red colourants must be expected to appear in what was simply called 'lake'.

Trade

[...] of this colour (lake) there be divers sorts at the colour-shops, very different, some being of a more dead and pale colour; 'tis made of the tincture of a vegetable, that stains a red, but of what, or how done, I cannot as yet learn perfectly; only note, that

¹ DOSSIE 1758a, p. 57.

² DOSSIE 1758a, pp. 56, 57.

the best sorts come from Venice and Florence described SMITH³ 1705, whose knowledge on the composition of lakes was apparently rather limited. Also he did not consider adulteration when he spoke of the different qualities.

Lake does not appear in the invoices relating to Vigani's cabinet.

Quality / Adulteration

SMITH 1705 was of the opinion that the *richest sort of lake* was the best of all dark reds, being of a *pure crimson* colour.⁴

DOSSIE 1758 wrote that *the best of what is commonly sold is made from the colour extracted from scarlet rags and deposited on the cuttle-bone*.⁵

Colourmen could test the brightness and transparency of a lake by grinding it with oil on a piece of glass and holding it to the light. If lead white were added it would show the brightness in relation to other samples. The light fastness of the lake could only be judged by actual experience, by leaving a sample in oil on a window and noting when and by how much it faded. It could be an indication of good light fastness if the lake did not change colour with the addition of lemon juice. However, DOSSIE 1758 warned that this test was not infallible. He added that some lakes tended to thicken in oil when stored in a bladder for some time.⁶

Properties

BARDWELL 1756 described the properties of lake as follows:

*Lake is a tender, sympathizing, deep Red; but of no strong Body; therefore it should be strengthened with Indian Red. It is the best glazing Colour that can be used.*⁷

Lake was generally a highly appreciated pigment in terms of its scarlet hue and usefulness in red glazes. However, it was observed to fade, sometimes entirely. Although such properties have been reported for other pigments as well, thoughts were rarely turned to investigating the causes of such behaviour.

³ SMITH 1705, p. 19.

⁴ SMITH 1705, p. 19.

⁵ DOSSIE 1758a, p. 57.

⁶ DOSSIE 1758a, pp. 65, 63.

⁷ BARDWELL 1756, p. 8.

It is therefore very interesting to read how DOSSIE 1758, about half a century after Vigani, established the fading as a degenerative process of the dyestuff being in contact with air. He also observed that attempts at sealing the pigment particles from the air with gum would affect the brightness and transparency of the glaze, a result of greater differences in refractive indexes between substrate and gum, than between substrate and oil.

For though some parcels (particles of lake) will hold their colour intirely well, yet others prepared in the same manner, as far as art can assure it, will fly in a degree that makes the use of it destructive to any painting: and if this defect be effectually remedied, as it may be by securing the tinging particles by gums, from all attacks of the air; yet that is generally at the expence of the brightness and transparency: the earth, which is the basis of the pigment, being locked up by the gums, and rendered incapable of being combined intimately with, or imbibing the oil.⁸

Manufacture

It is again DOSSIE 1758 who gave a very detailed and clear instruction on how to draw the dye onto the medium and produce the little hats that are characteristic for Vigani's sample. The recipe's language is that of an experienced, practically skilled, and accurately observing chemist, allowing each step to be retraced easily:

Take a pound of the best pearl-ashes, and, having dissolved them in two quarts of water, purify them by filtering through paper. Add then to this solution two more quarts of water, and having put in a pound of scarlet shreds, procured of the tailors, (for they must be entirely clean) boil them in the pewter boiler (...) till the shreds appear to have wholly lost their scarlet colour. Take them out of the solution and press them well; dipping them after in water and pressing them again, that all the fluid they had imbibed may be got from them, which must be put back to the rest. Take then another pound of the scarlet shreds, and repeat the like treatment of them in the same solution; as also a third and fourth pound. While this is doing dissolve a pound and half of the cuttle-fish in a pound of strong aqua fortis in a glass receiver, adding more of the bone, if it appear to produce any ebullition in the aqua fortis: and, having strained off this solution through flannel, pour it into the other by degrees: observing whether it produce any effervescence on putting in the last quantity: which, if it do, in any great degree, more of the cuttle-fish-bone must be dissolved in aqua fortis; and the solution very gradually added till no ebullition appear to be raised by it in the

⁸ DOSSIE 1758a, pp. 56-57

*mixture. If this be properly managed the fluid will soon become clear and colourless, and the tinging particles extracted from the shreds together with the cuttle-fish-bone, will subside to the bottom, and form a crimson sediment; which is the lake. The water must then be poured off; and two gallons of hard spring water must be put to the lake, and well stirred about to mix them: which, being likewise poured off, after the lake has again settled to the bottom, must be replaced by another two gallons; and the same method must be repeated four or five times: but if hard water cannot be procured, or the lake appear too purple, half an ounce of alum should be added to each quantity of water before it be used. When the lake is thus sufficiently freed from the salts, it must have the water drained from it in a filter covered with a linen cloth, which has been so worn as to have now knap or down remaining on its surface. After the lake has drained to a proper dryness, it must be dropped, on clean boards, by means of sticks of elder, mountain-ash, or other hollow wood, cut into the form of pens; and suffered to dry: when the drops will appear in the form of little cones or pyramids.*⁹

DOSSIE 1758 expanded that with *earth of alum* as substrate the lake would be even better for glazing, and that lake prepared with cochineal would be very fine and stand extremely well. His cochineal lake recipe also contained *annatto*. It is followed by an instruction to make *lake from Brazil wood*, which should only be used in varnishes, and could be improved with the addition of *seed lac* during the lake-making procedure.¹⁰

Preparation

SMITH 1705 observed that *Lake* had to be very well ground for use in oil painting to display the beauty of the colour and to work well, because otherwise it clung together *likes a jelly*. In order to avoid this it should be tempered as thinly as possible.¹¹

BARDWELL 1756 was much less specific by saying that *lake is ground with Linseed Oil, and used with drying Oil*.¹²

The preparation process for lake and other pigments in japanning was described by the anonymous C.K.:

⁹ DOSSIE 1758a, pp. 58-59; for explanation of chemical expressions see Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

¹⁰ DOSSIE 1758a, pp. 60, 61, 62.

¹¹ SMITH 1705, p. 19.

¹² BARDWELL 1756, p. 8.

*Of these (transparent colours used in Japanning), for a Green, are distilled Verdigrease; for a Red, fine Lake; for a Blue: Smalt, have to grind these on a Porphyri, or Marble Stone. Grind with a Mullet what Quantity you please with Smalt or Verdigrease, with Nut-oil as much as will moisten the Colours, and grind them till they are as fine as Butter, put then the Colours into Shells, and mix them with Oil of Turpentine till they become thin for use; (...) this for a curious Red, may be done with Lake, but then use drying Oil to grind them with.*¹³

It indicates that Lake was considered a bad drier.

Use

For oil painting SMITH 1705 advised to mix *lake* with *white lead* and *vermilion* for a flesh colour.¹⁴ Within the palette of BARDWELL's 1756 flesh colours *Lake* appeared in the opaque so called *Shade Teint* and in the translucent *Red Shade*:

Shade Teint is made of Lake, Indian Red, Black (Ivory Black), and White, mixed to a beautiful Murrey Colour of a middle Teint: This is the best Colour for the general Ground of Shadows; for which Reason I call it the Shade-Teint: It mixes with the Lights delightfully, and produces a pleasant clean Colour, a little inclined to the redish Pearl. As all the four Colours of its Composition are of a friendly and sympathizing Nature, so consequently this will be the same; and therefore may be easily changed, by the Addition of any other Colours.(...)

*Red Shade is nothing but Lake and a very little Indian Red: It is a charming working Colour, and good Glazer: It strengthens the Shadows on the Shade-Teint; and receives, when it is wet, the Green and Blue Tints agreeably. It is a good Ground for all dark Shadows.*¹⁵

BARDWELL¹⁶ 1756 also listed *Warm-Shade* as a mixture of *Lake* and *Brown Pink*, a pigment which is not represented in Vigani's cabinet.

DOSSIE 1758, not without warning (see Properties), showed the wide range of application of this pigment in oil painting:

Lake is used in all kinds of painting (except enamel:) but particularly in oil; where it supplies the place of carmine, which does not at all agree with that vehicle. It is valuable both for its brightness and crimson teint; which make it useful for carnations to the portrait painters; for skies to the landskip and ship painters and

¹³ K., p. 28.

¹⁴ SMITH 1705, p. 49.

¹⁵ BARDWELL 1756, p. 10.

¹⁶ BARDWELL 1756, p. 11.

*for flowers to those who paint still life. Its transparency in oil renders it also of great service in glazing, as it is called, over vermilion; and in painting scarlet draperies, and the red parts of the lips: and its acquiring a dark hue, by this transparency, when used without the addition of any opaque pigment, gives it an unrivalled excellence in the shades of red draperies, or other similar cases.*¹⁷

In Japanning the prepared red lake paint could be laid on *Silver, Gold, or any other light Colour*, and would then become transparent, *altering (its) Lightness or Darkness, according to that of the Metal or Colours* that are placed underneath.¹⁸

For opaque drawings of figures in Japanning work *fine Lake* may be mixed with *White-Lead* and *Gum Arabick Water*.¹⁹ K.C. stressed that the pigments mixed with the white should have no body, and that gum water was used so the paint did not become transparent. In that sense a *fine Lake* was probably of very small, fine particle size, but rich in colour.

¹⁷ DOSSIE 1758a, p. 56.

¹⁸ K., p. 28.

¹⁹ K., p. 28.



Fig. 1 [metal powder, not labelled] I/53

I/53 [metal powder, not labelled]

This metal powder is of a warm red-pink colour of medium particle size.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/54, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Copper col. Spec. I/54

I/54 Copper col. Spec.

This metal powder is of a purple with a blue tint with large particles. There are red flakes in the mixture. These may be an original admixture or a spillage from the sample in the adjacent compartment I/53.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/57, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Red Oker I/55

I/55 Red Oker

This compartment contains one big clump of a light pale purple and several small fractured pieces of the same colour at the bottom of the paper tray. The pieces appear to be evenly coloured throughout the homogenous mass of the sample. With some certainty one may assume that this sample does not represent red ochre. It resembles the samples of *fine Russet* in I/16 and *fine Roset* in La2/15 and may be a red lake pigment.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Chemical analysis of this sample would be required to determine, what pigment is contained in this compartment under most likely wrong label.



Fig. 1 Venice Lake I/56

I/56 Venice Lake

The hats with a flat circular base of 3-5 mm in diameter are of a dark, saturated purple colour. The mass is compact and homogenous. The hats are taller and pointier than those of I/52.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further reference see *Lake I/52*. The preface of Venice to the name of this lake probably suggests that it was traded via this city. Often Venice lake was praised for its quality, and HARLEY 2001 suggested that Venice had a trade monopoly and was thus able to be selective in the choice of materials.¹

¹ HARLEY 2001, p. 134.



Fig. 1 [metal powder, not labelled] I/57

I/57 [metal powder, not labelled]

This metal powder is of a warm brown with an orange tint. The particles of this powder are small.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/58, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 [metal powder, not labelled] I/58

I/58 [metal powder, not labelled]

This metal powder is of a light pale brown with medium sized particles. Pieces of paper from the paper tray are partially submerged in the powder.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/61, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Brown fr. I/59

I/59 Brown fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 Ash colour fr. I/60

I/60 Ash colour fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 [metal powder, not labelled] I/61

I/61 [metal powder, not labelled]

This metal powder is of a light grey colour, a powder of fine particle size, which mildly reflects the light.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 (black) fr. I/62

I/62 (black) fr.

Fr. are small and extremely thin plates (on average 2 to 3 mm length) of transparent stained glass. They have an irregular shape with sharp edges, typical of broken glass. They strongly reflect light.

Vigani's cabinet contains 7 samples in the following shades: blue I/3, green I/18, warm brown (*gold fr.*) I/34, white I/39, dark brown-violet (*brown fr.*) I/59, grey I/60, and purplish black I/62.

The paper is lost where the colour of this *fr.* would have been indicated. It was presumably 'black'.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Blew fr.* I/3



Fig. 1 Compartment I/63,
labelled Iridicum
Atramen:, is empty

I/63 Iridicum Atramen:

Only the paper tray with the inscription is left. There are no traces of the actual material inside.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES, 1707

KREKEL et al. 2005 suggested that, atramentum was a synonym for vitriol looking at terminology in German apothecaries' taxes from the 16th Century.¹ Unfortunately the sample in Vigani's cabinet has not been preserved to establish this link via chemical analysis.

¹ KREKEL 2005.

**Fine Art Materials in Vigani's Cabinet, 1704,
of Queens' College, Cambridge**

dissertation

in four volumes

submitted by Lisa Wagner

Volume 3

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Conclusion



Drawer K

Drawer K

25	24	23	22	21
20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No K/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	[paper lost]	Alkakenge [later changed to Alkakengi.]
2	Cassic fist	Cassia Ligne. Cassic Fist. Cinnamonium Cassia.
3	Nuces Cypress.	Nuces Cupressi Nux Myristila. [later changed to Myristica]
4	[paper lost]	NN. [no transcription]
5	Piper Longum	
6	6 6 Cocculi Indi	Cocculi Indicus

7	7 Chirmes Grana	
8	[paper lost]	NN. [no transcription]
9	9. Cope	Coffee.
10	[paper lost]	NN. [no transcription]
11	15 Myrobal [...] [ink faded]	Myrobalari.
12	14 Myrobal Emolicae	Myrobal Emolcea [later changed to Emolicae]
13	13 Myrobal Bolericae	Myrobal Belerical [later changed to Belericae]
14	12 Myrobal. albulae [or: libulae; ink almost completely faded]	Myrobal Emolical. [later changed to Emolicae]
15	11 Myrobalani Citrinae	Myrobal Citrinus.
16	16 Anasardia orientalia – Antiquorum	Anacardia occideatale. Antiquorum.
17	[.] Ca[...] [ink faded]	[no transcription]
18	18 Nuces Vomicae	Nuces Vomivae. [later changed to Vomicae] Strychnis Nux Vomica
19	[paper lost]	Dates
20	20 Ga[...] [paper lost]	Galls Quercus Lusitanica.
21	[ink faded and paper lost]	Nuces Myristicae. Nutmegs.
22	22 Tamarind [...]n fili[...]ia	Tamarinde [later changed to Tamarindi.]
23	[paper lost]	Cubebs.
24	Amygdala amara	Amyglala Amara Ripe Seed of Bitter Almind Tree. Prunus Amyglala.
25	[.]r[...]a Paradisi	Grana Paradisa. Amomum Melequeta.

No K/1 to K/5 are the only samples without originally attributed numbers.

No **K/11** to **K/15** are, an irregularity in the applied system, numbered the other way round, from left to right, K/15 being '11' and K/11 being '15'.

The paper box No **K/2** is labelled: '2 / Cicer alb.' outside on the front. This box seems to have been re-used.

No **K/3** and **K/5** are labelled on the left inside of the paper box or the paper boxes have been turned.



Fig. 1 Cocculi Indi K/6

K/6 Cocculi Indi

The compartment contains slightly oval, dark brown, dried fruit capsules, some with part of the branch still attached to them. The capsules are on average about 8 mm long, with a mildly rugged surface with white dust and an elevated ridge that marks the two halves of the shell.

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Unlike *Chirmes Grana* K/7, which translates to kermes grains, the *Cocculi Indi*, small Indian berries, are not the Indian/Asian scale insects from which shellac, lake, and lac dye are obtained. The kermes insects were obviously mistaken by Vigani to be berries from plants since they are placed in drawer K among dried fruit shells that contain seeds. *Cocculi Indi* are right beside the kermes insects, which could indicate that Vigani thought them to be the berries, which provide the red dyestuff that comes from India, comparable to the European red dyestuff from kermes. However, *Cocculi Indi* were not from a host plant for lac insects.

Cocculus indicus were medicinally used berries from the plant *Anamirta paniculata*, Colebr., Fam. Menispermaceae, also known as Fish Berries, Indian Berries, Levant Berries, or Hockle Elderberry. They are very poisonous and were sometimes used in place of nux vomica.¹

¹ WREN 1975, pp. 87,88.



Fig. 1 Chirmes Grana K/7

K/7 Chirmes Grana

These 'grains' (from Lat. grana = grain) are the dried bodies of kermes insects. The bodies are brown-red to red-black and up to 7 mm in diameter. They are light brown around the opening hole.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Synonyms: *Grana Kermes Offic.*, *Coccus Infectorius*, *Grana Tinctoria*, *Kermes Berries* and *scarlet* for the colour for painters are listed in GEOFFROY 1736.¹ It sounds as if 'scarlet' was as common a term for the pigment from kermes as was 'carmine' for the pigment gained from cochineal. However, in the literature relevant to painting 'scarlet' is rather associated with a bright hue of red without purplish tinge and not with a specific material or pigment from a defined dye.²

Composition

Kermes 'grains' are the dead bodies of female Kermes insects each containing about 2000 red eggs, which the female protected with her body after laying.³

These are Excrescencies of the Ilex Cocciglandifera, C.B.P. [... .] and are generally so full of small Worms and other Insects, that they deserve to be reckon'd Animal rather than Vegetable Substances, said GEOFFREY 1736, and adds that they were *first proved to be Excrescences by M. Fagon; but their Origin has been since more fully explained by Count Marsigli.*⁴

¹ GEOFFROY 1736, p. 370.

² For example a dress could be painted in a scarlet colour (red inclining to orange) or in a crimson colour (associated with a red inclining to purple). Interesting though is the confusing fact, that the colour designation 'crimson' etymologically originates in the old Spanish *cremesin* 'of or belonging to the *kermes*' (the scale insects from which a deep red dye was obtained). See also online Etymology Dictionary <http://www.etymonline.com> and *Carmine* I/9.

³ From the look of this sample it definitely does not represent the so-called kermes berry, described in SCHWEPPE 1992, p. 410.

⁴ GEOFFROY 1736, p. 370.

There also existed a 'kermes mineral' in the literary sources which must not be confused with the organic kermes described here. *Kermes mineral* was a saffron coloured powder that accumulated at the bottom of a flask when antimony plus a solution of fixed nitre and rain water were boiled together, filtered, and then left to settle.⁵

Provenance

The kermes insect *Kermes vermilio* PLANCHON inhabits the kermes oak *Quercus coccifera* L. (and a few other oak species) in the Mediterranean and Asia minor.⁶ GEOFFROY 1736 specifically mentioned Languedoc near Montpellier, where the insects were gathered.⁷

Trade

French kermes from the Languedoc and Provence region was traded through Avignon and through the port of Marseille, and kermes from the Eastern Mediterranean countries as well as oriental kermes were traditionally traded through Venice.

Vigani bought *Bacc Chermet* (bacc is abbreviated for Lat. bacca, berry) at a price of 6 pence per ounce from Colchester's drugstore, London, in April 1704. This was over 4.5 times less than cochineal, which he purchased in the same order.⁸

Quality / Adulteration

Kermes generally contains less colouring matter than cochineal. French kermes was known to be superior to the Spanish because of its relatively higher content of colouring matter and therefore was usually more expensive. Spanish kermes was subsequently often an admixture of the French.

Manufacture

After harvesting the dead females and the eggs, they are immediately killed by exposure to vinegar vapours or by drowning them in vinegar for about 12 hours, after which they are dried, said GEOFFROY 1736.

The extraction of the dye was similar to that of cochineal.⁹

⁵ DOSSIE 1758b, pp. 281-182; Kermes mineral was also known under the name of 'poudre des chartreux'.

⁶ SCHWEPPE 1992, p. 410.

⁷ GEOFFROY 1736, p. 370.

⁸ See *Cochinella* R/12, Trade.

Use

Kermes was mainly used in cloth dyeing by so-called *Scarlet Dyers*¹⁰.

The medicinal properties of *Kermis* are described in GEOFFREY 1736:

*In Medicine, they are esteemed to be greatly cordial and sudorisick, being very full of volatil Salt. They are given in Powder [...] to prevent Abortion from any Strain or Hurt; for this Powder strengthens Mother and Child [...]. They are Basis of the Syrup and Confection of Alkermes.*¹¹

⁹ See *Cochinella* R/12, Manufacture.

¹⁰ GEOFFROY 1736, p. 370.

¹¹ GEOFFROY 1736, p. 370.



Drawer L

Drawer L

25	24	23	22	21
20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No L/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Stalag[.]iti coal [.] Log di[.] S[...]tog 12.62	[no transcription; comment for the entire drawer: 'Geological Specimens.']
2	2 Enciochus compu[.]sse[.]s Gemellatus p. II 40	[no transcription]
3	Exrocni from torpenhow/ In Cumberland	[no transcription]
4	[...]trochis from D.J. in Cumberland lodg'd in red iron Earth	[no transcription]
5	Entrochus Cylindrariy Sive complanator [.]nasci	[no transcription]

	Lb. II 98	
6	Cu[...]ost[...] [...]gosa major [...]vata p:II3 [ink faded]	[no transcription]
7	7 Terebratulæ Capsulari p. 866 Non dissimilii.	[no transcription]
8	8 Echinites	[no transcription]
9	9 Muscu[.] Petrif.	[no transcription]
10	[...] [...] [ink faded] of Sea Hoad.	[no transcription]
11	11 [not labelled]	[no transcription]
12	12 Ostreu minu filiatū n. 451	[no transcription]
13	4.5 13. Terebra[.]uta bulgata ovalis n. 837	[no transcription]
14	[.] [paper lost, probably a number] [.]yp[...] minor c[...]p[.]lu [ink faded]	[no transcription]
15	15 Gryphiter major cum sao [...] 4[.]3 [ink faded]	[no transcription]
16	[paper lost]	[no transcription]
17	17 [only fragments left, ink faded]	[no transcription]
18	18 Thydiderites of P[...] a [...] [...] Rose-Ca[...] [paper lost and where preserved: ink faded]	[no transcription]
19	19 Mytiloides vulgator Anglicus N. 884	[no transcription]
20	[...] 12. [.]i[...] [paper lost and where preserved: ink faded]	[no transcription]
21	21. Pectunculites Oxy[.]hyncu[.]	[no transcription]

	n 664	
22	22 Lapides Plauta marino tenus filo nerae	[no transcription]
23	23 Lapis e Vesicas Bov.	[no transcription]
24	24 Lapis e Vesica Lupi	[no transcription]
25	25 Lapis e Vesica pu[.]eri Per ... Alkerton N.D.	[no transcription]

L/1: On the outside of the paper box it says: 'Nautilus'.

L/2: On the outside of the paper box it says: 'Asteric vulgaris'.

L/3: On the outside of the paper box it says: 'Cornu Hammonis'.

L/4: On the outside of the paper box it says: '2.91'

L/8: Inside, opposite to the label it says: 'Echini Petrif. Var. / 1.'

L/25: On the outside of the paper box it says twice: 'Sarcocolla'.

These boxes had been re-used.

Drawer M

22		21	20	
19	18	17	16	
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No M/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1. Lapis Ætites.	Lapis Tetities [later changed to Aetites] (Culpeper)
2	2 Lapis Calaminaris	Lapis Calaminaris. Lime Carbonate.
3	3 Lapis Tutiae	Lapis Tutioe [later changed to Tutiae] Impure ZnO.
4	4 Lapis Hiberniae	Lapis Hibernia Irish Slate.
5	5 Lapis Hiberniae figurâ Felicis notatus	

6	[.]rta u of [...]n [...] D[...]in[...]u [paper lost]	[no transcription]
7	7 Bolon: Tartar:	Bolon. Tartar.
8	8 Tartar: Cremor J. Francisci Vigani	Tartari Cremor J. Francis Vigani.
9	20 Bolus Armenia	
10	10. Tartar alb.	
11	13 Terra Sigill. rubr.	
12	12 Terra Sigill alb.	
13	11 Terra Sigill. Lemnia	
14	14 Lapis Spong[...] [...] [paper lost]	Lapis Spongy.
15	15 Osteocolla	
16	16 Corallium Rubr.	
17	Corallium rubrum Fisculosum. [or: Fisculaesum]	Coral ?
18	17 Sal nitrum non defaecat.	Sal nitrum.
19	18 Sal nitrum defaecat.	Sal Nit de foecat.
20	[...]lium [...] [paper lost]	Corallium alb.
21	[...] [paper lost] Corallium alb. Fist. opt.	Corallium alb. Fist.
22	[...]tid al. fr: [paper lost; 'al.' cannot clearly be identified]	Icilia ?

No **M/1**: The paper with the inscription has fallen into several pieces.

No **L/2**: The box is thus labelled twice.

No **M/6**: The compartment contains a transparent, whitish mineral.

No **M/8**: On the outside of the paper box it says: 'Tartar: Rubr.'

No **M/9**: The box and contents were originally located somewhere else as it is numbered '20'.

According to the original numbers of the labels No **M/11** and No **M/13** (Paper box and contents) have been exchanged.

No **M/17** originally did not have a number and is labelled on the left inside of the paper box. It might be a later addition, which made No **M/18** (originally numbered 17) move from here to share a large (double space) compartment with No **M/19** (originally numbered 18).



Fig. 1 Bologn: Tartar: M/7

M/7 Bologn: Tartar:

These are four pieces broken from a flat cake. The pieces are of a pale red with a buckled surface of partly joined granules on top. The underside is smooth and flat. Compare with sample *Tartar alb.* in M/10.

- MS Quns Vig. 8
- LECTURE-NOTES undated
- LECTURE-NOTES 1707

See also *Tartar: Cremor J. Francisci Vigani* M/8 and *Tartar alb.* M/10.



Fig. 1 Tartar: Cremor
J. Francisci Vigani M/8

M/8 Tartar: Cremor J. Francisci Vigani

These are very evenly sized and shaped white, semitransparent crystal needles of 2 to 3mm length. Their surfaces reflect the light.

- MS Quns Vig. 8
- LECTURE-NOTES undated
- LECTURE-NOTES 1707

Terminology

Following BRADLEY's lectures, 1730, *Cremor Tartari* is synonymous with *Cream of Tartar* and *Crystals of Tartar*.¹

Tartarus in general was synonymous with the expressions *Tartarum* and *Argil*, according to BRADLEY 1730.²

Composition

Tartar was mainly bitartrate of potash (acid potassium tartrate, $\text{KHC}_4\text{H}_4\text{O}_6$), present in grape juice, deposited in a crude form in the process of fermentation, and adhering to the sides of wine-casks in the form of a hard crust, which in the crude state varies from pale pink to dark red.

Cream of tartar, here made by Vigani, was purified crude tartar, which forms white crystals.

Trade

Vigani bought various types of tartar from Porter and Colchester, all at 1 penny per ounce³. Instead of the cream of tartar that Vigani ordered from Porter⁴ he placed his own product *Tartar: Cremor J. Francisci Vigani* in the cabinet.

¹ BRADLEY 1730, p. 56.

² BRADLEY 1730, p. 56.

³ MS Quns Vig. 4 for *Tart Alb.*; MS Quns Vig. 8 for *Red Tartor*, *Cr: Tartor*, and *Bolognian Tartor*.

⁴ MS Quns Vig. 8.

Properties

The salt of tartar was described as *grainy* or of a *sandy substance*.⁵

Manufacture

For Vigani's recipe to make *Sal Tartar* see LECTURE-NOTES undated, p. 2 and LECTURE-NOTES 1707, pp. 19, 20.⁶

Use

Tartar was a widely used chemical agent in various applications, amongst others in the manufacture of painting materials. So far, these additives have not received a great deal of attention. Therefore it is very fortunate to have several samples present in this collection for analysis together with the recipes of the time in Vigani's lecture notes.

Two applications are named below:

It was an ingredient in the manufacture of copper green from *verdigrease*, reported SMITH 1705.⁷ The colour thus made was used in colouring prints.

For use in colouring prints SMITH 1705 made a lye from tartar (burnt red hot in the fire) and water, which needed to be decanted after 2 days, and the lye put in a glass bottle ready for use.⁸ This lye was used to extract dyes like cochineal.

⁵ BRADLEY 1730, p. 56.

⁶ See transcriptions of both lecture-notes in the Appendix, Vol. 4 of this dissertation.

⁷ SMITH 1705, p. 95; see *Verdigr. Fine* I/19 for the recipe.

⁸ SMITH 1705, pp. 93, 94.



Fig. 1 Bolus Armenia M/9

M/9 Bolus Armenia

This sample of Armenian bole is both inconsistent with the other samples I/15 and La2/15 and within itself. The big lump is much lighter in colour almost of a whitish pink, whereas the small particles are of a darker and warmer red, much like sample I/15. In terms of colour the big lump does not correspond with the other samples or Armenian bole in the cabinet, which may indicate misplacement. All particles in compartment M/9 have sharp edges, as if broken apart, whereas the other samples are much more rounded.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Bole Armon* I/15.



Fig. 1 Tartar alb. M/10

M/10 Tartar alb.

This sample is similar to the *Bologn: Tartar:* in M/7. The flat cake is red with a purple cast. Some pieces show the formation of cubic buckles on the upper side, others display a net of fine purple needles. The bottom sides are flat.

Tartar alb. very likely stands for Tartar album, white tartar. Yet this sample is red.

- MS Quns Vig. 4
- LECTURE-NOTES undated
- LECTURE-NOTES 1707

See also *Tartar: Cremor J. Francisci Vigani* M/8 and *Tartar alb.* M/10.



Fig. 1 Terra Sigill. Rubr. M/11

M/11 Terra Sigill. rubr.

These are three round compressed red cakes of ca. 2cm in diameter with a moulded surface. The imprint shows a shield with a crescent moon to the left and to the right a little mound with small round domes on top. From the top a rounded line leads towards the mound. This could be in imitation of grapes. In the lower half under a relief line it says 'TERRA SIGIA LEHHIA' (in two of the cakes which appear to be imprinted with the same stamp), and 'TERRA SIG LEHIA', made with a different stamp. The spelling of the word Lehia or Lehhia is different; also the domes are in a different order and number in the two. Compare with *Terra Sigill. Lemnia* M/13 for the design.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See also *Terra Sigill. alb.* M/12 and *Terra Sigill. Lemnia* M/13.

Trade

Vigani bought 2 ounces of *Terra Sigill: Rub* for 4 pence from the druggist Colchester in London.¹

According to BRADLEY 1730 *sorts of Terra Sigillata* were received in England *in little round Cakes sealed in different Manners*.²

¹ MS Quns Vig. 4.

² BRADLEY 1730, p. 60.



Fig. 1 Terra Sigill. Alb. M/12

M/12 Terra Sigill. alb.

These three white cakes appear to be a softer material than the samples in *Terra Sigill. Rubr.* M/11. The imprints have worn off and the edges are rounded. The details of the imprints cannot be entirely deciphered. It could be a winged animal or it could resemble a lobster. Letters do not seem to be present.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See also *Terra Sigill. rubr.* and *Terra Sigill. Lemnia* M/13.

Terminology

Synonyms for *Terra Sigillata Alba (officin.)* according to GEOFFROY 1736 were *Earth of Malta, the island where it is found in a cave near the ancient town of Malta*, and *Terra Sancti Pauli (officin.)*. The latter name was given to it because, as the legend went, it was St. Paul who gave this earth its virtue to be an antidote against the poison of vipers and scorpions when he was shipwrecked on Malta.¹

Trade

Vigani bought 2 ounces of *Terra Sigill. Alb* for 4 pence from the druggist Colchester in London.²

Both BRADLEY 1730 and GEOFFROY 1736 report that terra sigillata was in the shape of little cakes with various imprinted stamps on them. In GEOFFROY's words it was *made up in tablets with various figures marked upon them*.³

Use

Terra sigillata frequently occurs in recipes with Armenian bole.⁴

¹ GEOFFROY 1736, p 59.

² MS Quns Vig. 4.

³ GEOFFROY 1736, p. 59 and BRADLEY 1730, p. 60.

The chief use in pharmacy was as an antidote against poisons of vipers and scorpions; alexipharmic qualities in cases of smallpox and measles were attributed to it. Even vessels were made of it, which were said to *communicate its cordial efficacy* to the wine or water kept in it.⁵

According to BRADLEY 1730 *Terra sigillata seem all to carry the same Virtues with them, as being drying and astringent.*⁶

⁴ See also *Bole Armon* I/15.

⁵ GEOFFROY 1736, p. 59.

⁶ BRADLEY 1730, p. 60.



Fig. 1 Terra Sigill. Lemnia M/13

M/13 Terra Sigill. Lemnia

These three cakes are of an orange red colour and show the same imprint as M/11. The twig reaching to the grapes is more pronounced. Again there are two cakes with the spelling 'LEHHIA' and one with 'LEHIA'. One cake got broken and is missing a third. The fractured side shows that the cake is of a homogenous mass.

- MS Quns Vig. 2
- MS Quns Vig. 7
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See also Terra Sigill. rubr. M/11 and Terra Sigill. alb. M/12.

Terminology

BRADLEY 1730 used *Terra Sigillata Lemnia* synonymous with *Cologne's Earth*.¹ This may have been a common notion since the sample of Cologne's earth in the Cabinet in compartment I/44 is labelled *Colens Earth Terra Lemni*.² This is a very striking remark because the two samples neither relate to each other in colour nor in shape or size. The correlation may be found in the near to identical medical properties.

Composition

The composition of this terra sigillata is aluminium silicate, or kaolin, which today is used in very large quantities as an absorbent.³

Provenance

Peck, who wrote on Vigani and his cabinet in 1934, imparted on terra sigillata lemnia:

This is, as its name implies, sealed earth. In the island of Lemnos on one day in the year a certain mine was opened in the presence of the clergy and magistrates, and after the recital of prayers a quantity of the earth was removed.

¹ BRADLEY 1730, p. 60.

² See *Colens Earth Terra Lemni* I/44.

³ PECK, 1934 #23, p. 47.

*This was made into a paste, divided into small pastilles, then stamped and distributet.*⁴

Trade

Vigani bought 2 ounces of *Sigill Lemnia* for 4 pence from the druggist Porter in London.⁵

Like the other terra sigillata types it arrived in England in the shape of little round cakes that were sealed.⁶

Use

BRADLEY 1730 is of the opinion that *Terra sigillata* seem all to carry the same Virtues with them, as being drying and astringent.⁷

PECK 1934 expanded that *extravagant claims were made for its uses as medicine, one old writer stating that "it dries, binds, resists putrefaction and poison, comforts and strengthens the head, heart and stomach and provokes sweat."* Dose: one teaspoonful.⁸

⁴ PECK 1934, p. 47.

⁵ MS Quns Vig. 2.

⁶ BRADLEY 1730, p. 60.

⁷ BRADLEY 1730, p. 60.

⁸ PECK 1934, p. 47.



Drawer N

Drawer N

15	14	13
12	11	10
9	8	7
6	5	4
3	2	1

No N/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Cortex Guiaci	
2	2 Cortex Tamarisci	Cortex Tamarisis.
3	3 Cortex Peruvianus	Cortex Perurianus. [later changed to Peruvianus]
4	4 Cortex Esulae	
5	5 Cortex Capparis	Cortex Cuspar.
6	6 Cortex Granatorum	

7	7 Cortex Esulae	
8	8. Cortex Citri	
9	9 Cortex Winteranus	
10	[not labelled]	NN. [no transcription, later commented as: 'No substance']
11	11 Cassia Lignea	
12-15	[not labelled, paper boxes are empty]	NN. [for No Name] N.S [for No Substance]

No **N/6** and No **N/8** are not the barks of the trees but the peel of the fruits.

No **N/7** clearly shows a watermark in the paper.

No **N/10** contains dislocated material: a dark brown-reddish lump of a resin and a seed capsule, possibly from No T/2.



Drawer O

Drawer O

18	17	16
15	14	13
12	11	10
9	8	7
6	5	4
3	2	1

No O/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Conchites Echinitis clunicularis 988	Conchites
2	Concha Tasciata Jonst.	Concha Fasciata Tonst.
3	Concha Longa Rondel.	Concha Longa Rondeer.
4	Cochlea Cylindroides	
5	Trochus Pyramidalis Depressus	NS. [for : No Specimen] Trochi Pyramidalig Depressus
6	Trochus Pyramidalis	
7	[not labelled]	[no transcription]

8	Pecten	[no transcription]
9	[not labelled, paper box empty]	[no transcription]
10	Turbo Variegabus	[no transcription]
11	Turbinitis minimus fusileatus n. 363.	Turbines. ?
12	Turbines	
13	Cochlea Depressa una cum albo nautilusae m[.]nori	Cochlea Deprisia.
14	Nautilites complanator. N.276 Nautilitae minoris proplasma. 306	[no transcription]
15	[not labelled]	[no transcription]
16	Murex [or: Murcx] Marmoreus	[no transcription]
17	Purpura	[no transcription]
18	Neriles fl. [?]	[no transcription]

No **O/11**: On the outside of the paper box it says: 'Turbines calati'.

No **O/12**: On the outside of the paper box it says: 'Turbo longus'.

No **O/14**: On the outside of the paper box it says: 'Cochlea caelata'.

These paper boxes have been re-used.

No **O/18**: The large snail shell in this compartment might be the Purpura from No O/17.

Only No **O/1** and **O/14** in this drawer are fossils of snail shells.



Fig. 1 empty compartment for Purpura O/17

O/17 Purpura

The compartment is empty.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

The dyestuff contained in purpura snails was mainly used in cloth dyeing. The development of the purple colour under the influence of light was described in 1685 by COLE in a letter to the Royal Society.¹

¹ COLE, 1685.



Drawer P

Drawer P

12	11
10	9
8	7
6	5
4	3
2	1

No P/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Radix Saszapari[...] [paper lost] [on paper wrap of the roots: Rad. Sarsaeparillae]	R. Sarsaparilla
2	2 R. Anglica [not labelled on paper wrap of the roots]	R. Angelica
3	3 R. Eryngii [not labelled on paper wrap of the roots]	
4	4 R. Turpethi [on paper wrap of the roots: R. Turpethi]	

5	5 R. Calami Aromatici [on paper wrap of the roots: Rad. Calami Aromatici]	
6	6 R. Scorzonerae [without paper wrap]	
7	7 R. Aristolochiae Long. [without paper wrap]	
8	8 R. Mei Athamantici [not labelled on paper wrap of the roots]	
9	9 R. Costi dulcis [without paper wrap]	R. Costi Dilcis. [later changed to Dulcis] Cashmere Shawls.
10	10 R. Emulae – Campana. [without paper wrap]	
11	[not labelled] [without paper wrap]	NN. [for no name]
12	Radix [...] [ink completely faded] [without paper wrap]	NN. Alkanet.



Drawer Q

Drawer Q

20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No Q/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Radix Aristolochiae Ros.	Radix Aristolochiae.
2	2 R. Chinae nodosaee	R. Chinae rodocae.
3	3 R. Curcumae	
4	4 R. Galapii	R. Jlapii. [later changed to Talapii]
5	5 R. Indis	R. Iridis.
6	6 R. Hermodactyli	R. Homodactyli.
7	7 R. Chinae	R. China.

8	8 R. Bistortae	
9	9 R. Cyperi long.	
10	10 R. Cyperi Ros.	R. Cyperi Rot.
11	11 R. Ellebori alb.	
12	12 R. Tormentillae	
13	13 R. Mechoacannae	
14	14 Radix Behen alb.	R. ???
15	15 R. Behen Rubr.	[no transcription]
16	16 R. Dictamni alb. R. Dictamni albi	R. Dictamni alb.
17	17 R. Polypodii	
18	Salap 18	
19	19 Rad. Azaumatica [or : Claumatica]	R. ?
20	20 ⁹ Radix Acori Pharm= = macopolis. Galangae maj officin.	Radix Acori Pharm. Macopolis. Galangoe. Maj officin.

No **Q/2** is labelled twice with the same name.

No **Q/19**: On the inside (front) of the paper box it says: 'Radix Aau', which has been crossed out.

No **Q/20**: the second part of the inscription from 'Pharm=' onwards is in another handwriting.



Fig. 1 R. Curcuma Q/3

Q/3 R. Curcuma

The dried pieces of the root have a light brown shrivelled outer bark and are deep yellow inside. A few holes from insect damage can be seen.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

A proper botanical classification of Vigani's time can be found in GEOFFROY 1736:

*Curcuma & Terra merita Offic. Cyperus Indicus Dioscorid. Turmeric. We have two Kinds of Turmeric, the Long and the Round. The Long is most used in Physick, and is the Root of a Plant called Cannacorus Indicus sive Curcuma Officin.*¹

Composition

In dyeing and medicine the rhizome of the plant was used.

Provenance

GEOFFROY 1736 distinguished between round and long pieces of curcuma. Still in the present day curcuma is sold in both, round (from the large, central rhizome, in the size of a pigeon's egg) and long pieces (from the lateral rhizomes), which is usually Madras curcuma, whereas Bengal curcuma occurs in short cylindrical pieces.²

Trade

Vigani bought 2 ounces of *Rad. Curcum* (Lat. radix curcuma, curcuma root) from the druggist Colchester in London at 1 pence per ounce.³

¹ GEOFFROY 1736, p. 287.

² WREN 1975, p. 307 and SCHWEPPE 1992, p. 180.

³ MS Quns Vig. 4.

Use

GEOFFROY 1736 reported that turmeric was used both as a spice and a dyestuff in India, however, he provided no reference to its use as a dye in England or Europe.

*The Indians make use of both Kinds to season their Victuals, as the Europeans do Saffron; they employ it likewise in dying and painting Stuffs. The Long Kind is a good Stomachick, Antiscorbutick, and Antihysterick, and very proper in the Jaundice. The Dose is from twelve Grains to half a Drachm.*⁴

⁴ GEOFFROY 1736, p. 287.



Drawer R

Drawer R

18		17	16	15	
14	13	12	11	10	9
8		7	6	5	
4		3	2	1	

No R/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Ca[...] [...]os[...] [ink faded]	Cap. Mosch.
2	Castoram Russiae	[no transcription]
3	Ovarium c[...]nunae vivipara [not very clear]	[no transcription]
4	Vipera veneta.	Vipera.
5	5 Ichthyocolla	Ichthyocolla.
6	Chel. Cane [or canc]	Chcl. Conc.
7	Ossa de Corde Cervi	Ossa de ?
8	8 Scorpio	

9	9. Sanguis Sirci [or: Arci]	Sanguis Flirei.
10	Sperma Ceti	Sperma. [later added to: Sperma aceti]
11	Oc. Cancr.	Ocul Cancr.
12	12 Cochinella	Cochinella. Coccus Coch.
13	Sericum cucdum	Sericum Crudum.
14	C. Cervi rasp.	Corni Ceru Rasp.
15	Hippocampus Rondeletii	
16	Cinet [written on the parchment lid of the bottle]	Civet.
17	[not labelled]	
18	Cinci marini [ink faded]	Cincii Marino. ?

No **R/4**: The watermark in the paper is clearly visible. On the inside (front) of the box it says: "C[...]oi Ras:".

No **R/7**: There is another inscription on the inside (front) of the paper box, which cannot be read.

No **R/8**: The watermark in the paper is clearly visible.

No **R/10**: On the inside (front) of the box it says: 'Sperma Cet' and on the outside: '10 / Crele cancri'. This drawer has been re-used. It is unusual to find a number on the outside of a box. Could this box have come from another collection of Vigani's?

No **R/13**: On the inside (front) of the box it says: 'Lana Hispanica / Cosmet.'.

No **R/16**: This is the only sample within this drawer which is kept in a glass bottle with parchment lid.

The uninterrupted sequence of numbers from "1" to "12" within this drawer demonstrates that the division into small and double-size compartments is original.



Fig. 1 Cochinella R/12

R/12 Cochinella

The dried cochineal insects appear like brown-black shrivelled berries of up to 5 mm in diameter, hence the frequent confusion about the origin of this dyestuff and its frequent attribution to plant berries. The bodies are shiny, some with dark purplish red spots.

- MS Quns Vig. 2
- MS Quns Vig. 4
- MS Quns Vig. 7
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

GEOFFROY 1736 listed the following synonyms: *Coccinella Offic.*, *Coccus Indicus Tinctorius*, *Cochineal*.¹ The synonym of *Coccus Indicus Tinctorius* is doubtful, as will be demonstrated in the section on Trade and the discussion of prices.²

The word *Carmine* was reserved *for the colour for painters*.³ The term 'grain' was and is still often used for the dried body of a cochineal insect. This appearance of a grain to the bare eye caused great confusion over the origin of cochineal, whether it was a plant or an insect.

BRADLEY 1730 used the spellings *Cochinilla*, *Coccinilla*, and *Cocheneal* in his lectures.⁴

Composition

At Vigani's time it was not universally acknowledged that cochineal originated from scale insects. In 1693 Anthony VAN LEEWENHOEK⁵ described in a letter to the Royal Society London the gathering process of cochineal insects, which he believed to be

¹ GEOFFROY 1736, p. 370.

² Compare also *Cocculi Indi* K/6.

³ GEOFFROY 1736, p. 370.

⁴ BRADLEY 1730, p. 142.

⁵ VAN LEEWENHOEK 1693.

worms, which would mutate into flies. A merchant from Amsterdam had challenged these observations with the simple calculation that in a pound of cochineal there were on average 102,400 particles. He wondered where such an infinite number of animals could exist, knowing that at that time just one convoy of ships carried 200,000 pounds of cochineal.⁶

In 1704 VAN LEEWENHOEK reinvestigated cochineal particles with one of his microscopes. He discovered eggs inside them, and within the eggs small animals with their legs folded up against their bodies and an *instrument* on their head later to be used to receive nourishment from the host plant. Head and trunk were easily separable. In the preparation process of cochineal, the insects were rubbed and thus head and body separated from each other. The cochineal grain therefore only represented the body. The bigger the grain, the more fully developed the animal, and the more eggs (up to 200) were inside it, the more colour it contained. VAN LEEWENHOEK also observed that mature eggs held more red colour. He found eggs in all cochineal bodies, which he examined, and therefore concluded that there were only females, as was likewise to be found in shrimps, prawns, and eels.⁷

GEOFFROY 1736 saw that *this is altogether an Animal Substance, being a kind of Bug with six Legs, which sticks on the Opuntia major, or Prickly Pear, and several other Plants, from whence the Indians remove them to the Opuntia*.⁸

BRADLEY 1730 informs us that *in the Collection which Doctor Douglass has got together of Materia Medica, we find some of the Flies perfect among the Cochineal*.⁹

Provenance

Two main suppliers of cochineal were Jamaica and Central America.

BRADLEY 1730 taught that cochineal *is brought to us from the Spanish West-Indies. It is a very dear Commodity*.¹⁰ The dependence on Spain in the costly cochineal trade was likely to have been broken at around that time, because the species was found on British territory in North America. BRADLEY updated his students adding that *it is but*

⁶ These objections are included in VAN LEEWENHOEK 1704, p. 1614.

⁷ This account including some drawings of the microscopic observations can be found in VAN LEEWENHOEK 1704.

⁸ GEOFFROY 1736, p. 370.

⁹ BRADLEY 1730, p. 144.

¹⁰ BRADLEY 1730, p. 142.

*lately that we have discovered it (cochineal) in South-Carolina, and I have had as good from thence given me by Governor Boon, as that of the West-Indian Growth.*¹¹

Trade

Cochineal insects were sold in three sorts: small, middle and large grains. For a comparison in size it can be said that on average 20 small grains, 8 middle sized, or only 2 large grains weighed just about one gold grain. The largest were the most expensive since more colour could be extracted. Around 1700 every fleet brought up to 200,000 pounds of cochineal grains into the Dutch ports, according to a tradesman in Amsterdam.¹²

Cochineal was commonly bought from the druggist¹³, which is confirmed by Vigani's purchases.

He bought *Cochineale* at a price of 2 shillings and 4 pence per ounce from Colchester's drugstore, London, in April 1704.¹⁴ This cochineal cost over 4.5 times the price of kermes bought in the same order.¹⁵

If GEOFFROY 1736 is correct in saying that *Coccus Indicus Tinctorius* was a synonym¹⁶ for cochineal at the time, it is astonishing to see that in the same invoice *Coccul Indie* was sold at 6 pence per ounce, which is over 4.5 times cheaper than *Cochineale*. Porter sold *Cocc India* to Vigani only a month later at half of Colchester's price, namely at 3 pence per ounce.¹⁷ This huge discrepancy in the price level of true cochineale and what was called *Cocculus Indicus* most likely indicates that they were two unrelated items. This is supported by the fact that Vigani placed *Cochinella* correctly in the drawer with animal substances and *Cocculi Indi* K/6 together with fruits and seeds in drawer K.¹⁸

¹¹ BRADLEY 1730, p. 143.

¹² In an address to van Leewenhoek, to be read in VAN LEEWENHOEK 1704, p. 1614.

¹³ SMITH 1705, p. 97 for example referred to this source of supply for painters.

¹⁴ MS Quns Vig. 4.

¹⁵ compare *Chirmes Grana* K/7, chapter on Trade.

¹⁶ GEOFFROY 1736, p. 370; see Terminology, above.

¹⁷ MS Quns Vig. 2. The same price is repeated in the copy of the invoice from December of that year, MS Quns. Vig. 7.

¹⁸ What might give more weight to GEOFFROY'S statement is that he specified the *Coccus Indicus* as *Tinctorius*, which means that a dyestuff could be gained from it. However any statement on this subject is pending research into the true nature of *Cocculi Indi* K/6 and the possibly related *Cocculus Indicus Tinctorius* of Geoffroy. For further information see *Cocculi Indi* K/6.

The confection of the insects as a trading product was described by BRADLEY 1730:

*It is an Insect almost like the Lady-Cow when 'tis full grown, but as we receive it, it is only the Chrysalis of the Insect, or in the same State the Silkworm is, when it is enclosed in its Bag.*¹⁹

This description of the insect in a cocoon is further removed from the truth than VAN LEUWENHOOK'S descriptions and drawings of his discoveries under the microscope.²⁰ His samples derived also from the traded goods and not from a study of specially collected insects from nature.

Adulteration

Adulteration of batches of cochineal insects probably occurred to a much lesser degree than adulteration of the pigment carmine, for the simple reason that any additions could quite easily be detected between the dried bodies of the insects.

Properties

SALMON 1701 expressed his astonishment at the tinging power of cochineal:

*Cochenele will have its color far more heightned by spirit of Urine than by rectified spirit of Wine: and one grain of Cochinele in a good quantity of Spirit of Urine, being put into one hundred twenty six ounces of water, tinged it (although but faintly:) which amounts to above one hundred twenty five times its own weight.*²¹

The superior quality of South Carolina cochineal was praised in BRADLEY'S lectures 1730:

*This Method of curing them (the animals, see Manufacture below) was first told to Governor Boon by a Slave that had been a long Time in the Spanish West-Indies, and was there employed to gather Cochineal, and was the first that discovered it in Carolina, as the Governor told me, who at the same Time gave me some of the Carolina Sort, which I tried ad found to be as good as any that I had seen; and moreover, we may observe that by the Order of the Council, a Pound of two of it was used by a noted Dyer, and proved extraordinary.*²²

¹⁹ BRADLEY 1730, p. 143.

²⁰ VAN LEEUWENHOEK 1704.

²¹ SALMON 1701, p. 203.

²² BRADLEY 1730, pp. 143-144.

Manufacture

In Jamaica the scale insects, which lived on the prickly pear, or Indian fig, were suffocated with smoke from fires and collected in a cloth that was spread out under the tree. They were dried in the sun and then rubbed between the hands until the wings, legs, and head fell off. The trunks of the insects were put into shallow copper boxes until thoroughly dried.²³ In this way they took on the shape of grains, and were thus often mistaken for grains from plants.

BRADLEY 1730 specified that the cochineal insect

*(...) feeds upon the Opuntia, or Indian Fig, when it is in its Nympha State; but when we have it gathered for us abroad, it is somewhat inclosed in a Silken Web, which is separated from the Insect by Fire, which they blaze about the Plant till these Insects fall to the Ground, they are then gathered together and sifted, to discharge them of the Dust.*²⁴

GEOFFROY 1736 on the other hand supposed that the *bugs* were killed with cold water when fully grown and then dried.²⁵

Instructions on how to extract the dye from the dried bodies of the insects are numerous. A few excerpts may exemplify the process, which has been discussed widely in the literature of recent decades.

To draw a lake from cochineal a 17th Century English amateur's manual advised two ways. The first involved drawing it on shearings of wool (from which it could later be drawn to paint, the so called pezzetti-method):

Infuse in cold Water a pound of the Shearings of the finest Woollen Cloth a Day, and so press it well to take away the Oiliness of the Wool; then in this manner allom the Schearings, viz.

Take of Roach Allom four ounces, and two of crude Tartar finely powder'd, one of Cochineal; put these into a little Pipkin, with about four quarts of Water, and when this begins to boil put in the Flocks; let them boil over a gentle Fire half an hour, so take 'em off, and suffer 'em to cool six hours, then take 'em out, and wash 'em well in fair Water; and when the Water is well soaked in them by standing two

²³ Described in VAN LEEUWENHOEK 1693 and ,shorter, in VAN LEEUWENHOEK 1704, p. 1615.

²⁴ BRADLEY 1730, p. 143.

²⁵ GEOFFROY 1736, p. 370.

*hours, press it out, and let the Flocks dry. Evaporate the Water, and at the bottom you'll find a Sediment of a curious Tincture, as also in the Flocks.*²⁶

The second method produced a red tincture:

*Put a pound of Roch-Allom powder'd into a pottle of Aqua Vitae of the first running, and being well dissolved, put in an ounce of Cochineel in powder finely sifted: Do as in the former, and put the Materials in a Glass Body with a long Neck, shake it often, that the Aqua Vitae may be well tinctur'd, then let it stand four days, and so pour it into a clean glazed earthen Pan; in common Water dissolve four Ounces of Roch Allom, put that to the coloured Aqua Vitae in Hippocrates's sleeve, or a Woollen Bag, and for the rest order it as the other Cochineel Lake, and 'twill answer.*²⁷

The preparation of a crimson colour drawn from cochineal berries for colouring prints was as follows:

*A crimson colour made from half an ounce good cochinele (...). Take 30 or 40 grains, bruis them to fine powder, then put of the tartar lye as many drops as will just wet it and "make it give forth its colour" add a little water if it is too deep, then scrape some allum into it which will turn it into a crimson colour, strain it, and use quite soon, because if it stands too long it decays.*²⁸

Two experimental colours of *Chochenele* mixed with *Saccharum Saturni*²⁹ and *Cochenele* mixed with the *Lixivium of Quick-lime*³⁰ to make glorious purple colours, the latter even promoted as *of the greatest glory imaginable in the world*, are listed in SALMON'S *Polygraphice*.³¹

Preparation

The manufacturing process from the extracted dye to the pigment is treated under *Carmin* I/9, as well as the preparation of the paint from the pigment.

²⁶ K., pp. 105-106.

²⁷ K., p. 106.

²⁸ SMITH 1705, p. 97-98; Smith's tartar lye is explained in SMITH 1705, pp. 93, 94.

²⁹ I.e. sugar of lead, see Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

³⁰ Lixivium is a lye.

³¹ SALMON 1701, p. 203.

Use

BRADLEY 1730 and GEOFFROY 1736 both referred to cochineal as being used in dyeing of scarlet and for making carmine for painting purposes.³² GEOFFROY 1736 premised this with cochineal being used *in all the same Intentions with Kermes*.³³

Cochineal's medical application was in the cure of fevers, administered to promote sweating.³⁴

³² BRADLEY 1730, p. 143, GEOFFROY 1736, p. 370.

³³ GEOFFROY 1736, p. 370, see also *Chirmes Grana* K/7, Use.

³⁴ BRADLEY 1730, p. 144.



Drawer S

Drawer S

11	7	10	9
8		6	
5	2	4	
3		1	

No S/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Lignum Lentiscinum	Lignum Lentiseinum.
2	2 Lignum Aspalathum [box contains another piece of wood, wrapped in paper, which is labelled: Lig Nophror [or: Nephrrer] 1 n[...]i	Lignum Aspalathum
3	3 Lignum Colubrinum	Lignum Mophror [later changed to Colubrinum]
4	4 Lignum Juniperi	
5	5 L. Santalum album	

6	6 Lignum Rhodii	
7	7 Lignum Aloes.	L. Aloes Bitter Aloes.
8	8 L. Santalum citrinum	
9	9 Lignum Guiaci	L. Guiaci [crossed out] Guaiaac.
10	10 Viscus quercinus	Viscus Quercinus Mistletoe Oak.
11	11 L. Santalum rubrum	Lapis Santalam rubrum.

No **S/1**: contains only raspings of wood.

No **S/2**: The inscription appears twice on the inside left and right. The compartment contains a separate piece of wood, which is wrapped in paper. On the paper it says: "Lig. Nophror / 1 n[...]" [or: Lig. Nephrrer, the last letter cannot clearly be identified as "r"].

No **S/7**: contains only the piece of wood. The inscription appears twice on the inside left and right.

No **S/9**: contains only raspings of wood.

No **S/10**: contains stalks.

The uninterrupted sequence of numbers from throughout this drawer indicates that this division into small and double-size compartments is the original arrangement.



Fig. 1 L. *Santalum album*

S/5 L. *Santalum album*

This is a ~9 cm long piece of a pale wood with one side of brown black on the surface, which may be a stain or a coating on the surface of the log from which the piece was split. Incisions were made at one end of the piece. The raspings from the same wood are very long and spiral up along the grain.

- MS Quns Vig. 4
- MS Quns Vig. 8
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

The wood of *Santalum album*, Linn. (Fam. Santalaceae) is usually sold in the form of fine, yellowish raspings of fragrant odour.¹

For further reference see *L. Santalum rubrum* S/11.

¹ WREN 1975, p. 267.



Fig. 1 L. *Santalum citrinum* S/8

S/8 L. *Santalum citrinum*

A ca. 4cm long cube of a yellowish brown wood with straight and compact grain is placed on a bed of raspings of the same wood.

- MS Quns Vig. 4
- MS Quns Vig. 8
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further reference see L. *Santalum rubrum* S/11.



Fig. 1 L. *Santalum rubrum* S/11

S/11 L. *Santalum rubrum*

This sample displays three pieces of an intensely red coloured wood with long, slightly twisted fibres. The bottom of the compartment is filled with raspings of the same wood, which spiral up along the grain.

- MS Quns Vig. 4
- MS Quns Vig. 8
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

The 'L.' in Vigani's label stands for the latin word 'lignum', meaning wood.

Synonyms are 'Lignum Santalum Rubrum', 'red Saunders', 'Rubywood', 'Red Sandalwood', 'Santalum rubrum', 'Lignum rubrum'.¹

Composition

Red sandalwood, *Pterocarpus santalinus*, Linn. belongs to the family of leguminosae. Imported in billets, it is usually met with in the form of raspings of a deep purplish-red tint, which do not colour water when soaked in it. The wood is nearly tasteless and has no odour.²

Provenance

The tree grows in Southern India and the Philippines. BROWN 1702 reported from Malabar on a sample that he sent back to England: *Santalum rubrum* [...] grows 16 or 18 foot high and one thick: Here is neither fruit nor Flower, but I will get them by the next opportunity.³

Trade

The invoices do not tell us, whether wood and raspings could be bought separately. The prices for all three types were more or less the same, whether bought from

¹ BRADLEY 1992, p. 111 and WREN 1975, p. 267.

² WREN 1975, pp. 267, 268.

³ Brown's report was published by PETIVER 1702, p. 1057.

Colchester or from Porter. Vigani bought 1 ounce of *Red Sanders* from Porter for 1 penny and 2 ounces of *Lign Sant Rub* from Colchester for 3 pence.⁴

Use

The main application of red sandalwood was in cloth dyeing. In medicine sandalwoods were used to treat scurvy.⁵ Brown observed that the *Decoction of the* [red Sandal] *Wood expels Wind, eases Gripes and is something cooling, corrects choler and purifies the Blood. 'Tis where it grows in the woods [of Malabar] counted a general Panacea.*⁶

⁴ MS Quns Vig. 4, MS Quns Vig. 8.

⁵ BRADLEY 1992, p. 111.

⁶ Brown's report on East India plants was published by PETIVER 1702, p. 1057.



Drawer T

Drawer T

13	12	11	10
9	8	7	
6	5	4	
3	2	1	

↓ ↓

No T/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Flores Origan	
2	2 Flores Stachados	Flores Stachados Lambs Tongue.
3	3 Flores Stachad. E horto chels.	Flores Stoechados e horto. Chelsea Physic Gardens.
4	4 Flores Chamaemeli	
5	5 Balaustia	
6	6 Fl. R. R.	[no transcription, they are red rose petals]
7	Fructa Acaciae	Fructus Acaciae

8	Colocynth	
9	Fruct. Alkekengi	
10	R. Jallap by R: Bradley	
11	Rhaponticum by R. B.	
12	[empty, no paper box preserved]	[no transcription]
13	Vanillo sive Banollo	Vanillo Sive, Banillo.

No **T/3**: Chelsea Botanical Garden is mentioned.

No **T/8**: There is a watermark on the paper box.

No **T/10** and **T/11**: are later added by Richard Bradley.

No **T/12**: does not contain a sample or paper box but only pieces of wood, used to divide compartments. They carry pencil inscriptions: 'G. R. 1931' (or 1963).



Fig. 1 Fl. R. R. T/6

T/6 Fl. R. R.

These are dried purple, red, red-orange, or pink rose buds and rose petals which have kept their colour very well.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Fl. R. R. is possibly the abbreviation in Latin for leaves of roses, or rose petals, under which they were more commonly known. The invoice entry *1oz Fol Ros R 9 pence* in MS Quns Vig. 4 does suggest this interpretation.

Trade

Vigani bought 1 ounce of *Fol Ros R* from the druggist Colchester in London for 9 pence.¹

Preparation

In the chapter on experimental observations on vegetable colours SALMON 1701 gave a recipe to make a black, which reads as follows:

*A decoction of dried red Roses in fair water, mixed with a filtrated solution of blew Vitriol, makes a black color; this mixed with a little Aqua fortis, turns it from black, to a deep Red: which by affusion of a little Spirit of Urine, may be reduced straight to a thick and black color.*²

A colour change experiment used the tincture of red roses in pure water mixed with the solution of red lead (*Minium*) in *spirit of Vinegar*³ to produce a thick green. When *oyl of Vitriol*⁴ was added the liquor turned back into a high red colour with a white precipitate at the bottom.⁵

¹ MS Quns Vig. 4.

² SALMON 1701, p. 202.

³ Probably acetic acid.

⁴ See Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

⁵ SALMON 1701, p. 205.

Use

Rose petals only occur very rarely in painting treatises, mostly as experimental colours, as seen above. It would be interesting to investigate their use as colouring matter further, to establish whether they could actually be found in any type of artwork.



Drawer U

Drawer U

20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No U/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Minera Antimonii al.	
2	3 Antimonium Es Hungariâ.	Antimonium ex.
3	2 Antimonium es agris Cornub. In Anglia.	Antimonium ex aquis. Cornub in Anglia.
4	4 Regulus Antimonii ex Antim. Anglicano p Se.	
5	5 Stibium ex Antimonio Hungarico.	

6	5 Minera Bismuthi	Mineral Bismuthi
7	6 Bismuth.	
8	8 Lithargyrus argenteus, ex officinis novi-castr in Angliâ. oritur ex Separatione Argenti a Plumbo.	Litharggyus. Argenteus ex officinis Novi – Castr, in Anglia.
9	9 Aureus ex iisdem offic.	Aureus ex, iisdem officines.
10	10 Despumatio Plombi ex iisdem officinis.	
11	11 Fūligo ex iisdem offic. An Anliquorum Pmpholyx [or Pmpholyz]	Fuligo ex iisdem officinis Antiquonum.
12	12 Minera Cupri Anglicana in qua reperitur Lapis Lazuli	Minera Capri, Anglicana ni qua reperitier, Lapis Lazuli.
13	13 Cuprum ex agris Lancastr. in Angliâ	Capsum ex aquis, Lancastr, ni Anglia.
14	14 Cuprum Americanum.	Caprum Americanum.
15	15 minera Auri Hungarici	
16	7 Spelter	
17	Bristoll Stone	
18	Found in great balls among y ^e Fuller's earth near Rygate in Surrey	
19	Lapis Specularis	
20	[not labelled]	NN. [no transcription]

The paper boxes (and contents?) of No U/2 and U/3 have been exchanged.

No **U/6**: The number on the paper box is another '5' and number '6' is placed in No **U/7**.

Number '7' can be found in No **U/16**.



Fig. 1 Lithargyrus argenteus U/8

U/8 Lithargyrus argenteus

The exact description on the paper liner is: *Lithargyrus argenteus, ex officinis novi-castris in Angliâ. oritur ex Separatione Argenti a Plumbo*, which translates to 'Litharge of silver from the mines of Newcastle in England, gained in the separation of silver from lead'.

These are white and slightly grey jagged crystals, with some clusters up to 3mm in diameter. These clusters appear to be accumulations of small irregular crystal plates.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Litharge of gold and litharge of silver were the two common names for these by-products of the lead and silver refining industries.

GEOFFROY 1736 pointed to the long terminological tradition to distinguish between the two sorts of litharge:

*Litharge, Lithargyrus sive Spuma Argenti Officin. Was of two Kinds among the Greeks, differing only in Colour. One was Yellow, called Chrysitis, or Lithargyrus Auri; the other White, called Argyritis, or Lithargyrus Argenti; and the same Distinction is still kept up.*¹

Composition

Litharge is a form of Lead(II) oxide [PbO].² It may contain traces of copper oxide and silver from the manufacturing process.³

¹ GEOFFROY 1736, p. 244.

² See massicot, which is also [PbO], but of different structural form. Massicot samples in the cabinet are: *Masticote deep* I/28, *Yellow Masticot* I/30, and *Pale Masticote* I/32.

³ PEY 1998, p. 491.

Provenance

Vigani's sample originates from English lead mines. GEOFFREY 1736 said of these that they were the richest sources for lead amongst European countries. Here the ore could be found *disposed stratum super stratum* with charcoal. The charcoal was set on fire to melt the metal so it would run out and could thus be extracted.⁴

Trade

Litharge does not appear in the preserved invoices that relate to the purchases for Vigani's cabinet.

Apparently the tradesmen used the terminology of litharge of silver or litharge of gold to deceive their customers in order to justify higher prices. GEOFFROY 1736 warned that *the Dealers in these Commodities have given out that the one was made from Silver, the other from Gold; whereas the Difference consists only in having been more or less exposed to the Fire, or in having a greater or less Mixture of Copper.*⁵

Manufacture

GEOFFROY 1736 described two very different ways of manufacturing litharge. Both involved lead. In the first case the metal got calcined. In the second process the lead acted as a purifier of silver ore. It became molten and swam "vitrified" on the molten silver, then ran off the side and turned into litharge. In both cases GEOFFROY described it as an oily fluid. It would be interesting to analyse chemically the two processes and compare the end result in terms of the structural composition of the litharge product.

The process of calcining reads like this:

*This Metal [lead] is easily burnt and reduced to an ash-coloured Calx, which by a stronger Degree of Fire turns Yellow, and then Red, being in that State termed Minium. By still increasing the Fire, this Substance melts into an Oily Fluid, which being exposed to the cold Air, concretes into a reddish or yellowish Mass consisting of several thin pellucid Laminae, soft to the Touch, though compact, which is termed Litharge.*⁶

Litharge occurred as a by-product in the silver refining industry like this:

⁴ GEOFFROY 1736, p. 240.

⁵ GEOFFROY 1736, pp. 244-245.

⁶ GEOFFROY 1736, p. 241; compare also the manufacture of massicot by the same author, detailed in *Masticote* deep I/28, Manufacture.

It is commonly made in those Furnaces in which Lead is separated from Silver, or where Silver is refined by Lead from the other Metals mixed with it.

When the Workmen design to separate Silver from the Lead or Copper contained in the same Oar with it, they First make a kind of Trough of Bone-Ashes, in which they melt a great Quantity of Lead; and into this melted Lead they throw the Silver Oar to be purified, and continue to blow with Bellows till all the Lead, mixed with the Copper, or Lead, contained in the Silver, swims on the melting pure Silver, like Oil. Then they gradually blow this Lead towards the Sides of the Trough, and afterwards cutting these Sides, the Vitrified Lead runs down to the Ground, and there becomes Litharge, sometimes of a Gold, sometimes of a Silver Colour;⁷

This latter process was also briefly mentioned by BRADLEY 1730 in his lectures on Vigani's and Dr Addenbrooke's cabinets.⁸

Preparation

SMITH 1705 recommended litharge as a drier in linseed oil: some colours took too long to dry if only tempered with linseed oil, therefore it might have been necessary to use a specially prepared oil, such as:

To a quart of linseed-oyl, add two ounces of the litharge [sic!] of Lead, which may be had at every drugser's shop (some use red lead) powder it finely before you put it to the oyl, when you have mixt it, set it on the fire in an earthen-pan, and let it boyl for near an hour, more or less, till the oyl be grown fat, or almost of the thickness of treacle that comes from sugar; then set it on the fire with a lighted paper, and stir it well while burning, then putout the flame after it hath burnt a minute or two, and let the matter stand till it be thoroughly cold, and the litharge well settled to the bottom, then pour off the clear oyl, and keep it for use in a bladder close tyed up, or for want of that, in a glass bottle.⁹

One part of this drying oil, or fat oil as SMITH also called it, should be mixed with three parts of plain linseed oil to make the paint dry sooner and ad lustre and gloss as if varnished. The big disadvantage of litharge as a dryer, he admitted, was that it turned the drying oil into a deep red colour. This would affect mixtures of the drying oil with

⁷ GEOFFROY 1736, p. 244.

⁸ BRADLEY 1730, p. 19.

⁹ SMITH 1705, pp. 37-39.

white or blue pigments, in that the resulting paint would have an undesired yellow or green hue.

Use

The common application in painting of litharge is its functioning as a drier in oilpaints. Disadvantages of its admixture to linseed oil are mentioned above.

SMITH 1705 was of the opinion that even though *umber*, *red lead*, and *verdigrease* do not need the addition of drying oil it could be added for lustre. He referred here to the drying oil, or fat oil, for which the preparation with litharge is described above.¹⁰

Litharge could also be found in some rather rare, or 'curious' secret recipes. For example in glass painting to make a fine carnation colour *litharge of silver* was an ingredient together with *Jet*, *Tin*, *Gum*, *Scales of Iron* and *red Chalk*.¹¹ The same treatise contained a recipe to make horn look like tortoise shell. The applied mixture to create this effect contained litharge of gold among many other ingredients.¹² *Letharge of Gold* was also an ingredient in a very complex mixture for a gold size with *Gum Anima* and *Gum Espaltum* as Binding Media to lay on gold in japanning work.¹³

GEOFFROY 1736 lets us know that litharge dissolved in oil was the basis of most plasters, making use of its drying, detergent, and gently astringent properties.¹⁴

Among the many applications in the crafting industry litharge could be the source of lead in the manufacture of glass of lead (Lat.: vitrum saturni).¹⁵

The chemically literate would understand that a way to produce *Praecipitatus Saturni*, a milk coloured sediment, was to mix *Litharge* with distilled vinegar, upon which the precipitate¹⁶ fell out. This precipitate was *exceeding useful* for glass works, particularly red enamel, wrote SALMON 1701.¹⁷

¹⁰ SMITH 1705, pp. 37-39; see also Preparation.

¹¹ K., p. 107.

¹² K., p. 116.

¹³ ARTLOVE, 1730, p. 19.

¹⁴ GEOFFROY 1736, p. 245.

¹⁵ SALMON 1701, pp. 748-749.

¹⁶ Praecipitatus Saturni translates to precipitate of lead. Salmon described the process as [...] a noble preparation of Saturn, and tho' it is not properly the Spirit, yet it is that which contains the Spirit [...]. SALMON 1701, p. 750.

¹⁷ SALMON 1701, pp. 749, 750.

Litharge, and this excited hope in the keen drinker, was also used to adulterate wine when it had turned sour, in order to sweeten it. Having enjoyed this cocktail the consequences were less appealing: the drinker would suffer from spasms and suffocation.¹⁸

A few other examples of the use of litharge in the early 19th Century are mentioned by PEY 1998, who described two samples, 'Goudglit' and 'Zilverglit', in the Hafkenscheid collection.¹⁹

¹⁸ GEOFFROY 1736, p. 243.

¹⁹ PEY 1998, p. 491.



Fig. 1 Aureus ex iisdem offic.
U/9

U/9 Aureus ex iisdem offic.

Translated this means 'golden from the same mines'. The description refers to the label of the sample in the adjacent compartment U/8. Therefore U/9 represents litharge of gold from the mines of Newcastle in England.

The shape of the crystals is similar to those in U/8, however they contain red and pink particles, and some with a gradually stronger blend of red.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further description of litharge refer to *Lithargyrus argenteus* U/8.



Fig. 1 Minera Cupri Anglicana in qua reperitur Lapis Lazuli U/12

U/12 Minera Cupri Anglicana in qua reperitur Lapis Lazuli

This sample according to the description represents a piece of English copper ore in which, as the label says, '*Lapis Lazuli*' typically occurs. The small piece is 1.7 cm across in its longest dimension. It is brown black with a metallic shine, sharp edges, and contains some silver coloured cubic shaped metallic inclusions.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Knowing from sample *L. Armenus sive L. Lazuli al.* F/18 Vigani may not be entirely aware of the difference between lapis lazuli, a sulphur-containing sodium aluminium silicate, and azurite, a basic copper carbonate. It is quite probable that he used the wrong term for this blue mineral, which was mined together with copper ores. This mineral is more likely to be azurite.

If the mineral in English copper may be azurite, this would indicate a local source of azurite from where it may have been traded to English artists. This source has not previously been mentioned in the standard works by HARLEY 2001¹ and GETTENS 1974² and needs further investigation.

¹ HARLEY 2001, pp. 46-49.

² GETTENS 1974, see also GETTENS 1993c.

Drawer W

14		13
12	11	10
9	8	7
6	5	4
3	2	1

No W/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Mater Margaritarū	[no description]
2	Concha Veneris	[no description]
3	Conchites I	Cast of Lamellibranch, Sub class Mollusce. [no 3-11: the names given are probably descriptions, because they are in the comment-row of the Inventory; the boxes are probably not labelled]
4	II	Echinoid. [comment]
5	III	Echinoids. [comment]

6	IV	Echinoids. [comment]
7	V	Iron Pyrites Marcasite. [comment]
8	VI	?
9	VII	Ammonite Calcite or a Nautiloid. [comment]
10	VIII	Echinoids. [comment]
11	Lapis Spinalis	Bachtone – Ichthyosaurus. [comment]
12	[not labelled]	[no description]
13	Tophus Bovinus	Tophus Bovinus. T
14	[not labelled]	Equus Caballus Horses Tooth. [comment]

It appears as if in the original version of the layout of this drawer the samples in W/3 to W/10 were all samples of “conchites”, following the original labelling from “Conchites I” to “VIII”.

Whether the iron pyrites in W/7 were mistaken for a conch, which is unlikely, or put in that place at a later time, after the original sample had been lost, cannot be established.

The sample in W/11 looks like a fossilised vertebra.

W/12 contains a large hairball with a hard thin coating, perhaps from the stomach of a cow.

The sample in W/13 is a white coral, which is obviously misplaced since the label refers to some animal substance from an ox or cow.

W/14 contains a large tooth.



Drawer X

Drawer X

14		13	12	11	
10	9	8	7	6	5
4		3	2	1	

No X/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Dictamnus Creticus	Dictamnies Creticus.
2	Carcina [or: Carcirta]	Cascuta Dodder.
3	Fungus Sambuci.	[no transcription; comment: '3. – 14. Unknown.']
4	1 Pou[.] R montanum	[no transcription]
5	Isla[.]andba[...] [ink faded]	[no transcription]
6	Coram[.]a [ink faded]	[no transcription]
7	[...]ug Visuaga ga[.]rd & Parkinson [...]sish [ink faded] Toothpock	[no transcription]

8	Ichananth [or: Schananth] [on a separate piece of paper: 19 Scananthus]	[no transcription]
9	Ra[...] Tu[...] [ink faded, paper lost]	[no transcription]
10	[...]tera[.]h [ink faded]	[no transcription]
11	[paper lost, not labelled]	[no transcription]
12	[paper lost]	[no transcription]
13	N[...]a [...]ica [ink faded, paper lost]	[no transcription]
14	[...]ica [paper lost]	[no transcription]

Drawer Y

Drawer Y

20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

No Y/...	Transcription from Labels in Cabinet [+ Remarks]		Name according to Old Inventory [if differing from Transcription]
1	[CP]	Tamarinds 2oz	Tamarinds.
2	[CP]	Suger of Leade	Sagor of Leade.
	[CP]	Pil: Stom: cit Gum: R 2dram	Pil. Stom. Et Gum. R. zii
3	[CP]	Ung't: Basilicon 2oz	Unglt. Basilicon. zii.

4	[CP]	Balsam: Lucatell 2oz	Balsam Lucatell See Grays Supplement
	[P]	Troch. R	[see comment below]
5	[B]	[letters on label cannot be identified]	[see comment below]
	[B]	[letters on label cannot be identified]	[see comment below]
	[B]	Spec: Aromat Rosat: [label separated from bottle]	Spec. Aromat Rosat. zii.
	[B]	T[.]h: Rad: Ari comp: R [label separated from bottle]	Pulv. Rad. Ari. Comp R. zii
6	[CP]	[...]uent: ethaea. 2oz	[see comment below]
7	[CP]	Elect : Caryocos [.]n: 2oz	Elect Caryocostin. zii
8	[CP]	El: [...] [maybe: Vas] cord: [ink faded] 2oz	[see comment below]
9	[CP]	El: De Bau: [or: Bacc:] Laur. 2oz	El de Baccis Laurd zii.
10	[P]	[...]m[.] [ink faded] Ox feroc: 2oz	Emplastr Oxycroc zii.
	[CP]	Antihecticum Poterii	Antihecticum.
	[CP]	Extract Rudii - R	Extract Rudii. R. zii.
	[Label]	[on a separate label, without container:] 'Sacra 2 r: Pi[...]	[see comment below]
11	[CP]	[not labelled]	[see comment below]
12	[CP]	Ung ^t : E Gum : Elemi 2oz	Unglt Gum Elvmi [later changed to Elemi] zii
13	[CP]	Ung ^t Aegyptiacū 2oz	Unglt Egyptiacu. [later changed to Egyptiacum]

14	[P]	Powdered Myrrh of Carlisle	Powdered Myrrh of Carlisle
	[CP]	Pil: Coch: Major: R 2dram	Pil. Coch Major. R. zii
15	[WB]	Troch: Alkandal:	Troch Alhandal.
	[WB]	Troch: de Myrhae	Troch de Myrhee.
	[WB]	Troch : de Carabe R	Troch de Carabe.
	[CP]	Pil : Starkaei : [or Starkcei:] Sen [.] Mathaei R 2dram	Pil Starkaco [later changed to Starkace]
	[CP]	Pil: E: Styrace R 2dram	Pil. E. Styrace. R. zii.
16	[P]	Emplast: Paracels: 2oz	Emplast. Paracels Compa. zii. Emplast Paracels. zii.
	[P]	Emplast Adherniam R 2oz	Emplast Adhesion. R. zii
	[P]	[not labelled; it is an emplastrum, wrapped in parchment or the like]	[no transcription]
17	[CP]	Conf : Al. korm: S: M: $\frac{1}{2}$ oz	Cons. Alherm. S.M. zss.
18	[P]	Emplast: Diackyl: Simp: 2oz	Emplast Diachyl. Simp. zii.
	[P]	Empl [.]milog [black spots from contents cover letters]	[see comment below]
	[P]	Empl: E : Mucilag: 2oz	Empl. E. Mucilag. R. zii.
19	[CP]	Num Mercur dulcis [.]	[see comment below]

	[P]	Troch. Fledychr. [or: Hedychr.] R	Fledychr.
	[P]	Troc[.] [...] Sc[...]le[.] [ink faded, paper lost]	[see comment below]
20	[CP]	Unguent : Apostolor : 2oz	Unguent Apostolor. zii.

[B] = sample contained in a glass bottle

[CP] = sample contained in clay pot

[P] = sample contained in paper wrapping

[WB] = sample contained in wooden box

The typescript inventory comments on 38 specimens in a completely different order than the one we can find in the cabinet today. 6 specimens are marked '?'. 'Emplast Paracels' occurs twice, one of those with the addition: 'Compa.' (no. 10 and 29 in the typescript inventory)

3 specimens are given the following transcription:

3. Pulv e Chel. Cancr. Comp. R. zii. Comp powder of Chel Canotorum,
claws of Crabs.

9. Pulv Comitris, Warvicensis R. zii

15. Laurd Lond in R. zi

These names cannot be identified with today's transcription of substances.



Drawer Z

Drawer Z

17	16	15	14	13	12	11
4	10	9	8	7	6	5
	3		2		1	

No Z/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	10 Tacamahaca	Taccanihacca Resin [later changed to Taccamahacca]
2	2 Radix Contragorvae [or: Contragervae]	[no transcription]
3	3 Raddix Phu	R. Phd. Spikerard of Bites [later changed to Spikenard of Bitle]
4	4 R. Ellebor nigr.	Radix Ellebori nigri.
5	R. Azari.	
6	Zedoria	Zedoaria.
7	Rubia Tinctorum	Rubia Tinctora.

8	R. Cassa minaris	[no transcription]
9	R. Pyreth[...]och [paper lost]	Radix Pyrethrum.
10	R. Gentianae	Radix Gentiana.
11	R. Galangae minoris	Radix Galangce. Minoris.
12	R. Rhabarbari	
13	Specacuannha	Ipecacuannha Carthegena.
14	Rad. Rhapontici	Rad. Phapontici. [later changed to Rhapontici]
15	R. Filipendulae	[no transcription]
16	R. Serpent. Virginianae	Serpent Virginiaroe. [later changed to Virginianae]
17	11 Balsamum Tolutanum	Balsamum Tolutarum. [later changed to Tolutanum]



Fig. 1 Rubia Tinctorum Z/7

Z/7 Rubia Tinctorum

The thin crooked strands of root are dark brown bark, easily detached, and brown red inside. They do not seem to be affected by insect damage.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Rubia tinctorum, Linn, Fam. Rubiaceae¹ is known as a pigment under the name 'madder'. The habitat of the rubia plant is Southern Europe and the Caucasus.²

Rubia tinctorum and madder have been subject to extensive research, of which major works include KIRBY 1996, WHITING 1988, CARDON 2000 and CHENCINER 2000. For this reason the author decided not to go into more detail with regard to its application in fine art.

Vigani bought 2 ounces of *Rad Rub Tintor* for 3 pence from the druggist Colchester in 1704.³

Although not generally used in medicine, *rubia tinctorum* has at various times been reputed to be effective for promoting menstrual and urinary discharges. Madder had been used as a remedy in liver diseases, jaundice, gall, and spleen complaints. Roots, leaves, and seeds are all reputed to be medicinally active.⁴

¹ WREN 1975, p. 193.

² WREN 1975, p. 193.

³ MS Quns Vig. 4.

⁴ WREN 1975, p. 193.



Drawer 1

Drawer 1

36	35	34	33	32	31
30	29	28	27	26	25
24	23	22	21	20	19
18	17	16	15	14	13
12	11	10	9	8	7
6	5	4	3	2	1

No 1/...	Transcriptions from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	Styrax Collat [or: Coclat] 2oz	Storax Collat. 28
2	Succus Kermis [or: Koimis] 2oz	Succus Koimis. 28
3	Oī La[...]ū [ink faded] 2oz	Oī Laur. 28
4	Bals Cipivi 2oz	Bals Capivi. 28
5	Oī Palmelio 2oz	Oī Palm.

6	Ol Palma	NN. [no transcription]
7	Assafoetid	Assafoetida
8	Terebin Strasb. 2oz	Terebinth Strsb.
9	Tereb[...] [ink faded] Com- 2oz	[no transcription]
10	Venice Turpentine 2oz	Venice Turpentine.
11	Venic Turpent. 2oz	Venice Turpentine.
12	[not labelled]	[no transcription]
13	Tereb E Chio. 1oz	Terebinth Chio.
14	Tereb i E Cypri [.]oz	[no transcription]
15	Trageum	Trageum.
16	Ba E. Gillead 2oz	Balm Gilead.
17	[box empty, no labels]	[no transcription]
18	[not labelled]	[no transcription]
19-24	[boxes empty, no labels]	[no transcription]
25	[ink completely faded]	[no transcription]
26-30	[boxes empty, no labels]	[no transcription]
31	Bals Peruv [or: Peruo] 2[.]	Bals Peruv.
32-36	[box empty, no labels]	[no transcription]

The Inventory starts with: '1. Bals Peruv', '2. H. P', '3. Storax Collat' (and then more or less in the order which is listed in the table). 'Bals Peruv' is today in box 31. It is obvious that the bottles have been moved after the Inventory was made. No '2. H. P.' of the Inventory cannot be attributed to any of the labels still preserved today.



Fig. 1 Succus Kermis 1/2

1/2 Succus Kermis

A dark red mass that is purple red close to the bottom of the jar. The colour appears to be packed around white bodies. The label suggests that the colouring matter may come from kermes. GEOFFREY 1736 referred to the use of kermes in a syrup (see below).

- MS Quns Vig. 2
- MS Quns Vig. 7
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

This preparation most likely contains kermes and may be used to create a reference for kermes from around 1700 in chemical analysis.

Vigani bought *Succus Kermis* and again *Succ Kermes* at a price of 5 pence per ounce from Francis Porter in London in March 1704 (1703 in the old system).¹ The same price is noted in the repeated bill from December of the same year.²

GEOFFROY 1736 mentioned the use of kermes in the *Syrup and Confection of Alkermes*³, a medicinal preparation, which may be related to Vigani's *Succus Kermis*.

For more information on kermes see *Chirmes Grana* K/7.

¹ MS Quns Vig. 2

² MS Quns Vig. 7

³ GEOFFROY 1736, p. 370



Drawer 2

Drawer 2

48	47	46	45	44	43	42	41
40	39	38	37	36	35	34	33
32	31	30	29	28	27	26	25
24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

No 2/...	Transcriptions from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1	1 Bals. Peru	
2	2 Bals. Capivi	Bals Capivie.
3	3 Bals. Americ. Ūl.	Bals Amerie
4	4 Bals. Gilead.	
5	5 Ol. Pet. Alb.	

6	6 Ol Petr. Nigr.	
7	7 Ol Anisi	
8	8 Ol Terebinth.	
9	[ink faded]	[no transcription]
10	10 Ol Caryopliae [?]	Caryoplyt. Ol.
11	11 Ol Anisi	
12	[not labelled]	[no transcription]
13	[not labelled]	[no transcription]
14-18	[not labelled]	[no transcription]
19	Oleum G[...]niae	[no transcription]
20-21	[not labelled]	[no transcription]
22	Syr Balsam R	[no transcription]
23-25	[not labelled]	[no transcription]
26	[ink completely faded]	[no transcription]
27	[...] f orche[.]a[...] [ink faded]	[no transcription]
28-33	[not labelled]	[no transcription]
34	[ink completely faded, half the label is lost]	[no transcription]
35	[not labelled]	[no transcription]
36	[not labelled]	Sulphur Antinon.
37-39	[not labelled]	[no transcription]
40	[ink completely faded]	[no transcription]
41	Bezoar Minerale [label fell off; is kept separately in the box]	[no transcription]
42	[label lost]	[no transcription]
43	[not labelled]	[no transcription]
44	[label lost; on the remaining piece:] -lic	[no transcription]
45-46	[not labelled]	[no transcription]
47	[label lost; on the remaining piece:] -Si	[no transcription]
48	[glass bottle with inprint:]	[no transcription]

	[front:] BY THE KINGS ROYALL PATENT GRANTED TO [back:] ROB^T TURLI NGTON FOR HIS INVENTE^D BALSOM LIFE [left side:] LONDON [right side:] IAN.^Y 26 1754	



Drawer La1

Large Drawer La1

48	47	46	45	44	43	42	41
40	39	38	37	36	35	34	33
32	31	30	29	28	27	26	25
24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

No La1/...	Transcription from Labels in Cabinet [+ Remarks]	Name according to Old Inventory [if differing from Transcription]
1-4	[empty]	[no transcription and not mentioned in Inventory]
5	[not labelled]	[no transcription and not mentioned in Inventory]
6	Prus. Oils Paf [.] [ink faded]	[no transcription and not mentioned in Inventory]
7-8	[not labelled]	[no transcription and not mentioned in Inventory]
9-12	[empty]	[no transcription and not mentioned in Inventory]
13-14	[not labelled]	[no transcription and not mentioned in Inventory]
15	Acet. Bargtes ar [.]	[no transcription and not mentioned in Inventory]
16	[not labelled]	[no transcription and not mentioned in Inventory]
17-20	[empty]	[no transcription and not mentioned in Inventory]

21	[not labelled, bottle empty]	[no transcription and not mentioned in Inventory]
22	[empty]	[no transcription and not mentioned in Inventory]
23-24	[not labelled]	[no transcription and not mentioned in Inventory]
25-48	[empty]	[no transcription and not mentioned in Inventory]



Drawer La2

Large Drawer La2

22	21	20	19	18	17
16	15	14	13	12	11
10	9	8	7	6	5
4	3	2	1		

No La2/...	Transcription from Labels in Cabinet [+ Remarks]		Name according to Old Inventory [if differing from Transcription]
1	[WB]	Venice Vipers 18 4 -	Venice Vipers.
		[not labelled, a stone]	[no transcription and not mentioned]
2	[P]	Seedlack & Shellack	Seed Lac & Shell Lac.
	[P]	~~M~~ Arrow Root	Arrow Root.
3	[P]	S. Benzoin	[no transcription and not mentioned]
	[P]	Arsenic	Arsenic
	[P]	Lapis Calaminari ^s	Lapis Calaminari.
	[P]	Soap Cerate	Soap Cerate.
	[P]	Gypsum Ponaerosum [on side of package:] Gypsum Ponder.	Gypsum Powderosum.
4	[P]	Allum	Allum.

	[P]	Arnotto δ	[no transcription and not mentioned]
	[P]	Assafaetida [and:] Finest Assafaetida	Assafoetida. [finest]
	[P]	Gum Tragacanth 'Exceeding fine'	Gum Tragacanth. Exceeding Fine.
5		[not labelled, a stone]	[no transcription and not mentioned]
	[WB]	indog [or: indos] Cood	[no transcription and not mentioned]
6		[not labelled, fossil]	[no transcription and not mentioned]
		[not labelled, metal with crystal structure]	[no transcription and not mentioned]
7		[not labelled, yellow transparent resin]	[no transcription and not mentioned]
		[not labelled, 2 stones, one of them split in halves]	[no transcription and not mentioned]
8	[P]	Bark of Sassafras [on the side of the package:] Sassapras	Bark of Sasafras
	[P]	Shell Lac [on the side of the package:] Shell Lac	Shell Lac.
	[P]	White Lead [on the side of the package:] White Lead	White Lead
9	[P]	Purified Zinc [on the side of the package:] Zinc	Purified Zinc
10	[P]	Salt Petre [on the side of the package:] Salt Petre	Salt Petre.
	[P]	Sperma ceti EsP [handwriting see notes at end of table]	Spernacete.
	[P]	Zaffre	[no transcription and not mentioned]
11		[not labelled, cast metal]	[no transcription and not mentioned]

		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
12		[not labelled, red stone]	[no transcription and not mentioned]
		[not labelled, whitish, transparent mineral]	[no transcription and not mentioned]
		[not labelled, an ore]	[no transcription and not mentioned]
		[not labelled, a stone with crystals]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, 2 small pieces of metal foil]	[no transcription and not mentioned]
13		[not labelled, metal foil, several times folded]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, cast metal]	[no transcription and not mentioned]
		[not labelled, white mineral with long needles]	[no transcription and not mentioned]
14		[not labelled, cast metal stick]	[no transcription and not mentioned]
	[WB]	Deep-Stroron [or: Strown] Smalt 1oz	Deep Stronn Smalt 1 8.
	[WB]	Flatt Oaker 1oz	Flatt Oaker 1 8.
	[WB]	Jamaco Endico 1oz	Jamaico Endico 1 8.

15	[WB]	Roman Oaker 1oz	Roman Oaker. 1 8.
	[WB]	French Oaker – 1oz	French Oaker. 1 8.
	[WB]	Boll – Almenick 1oz	Boll – Almenick. 1 8.
	[WB]	Burnt Umber 1oz	Burnt Amber 1 8.
	[WB]	Cullens Earth 1oz	Fullers Earth.
	[WB]	Vine Black 1oz	Fine Black.
	[WB]	Ivory Black 1oz	Ivory Black. 1 8.
	[WB]	Blew Black 1oz	Bleu Black. 1 8.
	[WB]	fine – Roset 1oz	Fine Roset.. 1 8.
	[WB]	Ross – Pink 1oz	Rose Pink. 11 8.
	[WB]	Super fine Calsind Smalt 1oz	Super fine Calsind smalt 1 8
	[WB]	Sapph Green 1oz	Sapph Green. 1 8.
	[WB]	Crimson Culler Spekel's	Crimson Culler Speckets.
	[WB]	Salop	Salop 1 8.
16	[P]	Manganese [on the side of the package:] Manganese	Manganese.
17		[not labelled, large white transparent crystal]	[no transcription and not mentioned]

		[not labelled, metal in the shape of a long needle]	[no transcription and not mentioned]
18		[not labelled, metal in crystal shape]	[no transcription and not mentioned]
		[not labelled, brown stone]	[no transcription and not mentioned]
		[not labelled, greenish-yellowish stone]	[no transcription and not mentioned]
19		[not labelled, metal ore]	[no transcription and not mentioned]
		[not labelled, transparent, whitish crystal]	[no transcription and not mentioned]
		[not labelled, semitransparent, white mineral]	[no transcription and not mentioned]
		[not labelled, yellowish stone]	[no transcription and not mentioned]
		[not labelled, dark brown glass.]	[no transcription and not mentioned]
20	[P]	Manganese EsP ?MnO ₂	[no transcription and not mentioned]
21	[NP]	[not labelled, a powder]	[no transcription and not mentioned]
22	[NP]	Oyster Shell [on the side of the package:] Oyster Shell	Oyster Shell.

[P] = sample contained in paper wrapping

[NP] = sample contained in newspaper wrapping

[WB] = sample contained in wooden box

The Old Inventory lists under '(a) Packets Etc.,' the transcriptions 'Manackanite' and 'Wootz', which could not be identified with today's transcriptions of preserved labels. All the materials, which are not labelled (for instance all the metals), are not mentioned in the Old Inventory.

No La2/10 Sperma ceti and La2/20 Manganese are signed 'EsP', the initials of Ernest Saville Peck, possibly in his handwriting if compared with his autograph note MS Quns Vig. 15.



Fig. 1 Gypsum Ponaerosum
La2/3

La2/3 Gypsum Ponaerosum

This sample is wrapped in paper and tied up with a cord. The paper is much darkened and has become brittle.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Under the policy of minimalist intervention the paper wrapper was not opened to inspect the sample. This would only be justified in connection with scientific analysis of the substance, which would be highly desirable in order to determine what material *Gypsum Ponaerosum* was in Vigani's time.¹

¹ The mineral database URL www.mindat.org lists 'gypsum ponderosum' as synonym with baryte, referencing to sources of the late 18th and 19th Centuries.

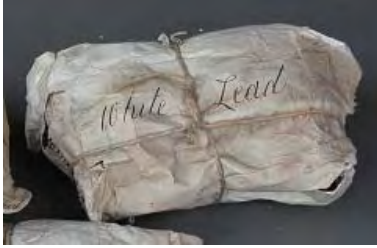


Fig. 1 White Lead La2/8



Fig. 2 White Lead La2/8, open package



Fig. 3 White Lead La2/8, Lead plates with lead white crust



Fig. 4 Dating of the newspaper: the advertised draw of the ensuing English State Lottery 1783.

La2/8 White Lead

Wrapped in newspaper, this sample consists of pieces of lead foil with a white layer, the product of corrosion, on either side. The brittle plates of irregular shape vary from just a few millimetres to up to 3 cm in diameter. The white crust easily breaks away and decays into powder of a bright, cold white colour.

The newspaper is most likely from 1783 (compare the announcement of the draw of the Irish and English State Lottery in Fig. 4). Whether the sample inside is from this period or from Vigani's time, cannot be established. Products of the names 'white lead' or 'lead white' do not occur in the invoices related to the cabinet. Production of this material by Vigani is a possibility, however we do not find an indication of such a recipe in his course work. Should the sample be of a more recent date, or indeed from 1783, it would be unknown who would have added such a sample or was looking after the cabinet at that time.

- Does not appear in invoices
- Does not appear in lecture-notes, undated
- Does not appear in lecture-notes, 1707

Terminology

In the literature of the period, both the expressions 'white lead' and 'lead white' can be found as terms for the pigment. The designation *white lead* on this newspaper wrap therefore indicates the pigment and is not a description of the metal lead turned white, a 'white lead'.

A very common term for probably the same material was *flake-white*, which SMITH 1705 characterised as follows:

*shall exceed ceruse in quality. Is rare and expensive, and said to be found under the lead of some very old buildings where it is formed over the years through corrosion processes from some sharp quality in the air.*¹

Flake white appears to have been a variety of lead white of a certain quality attributed to it, by some authors praised as of superior quality. Others, however, find that 'ceruse' was the purest lead white, examples of which will be shown below.

Composition

Pure lead white is commonly known to be basic lead carbonate $[2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2]$. However variation in its structure can occur depending on the process and conditions of its manufacture.

Provenance

As HARLEY² 2001 investigated, England had a rather large lead white industry in the 17th Century, however we do not know whether Vigani's sample was manufactured locally or imported from abroad.

Trade

White lead does not appear in the invoices related to the cabinet.

Quality/Adulteration

In terms of quality there appear to have existed several white pigments containing lead. It is not entirely established what constituted each of these pigments and whether sometimes the manufacturing process might have accounted for different qualities and for the appraisal a certain pigment received. Statements in the painting treatises seem to suggest that pigments under the same name could be associated with differing

¹ SMITH 1705, p. 16.

² HARLEY 2001, p. 167.

qualities. It still needs to be worked out whether around 1700 the term lead white could comprise ceruse³ and flake white, or whether ceruse was regarded as a completely separate pigment.

Some of the statements regarding the matter were:

*There are two sorts of this colour [white lead] at the colour shops: ceruse, which is the most pure and clean part, and the other called by the plain name white Lead.*⁴

*Flake White, is a very pure White, but the other [White-Lead] will do for ordinary Work.*⁵

*Flake-White, or Fine White, is the very best White we have.*⁶

For the middle of the 18th Century DOSSIE 1758 reported that most lead white or ceruse (he did not distinguish between the two) was extended with large amounts of chalk. It sounds as if he did not consider chalk to be a proper ingredient in ceruse, but that, like lead white, it was a pure substance:

Adulteration of white lead, or ceruss; and the means of its detection.

White lead, though of small price, yet being consumed for the purposes of painting in great quantities, is, for the most part, adulterated by the manufacturers, or wholesale dealers in it; and in this state, consequently, procured for the most part as a simple in medicine.

The common adulteration is with chalk or talc; as being the cheapest ingredients, with which it can be sophisticated: this, in a lesser degree, is of no great moment with regard to the medicinal uses of this substance, which are principally for the making plaisters, or unguents. But, in a greater proportion, such mixtures of heterogeneous matter deprave it highly for some applications.

The adulteration may be, therefore, examined most easily, by comparing a piece of what is suspected with another piece, known to be pure, of equal bulk; and the difference of weight will shew the fraud,

[355]where the sophistication is in a great proportion. But, where the quantity of adulterating matter is less, or the proportion of it would be more exactly known, the following manner should be used.

Take an ounce of the white lead suspected; and mix it well with about half an ounce of pearl-ashes, or of any fixt alkaline salt, and about a quarter of an ounce of charcoal dust; and, having put them into a crucible, give them a strong heat.

The lead will, by this means, be reduced to its metallic state; and, being weighed,

³ Samples of ceruse in the cabinet can be found in E/24 and I/40.

⁴ SMITH 1705, p. 15.

⁵ K., p. 28.

⁶ BARDWELL 1756, p. 7.

*will shew, by what it may fall short of the weight of an ounce, the proportion of the adulteration: about a tenth part being allowed for the corroding acid of the white lead.*⁷

This appears to be a relatively imprecise method, particularly if only small samples were at hand.

Properties

It was acknowledged that lead white was not the most stable pigment in paintings and could, under certain conditions, turn black. SALMON 1701 pointed out that all pictures were apt to *grow tawny, to tarnish or grow rusty*, but that particularly those with mixtures of lead white were subject to such changes. To prevent this from happening he suggested exposing the pictures every year to the sun for three or four days in May or June.⁸

On the other hand *White Lead* in linseed oil was recommended as a weatherproof paint for outdoor timber for reasons of beauty and preservation.⁹

Along these lines SMITH 1705 wrote that *the colour works with ease, and can be ground as fine as oil, it lies smooth and binds hard on any work laid on, good to preserve stone or timber work when laid on with linseed oil which makes it extra hard, for inside doors better nutoil, so it doesn't turn yellow.*¹⁰

BARDWELL 1756 observed that *Flake-White* was a *friendly working Colour, and comes forward with Yellows and Reds, but retires with Blues and Greens. It is the Nature of all Whites to sink into whatever Ground they are laid on; therefore they should be laid on white grounds.*¹¹

Manufacture

The manufacture of lead white was not only a concern to painters but was very much a topic of the natural sciences as well and different processes for making it were recorded on travels abroad. Such publications were read and referred to by painters and authors of painting treatises.

⁷ DOSSIE 1758b, p. 354.

⁸ SALMON 1701, p. 173.

⁹ SALMON 1701, p. 180.

¹⁰ SMITH 1705, p. 14.

¹¹ BARDWELL 1756, p. 7.

SMITH 1705 for example briefly explained that

*At Venice they make it rolling up lead plates and hanging them in a Earthen pots down to the middle, the lower part being filled with strong vinegar, then covered. The "white calx" is then knocked off with hammers.*¹²

He recommended his readers to consult Philberto Vernatti's article on the subject communicated to the Royal Society, printed in the Philosophical Transactions.¹³

Preparation

Some authors gave considerable attention to the preparation, particularly the refining of lead white. One of such instructions can be found in SALMON 1701:

III. To make that your White-lead shall neither rust nor shine (both which are great faults in the Art of Limning) before you grind it lay it in the Sun two or three days, to exhale that greasy and salt matter that poysons and starves the colour; scraping away also the outside that is foul or dirty, which then grind with fair Water, or Lavender, or Rosemary water upon a Porphre. When it is ground have in a readiness a chalk stone, with furrows in it, into which furrows put the colour whilst it is wet, and so let it dry in the Sun, and it will be very clean and white.

IV. Being through dry, let it be washt in this manner. Take of the former cleansed Lead a pound, put it into a bason of spring water, stir it a while together till the water is all very white, then let it stand, and a kind of greasie scum will arise, which blow off, and pour the white water, (being stirred afresh, and a little settled again) into a clean Bason, leaving the grosser body at the bottom behind (not fit for our purpose) let this water stand an hour or two, till it is quite settled.

*V. Then decant the clear water, and put to the sediment fresh water, stir it as before mentioned, then let it settle half the time it did at first, and pour off the white water into another clean bason, leaving again the courser part behind; let this water settle, and decant away the clear water from it: the remaining Lead dry, and then put it up into papers for your use. Thus refined five or six times, it will be most pure, and best for use.*¹⁴

SALMON 1701 allowed for a very detailed account on the refinement process of lead white. Other pigments, apart from ultramarine, received much less attention regarding their purity and almost none regarding the improvement or refinement of the pigment.

¹² SMITH 1705, p.14.

¹³ SMITH 1705, p.15.

¹⁴ SALMON 1701, p. 94.

Can we infer that other pigments were purer when received in the painter's studio or else that the impurities of most pigments were not believed to have a major impact on the ageing and corrosion processes of the pigment?

Purity of the pigment would eventually contribute towards better preservation of the paint, but is not the only influential factor on the corrosion processes that are typical for lead white.

SALMON 1701 went further by giving instructions how to make an *Incomparable fine white Lead*:

*Take choice white Lead in Flakes, grind it well upon a Porphyry with Vinegar, and it will turn Blackish: then take a pot full of Water, in which wash your White Lead very well, let it settle, and pour off the Water: grind it again with Vinegar, and wash it in like manner again; repeat this work once or twice more, and you will have and Excellent White, as well for Water colors, as Painting in Oyl.*¹⁵

NORGATE 1648 provided an even longer and more detailed description of the grinding, washing, and drying process of both, lead white and ceruse, treating them as two different white pigments in his treatise.¹⁶ The dried pigment should then be stored in clean papers and boxes until used.¹⁷

In oil painting *this Colour [Flake-White] should be ground with the finest Poppy Oil that can be made. At present our White is bad, on account of the Oil, which is not really Poppy.*¹⁸

The preparation of the paint in limning could be done by tempering purified lead white with *gum-water*.¹⁹

Use

SALMON 1701 advised to use white lead in oil as a final layer of the priming on canvas or panel paintings in preparation for an oil painting. His priming consisted of animal glue size and *whiting*.²⁰

¹⁵ SALMON 1701, p. 219.

¹⁶ MULLER 1997, pp. 56-57, and endnotes 15 and 16.

¹⁷ MULLER 1997, p. 57.

¹⁸ BARDWELL 1756, p. 7.

¹⁹ SALMON 1701, p. 94; Salmon's *gum-water* contained gum Arabic.

²⁰ SALMON 1701, p. 162.

In limning lead white was used for a flesh colour. It should be ground in weak *Gum-lake water*²¹, left standing for a couple of days and then mixed with *Roset* and *Vermilion*.²²

White Flake made up with isinglass was one of the coatings given in a build up of 8 to 10 layers to achieve a *White-Ground* in jappanning works. Before the painted design could be laid on, this ground had to be polished and varnished with *White Varnish*, which encompassed nearly all lighter gums and resins available, dissolved in *Venice-Turpentine* and *Spirit of Wine*.²³

For painting figures in jappanning work the anonymous author C.K. advised to mix pigments *that have not a body of their own* with *White-Lead* or better *Flake White* to a lighter or deeper hue as required. The binding medium was *Gum Arabick Water*.²⁴

Blue Japan

*To do this, grind white Lead very fine, add Smalt as finely ground, mix them with Isinglass Size, the white Lead grind with Gum-Water, let there be a Proportion of White and Blue, and mix them well to the Thickness of common Paint, go over your Work with it, and when it is well dry, proceed so three or four times, till the Blue lies with a fair Body, rush it smooth, and go over it again with stronger Blue, and when dry wash it with the clearest Isinglass Size, having a new Pencil for that purpose, then when it is dry, warm it by the Fire and go over it with a Pencil dipped in white Varnish seven or eight times, and so let it continue for a Day or two, then wash it as often as before, and so continue many Operations at intermitted times, for a week at least must pass before you can well venture to polish it, and when it is polished, clear it with Oil and Lamp-black.*²⁵

²¹ This *Gum-lake water* contained gum hedera.

²² SALMON 1701, p. 94.

²³ ARTLOVE 1730, p. 12.

²⁴ K., p. 28.

²⁵ K., p. 35.



Fig. 1 Zaffre La2/10

La2/10 Zaffre

The sample of zaffre is wrapped in paper and tied up with a ribbon. Zaffre is an intermediate product in the manufacture of blue cobalt glass/smalt. It consists of crude cobalt oxide, or of an impure cobalt arsenate, formed after roasting cobalt ore. It is used in porcelain painting, and in enamelling pottery to produce a blue colour.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information on smalt refer to *Deep Smalt I/1*.



Fig. 1 Deep-Stroron (or: Strown) Smalt La2/14

La2/14 Deep-Stroron (or: Strown) Smalt

This pigment is of a strong dark blue colour with a sparkling surface. The particles are relatively large, It looks very similar to the sample in *Deep Smalt I/1*, however the powder left at the bottom of the box is not compacted.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Deep Smalt I/1*.



Fig. 1 Flatt Oaker La2/14

La2/14 flatt Oaker

This sample of yellow earth is paler than both samples of French ochre in I/35 and La2/15. The yellow tends towards a very light brown. The compacted lumps and small granules appear to represent the pigment before grinding, since the mass is uniform and even coloured.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

It is not clear whether the term '*flatt*' is an equivalent to 'light', 'pale', or 'plain', as this sample represents a very light shade of yellow. *Plain oaker* was paler than *spruce oaker*. Both were the two types of earth that fell under yellow ochre according to a division made by SMITH 1705.¹

BARDWELL 1756 said that *Light Oker is a friendly mixing Colour, and of great Use in the Flesh: It is usually ground with Linseed Oil, but Nut Oil is better. All Yellows are strengthened with Reds, and weakened with Blues and Greens.*²

Such light ochre could also be the basis for the production of light red ochre as BARDWELL 1756 continued:

*Light Red is nothing but fine light Oker burnt: This and White in mixing produce the most perfect Flesh-colour that can be made. It is a beautiful, clean, kind, working Colour; but too string for the White; and therefore will grow darker. It should be ground and used with Nut Oil.*³

Neither flatt Oaker nor an equivalent is listed in the invoices relating to Vigani's cabinet. For more information on ochres see *French Oker I/35*.

¹ SMITH 1705, p. 22.

² BARDWELL 1756, p. 8.

³ BARDWELL 1756, p. 8.



Fig. 1 A lid for 1 ounce of Jamaco Endico on a box that clearly does not contain indigo. La2/14

La2/14

Jamaco Endico

This wooden box contains lumps of red earth and not indigo. Lids must have been confused at some point. However, neither a box containing indigo nor a cover describing an earth have been found. This red earth resembles the sample of Armenian bole in I/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Further information on indigo can be found under *Jamaica Indico* I/42.



Fig. 1 Blew Black La2/15

La2/15

Blew Black

This sample appears to comprise irregular pieces and cubes of charcoal, deep black in colour with a blue cast. There are white ashes on the outside.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Blew black was in the 17th Century defined as a charcoal made by a slow burning process of stalks from willow or vine.¹ There is a very different looking *Vine Black* La2/15 in a wooden box in the same compartment in the cabinet, already in powder form. It would be interesting, if possible, to establish the differences between the two samples of black pigment using chemical analysis and then refer back to the treatises for further interpretation.

SMITH 1705 says that *Willow Charcoal* was good in oil if finely ground, but not as easily to have as the lampblack and therefore not that frequently used.²

¹ HARLEY 2001, pp. 157-158.

² SMITH 1705, p. 18; Willow charcoal, similarly to vine black, is made by burning the twigs to coal under the exclusion of air.



Fig. 1 Boll – Almenick La2/15

La2/15 Boll - Almenick

The sample in this wooden box resembles the red lumps of *Bole Armon* in I/15 in colour and shape. It shows a uniform warm red shade. It is different from the *Bolus Armenia* in M/9.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Bole Armon* I/15.



Fig. 1 Burnt Umber La2/15

La2/15 Burnt Umber

This box contains one large warm dark brown lump, which resembles the lumps in *Burnt Umber* I/45. The mass is homogenous and evenly brown throughout the thickness of the piece.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Burnt umber is described together with *Umber* I/46.



Fig. 1 Cullens Earth La2/15

La2/15

Cullens Earth

At the bottom of the box there are small clumps and powdered pieces of a deep brown substance. The lignite structure is not as pronounced as in I/44 since the pieces are much smaller.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Refer to *Colens Earth Terra Lemni* I/44 for more information.



Fig. 1 French Oaker La2/15

La2/15 French Oaker

The box is almost empty with few small fragmented pieces of yellow earth collected at the bottom.

It should be part of the chemical analysis to find out whether this sample is identical with the material *French Oker* I/35.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Neither French Oaker nor an equivalent is listed in the invoices relating to Vigani's cabinet. For more information on ochres see *French Oker* I/35.



Fig. 1 Ivory Black La2/15

La2/15 Ivory Black

The sample presents itself as relatively small fractured lumps, a few millimetres in diameter and of uniform warm black colour. Some of the material has rubbed off at the inner walls of the wooden box. The pieces are generally smaller than those of ivory black in I/41.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Refer to *Ivory Black* I41 for further information.



Fig. 1 Roman Oker La2/15

La2/15 Roman Oker

Only few small fractured crumbs of this red earth are preserved in the wooden box. They appear to be of even dark red colour without major impurities.

It is for the results of chemical analysis to establish whether this sample is identical with the material *Roman Oker* I/14.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Neither Roman Oker nor an equivalent is listed in the invoices relating to Vigani's cabinet. For more information on ochres see *French Oker* I/35.



Fig. 1 fine Roset La2/15

La2/15 fine – Roset

At the bottom of the box fine pigment dust and small lumps in off-white, slightly yellowish pink colour are preserved. The sample consists of finer particles, but resembles otherwise the *fine Russet* in I/16.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For more information refer to *Fine Russet* I/16.



Fig. 1 Ross Pink La2/15

La2/15 Ross Pink

This is a dark red purplish, translucent lump. Its surface appearance is similar to glass with shiny sides, resulting from a fracture, and sharp edges. It looks similar to the lumps of sap green in I/43.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

According to HARLEY 2001 the name 'rose pink' first appeared in England in the English translation of Boutet's *Traité de mignature* in 1729. 'Rose pink' was the translation for 'lacque colombine', a pigment made from the red dye of brasil wood that resembled the colour of a dove's throat.¹ Rose pink was made by mordanting the dye on alum. Therefore it was not a true lake pigment.²

Vigani's *Ross Pink* however dates from the very beginning of the 18th Century and hence presents an earlier reference to that name. It would in this context be interesting to confirm the pigment's composition by analysis.

DOSSIE 1758 wrote on *rose lake*, commonly *rose pink*:

Rose pink is a lake like the former [beautiful lake from Brazil wood, described in the preceding chapter]; except that the earth or basis of the pigment is principally chalk; and the tinging substance extracted from Brasil or Campeachy (commonly called Peachy) wood.

*As it never can be expected to stand, when used with oil or water, it is seldom employed for any purposes but the coarse work of house painters, or for paper hangings; unless sometimes with varnish, where it is secured from flying, and, when beautiful, may be substituted for lake.*³

A recipe for making *Rose pink* followed this description.

¹ HARLEY 2001, p. 134.

² HARLEY 2001, p. 109.

³ DOSSIE 1758a, p. 64.



Fig. 1 Sapph Green La2/15

La2/15

Sapph Green

These clumps of an apparently dark black opaque mass resemble the sample in I/43, except that the lumps in this wooden box are smaller.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Refer to *Sap Green* I/43 for more information.



Fig. 1 Crimson Culler Spekel's
La2/15

La2/15 Crimson Culler Spekel's

This metal powder is of a brownish purple colour and medium particle size.

Compare I/22, I/25, I/26, I/33, I/36, I/37, I/38, I/47, I/48, I/49, I/50, I/51, I/53, I/54, I/57, I/58, I/61,

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

See *Deepest Orange* I/25 for further description.



Fig. 1 Super fine Calsind Smalt
La2/15

La2/15 Super fine Calsind Smalt

This sample appears to be finer in particle size than the powder in *Calcin'd Smalt* I/4. It is of a light, bright blue colour. The particles are loose or just very lightly compacted.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

For further information refer to *Deep Smalt* I/1.



Fig. 1 Vine Black La2/15

La2/15 Vine Black

This box is filled to the top with a warm black pigment. The pigment is lightly compacted. On the surface of the pigment sample and inside the lid, which is powdered with traces of pigment, there are fine, white crystals shaped as needles. Interestingly, this is the only sample of vine black in the cabinet. There is no space allocated to it in either Drawer I or in any of the other drawers and the wooden box is still completely filled. Yet it does not appear as if it were a later addition to the cabinet, because the box and label resemble the other pigment boxes in La2/15.

- Does not appear in invoices
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

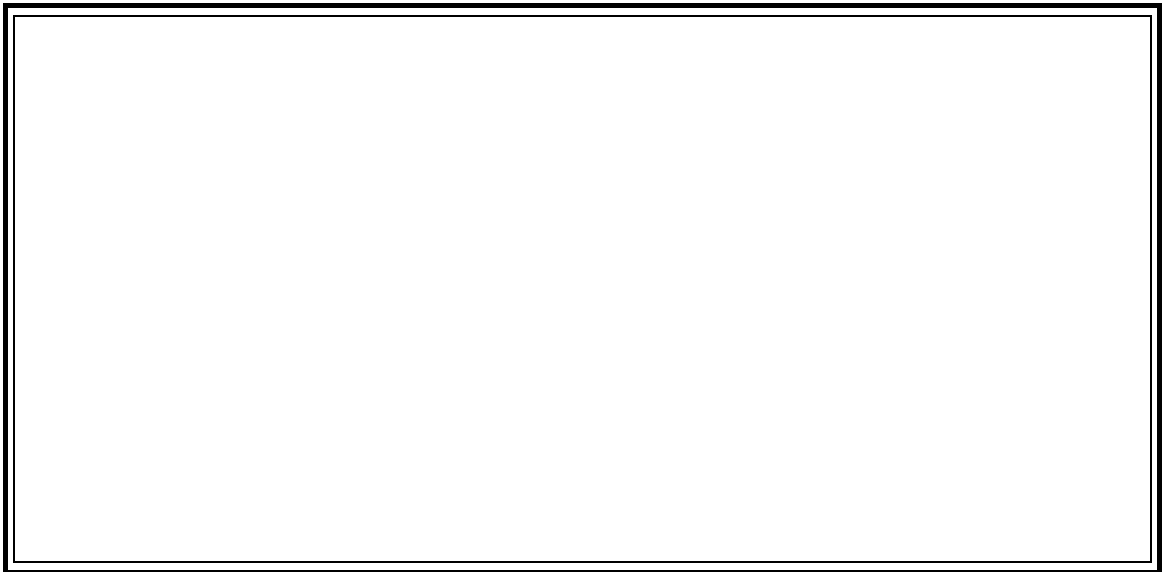
It is not clear whether this vine black is made from slowly burned stalks of vine or wine lees. If made from stalks it might be the same with *Blew Black* La2/15. The two boxes with labels look as if derived from the same supplier, which indicates that there must be some difference between the two products apart from the name, for otherwise they would not have been sold separately.

Examination of the two samples might answer these questions.



Drawer La3

Large Drawer La3



The manuscripts and other documents are kept in brown paper envelopes and transparent plastic folders. Apart from these, the drawer also contains a number of roughly sawn hardwood pieces, the purpose of which is unknown.

MS Quns Vig. 1 Proposal for insect collection, 23 February 1703/4 (old calendar, as for the manuscripts below)

31.2 cm x 19.4 cm, ink on paper, no watermark

Digital images: 2788, 2789

Transcription in the Appendix

MS Quns Vig. 2 Invoice Fran. Porter to Vigani, 7 March 1703

31 cm x 38.5 cm, ink on paper, watermark

Digital images: 2786, 2787

Transcription in the Appendix

MS Quns Vig. 3 Poley Clopton to Mr Purvar, 14 March 1703/4

6.5 cm x 15.8 cm, ink on paper, no watermark

Digital images: 2793, 2794

Transcription in the Appendix

MS Quns Vig. 4 Invoice Hen. Colchester to Poley Clopton?, 11 April 1704
with receipt, 18 February 1703/4

38.5 cm x 31.3 cm, ink on paper, watermark

2 sheets of paper, folded in halves to make a booklet of 8 pages

Digital images: 2801, 2802, 2803, 2804

The digital images show each side of the two sheets

Transcription in the Appendix

MS Quns Vig. 5 Invoice Clutterbuck to Poley Clopton, 6 May 1704

19.5 cm x 16 cm, ink on paper, no watermark

Digital images: 2790, 2791

Transcription in the Appendix

MS Quns Vig. 6 Receipt for John Austin, 8 August 1704

8.8 cm x 15.4 cm, ink on paper, watermark

Digital images: 2795, 2796

Transcription in the Appendix

MS Quns Vig. 7 Invoice Fran. Porter to Vigani, 12 December 1704

29.5 cm x 37 cm, ink on paper, watermark

Digital images: 2799, 2800

Transcription in the Appendix

This invoice repeats MS Quns Vig. 2 from 7 March 1703

MS Quns Vig. 8 Invoice Fran. Porter to Vigani, 16 January 1704

28.8 cm x 36.5 cm, ink on paper, watermark

Digital images: 2784, 2785

Transcription in the Appendix

MS Quns Vig. 9 Financial note Vigani/Poley Clopton, 6 February 1704/5

16 cm x 19.5 cm, ink on paper, watermark

Digital image: 2783

Transcription in the Appendix

MS Quns Vig. 10 Letter Fran. Porter to Vigani, 8 February 1704

21.5 cm x 18.2 cm, ink on paper, watermark

Digital images: 2797, 2798

Transcription in the Appendix

MS Quns Vig. 11 Financial note Poley Clopton to Vigani, 9 February 1704

9 cm x 13.4 cm, ink on paper, no watermark

Digital image: 2792

Transcription in the Appendix

MS Quns Vig. 12 Letter E. S. Peck to L. T. Polts Esq., early 1930ties

Envelope: 10.7 cm x 13.7 cm, ink on paper, no watermark

Digital image: 2811 with key to the right of the envelope

Transcription in the Appendix

MS Quns Vig. 13 Envelope 'Report of an address [...]', February 1933

Envelope: 9 cm x 15.2 cm, ink on paper, no watermark

Digital image: 2809

Transcription in the Appendix

The envelope contains a newspaper cutting from The Cambridge Daily News, 15. Feb 1933, 'Old-Time Cures. First Professor of Chemistry'

MS Quns Vig. 14 Letter Carl Pouten to E. S. Peck, 3 June 1937

22.8 cm x 17.8 cm, ink on paper, watermark

Digital images: 2805, 2806

Transcription in the Appendix

MS Quns Vig. 16¹ E. S. Peck concerning Vigani lecture notes, 15 October 1938

15.2 cm x 9.2 cm, ink on paper, no watermark

Digital image: 2810

Transcription in the Appendix

**MS Quns Vig. 17 Letter Editor of the Pharmaceutical Journal
to the Press Secretary of Queens' College, 14 May 1948**

25.3 cm x 20.3 cm, machine type on paper, watermark

Digital image: 2807

Transcription in the Appendix

¹ The manuscript, which was given the number MS Quns Vig. 15, is not contained in this drawer. It is a note by E.S. Peck to the President of the College regarding the booklet of Vigani's lecture notes (LECTURE-NOTES undated) that he gave to the College. The letter is inserted at the end of the booklet, kept in Queens' College old library. The transcription can be found in the Appendix.

Enclosed with the letter was an article in the *Pharmaceutical Journal* on *the analyses of a number of substances still preserved in the cabinet*. This was most likely the article by N. EVERS 1933, titled *Some 200 Year-old Specimens of Drugs* (see below).

MS Quns Vig. 18 Letter L. J. M. Coleby to Dr Seltman, 20 June 1952

Letter by L. J. M. Coleby to Dr Seltman, Queens' College, 20 June 1952

19.5 cm x 16 cm, printed address, ink on paper, watermark

Digital image: 2808

Transcription in the Appendix

The article referred to as *my paper on "Vigani"* is the reprint of L. J. M. COLEBY 1952, titled *John Francis Vigani, First Professor of Chemistry in the University of Cambridge*, also kept in drawer La3 (see below).

Black Binder: 'Matters relating to Professor Vigani – Professor of Chemistry 1703 - 1712'

The binder contains three items:

1. List of Substances in the Cabinet², 26 sheets
2. Transcriptions of Letters and Invoices³, 17 sheets
3. typescript of Professor Ferguson's paper⁴ read before the Cambridge Antiquarian Society on 16 May 1894, 33 sheets

E. S. Peck may have collated all three items before February 1933 as a foundation for his Vigani studies.

Article by Norman EVERS 1933, *Some 200 Year-old Specimens of Drugs*⁵

27.3 cm x 21 cm, print on paper

printed in *The Pharmaceutical Journal and Pharmacist*, 1933.

The article was cut from the journal. It is most likely the 'cutting' sent by the Editor of the *Journal* to Queens' College in 1948 (MS Quns Vig. 17).

2 copies of N. EVERS 1933, *Some 200 Year-old Specimens of Drugs*⁶

² For clarity in the dissertation this is referred to as 'the Old Inventory', which was most likely produced by E. S. Peck who published a summary of the cabinet's contents in his paper PECK 1934.

³ Transcribed in this binder are all the documents listed above, which date to the years 1703 and 1704, with exception of MS Quns Vig. 1.

⁴ FERGUSON 1894. E. S. Peck had a copy of this paper sent from Ferguson's documents in Glasgow University Library in preparation of his lecture in 1933; Peck 1934, p. 34.

⁵ EVERS 1933.

⁶ EVERS 1933.

25.7 cm x 19.2 cm, copy on paper, glued on green carton (26.3 cm x 19.6cm, recycled stationary folder), with a label '*not to be taken out*' at the bottom of the sheet

This could be the *photostatic copies*, which the editor of the Pharmaceutical Journal offered to Queens' College in 1948 (MS Quns Vig. 17)

Catalogue⁷ of a loan exhibition of historic scientific apparatus in Cambridge

21.7 cm x 14 cm, print on paper, 32 pages

The exhibition, organised by the Cambridge Philosophical Society and R. T. Gunther⁸ as scientific advisor, was held in the Old Schools, Cambridge, in 1936. It showed, amongst others, Vigani's cabinet (No. 153 in the catalogue) together with the Heberden collection (St John's College), Addenbrooke's cabinet (St Catharine's College), and the large air pump from Queens' College (No. 102 in the catalogue, see Label below).

Reprint: R.T. Rowson 1950, *An Apothecaries' Chemistry Cabinet*

27.4 cm x 20.9 cm, print on paper, 2 pages, signature in ink

Reprint from the Pharmaceutical Journal and Pharmacist, 13 May 1950, signed '*with compliments J. M. Rowson*'. The cabinet in question dates to 1820-1840.

Reprint: L. J. M. COLEBY 1952, *John Francis Vigani, First Professor of Chemistry in the University of Cambridge*

24.5 cm x 18 cm, print on paper, 15 pages

Reprint of an article⁹ published in Annals of Science, 1952. This is most likely the copy, which Coleby sent to Dr Seltman, Queens' College, on 20 June 1952 (MS Quns Vig. 17).

Three Labels

5 cm x 15 cm, 2 cm x 11.5 cm, 4 cm x 11.5 cm, type writer on paper

Digital image: 2812, centre right, top right, and bottom left

The labels literally follow word by word some of the sequences in E.S. Peck's short inventory¹⁰. Since the cabinet was exhibited at Peck's reading on Vigani on 13. Feb 1933, the labels may have been written for this occasion.

'SPECIMENS FROM THE CABINET OF PROFESSOR VIGANI'

⁷ CAMBRIDGE PHILOSOPHICAL SOCIETY 1936.

⁸ GUNTHER 1937, written in connection with this exhibition.

⁹ COLEBY 1952.

¹⁰ PECK 1934.

'Scorpion, used for making potions.'

'Labdanum gum, said to have been /scraped from the beards of goats /which fed on the leaves of that /shrub.

Stones: amethyst, chrystal, emerald, /bloodstone (haematite), ruby, etc.'

Two Labels

8.5 x 5 cm, red ink on paper

No digital image

The handwriting is identical with the one for '*labdanum*' in drawer A/3.

'Crabs Claws', and 'Cinchona'

Label

6.2 cm x 9 cm, ink on carton, with fold and pinhole to attach to the cabinet

Digital image: 2812, bottom left

The handwriting is identical with MS Quns Vig. 13.

'This cabinet of medical materials /belonged to /John Francis Vigani, /the first Professor of Chemistry /in the /University of Cambridge.'

Label

3.2 cm x 12.7 cm, black print on two papers glued on carton

Digital image: 2812, bottom right

Text and print follow the exhibition catalogue¹¹ of the loan exhibition of historic scientific apparatus 1936, in Cambridge.

This label has no connection to Vigani or the cabinet.

'103

102. Large Air-pump. C. 1790-1800, /Queens' College.

By 'R[ichard] Saunders, Salisbury Court, London'.

Handlist of papers relating to Vigani's cabinet, 1 March 1993

A4-format, photocopy of original typescript on paper

Compiled by Clare Sargent, The Library, Queens' College, 1 Mar 1993

¹¹ CAMBRIDGE PHILOSOPHICAL SOCIETY 1936, p. 18.

Mummy

There is no sample of mummy preserved in the cabinet, but it appears in the invoices.

- MS Quns Vig. 4
- Does not appear in LECTURE-NOTES undated
- Does not appear in LECTURE-NOTES 1707

Terminology

Real mummy in medical terms was called *Mumia vera Offic*, or simply and more generally by the name of *Mummy*. Both versions can be found in GEOFFROY 1736.¹

There was also a synthetic, inorganic substance with the name of *Mineral Mummy*, as will be shown below.

Composition

Apparently two types of real mummies were traded and available on the market in Vigani's time, as GEOFFROY 1736 illustrated:

*There are two kinds of Mummy; the first of which hat its Original from human Carcasses dried by the Sun and Sands in the Deserts of Africa, such as those of Zara, Lybia, &c. where the Winds sometimes bury whole Caravans in the Sands. These Bodies by drying become the Consistence of Horn, and very light. These are called white Mummies, but are not used in Physick. The second sort are the Embalmed Bodies found in Egypt, which are very rare, and seldom to be met with among the Druggists; in place of which they sell us Parts of Bodies embalmed with Myrrh, Aloes, Incense, &c. by the Jews.*²

Mineral mummy was an inorganic yellow powder gained from a special heating process of the amalgam of lead and mercury.

Provenance

GEOFFROY 1736 stated that Jews embalmed "mummies", which were actually contemporary body parts. This is a good example of the racism or anti-Semitism that

¹ GEOFFROY 1736, p. 385.

² GEOFFROY 1736, pp. 385-386.

can be found throughout the literature of the natural sciences of the epoch and is not necessarily an authentic statement of provenance.³

Trade

Vigani bought 1 ounce of *Mummiae* for 4 pence from the druggist Henry Colchester of London in February 1704 (old system: 1703).⁴

Adulteration

Judging from one statement only, namely GEOFFROY'S description cited above, it appears as if the artificially created mummies from contemporary embalmed body parts were not considered adulterations or fake mummies. It appears as if they were recognised trade goods, more common than real Egyptian mummies, and valued equally in their medicinal properties.

Properties

No detailed information could be gained on this aspect.

Manufacture

Real mummy was made by embalming bodies or parts of bodies with organic substances, such as aromatic resins and oils that would contribute to preserving the body. It was a complex process that had been perfected by the ancient Egyptians. Literature on the subject is extant. A short description of the process appropriate to the format of the thesis would not do it justice.

The making of *Mineral Mummy* was described by GEOFFREY 1736 as follows:

The Mineral Mummy of Lead of Poterius, is the Calx of Lead and Quicksilver amalgamated together, made in this Manner:

*Take of Mercury revived from Cinnabar two Parts, and one Part of Lead. Amalgamate them together, and continue to shake them strongly in an Earthen Vessel over a Charcoal Fire, till the whole is reduced to a black Powder. Bake this Powder in a Sand Heat, in a Glass Matrass, till it turns yellow, and keep it for Use.*⁵

³ See 2.2.5.2. Quality Control – Regulations of the Detection of Adulterations, Vol. 1 of this dissertation.

⁴ MS Quns Vig. 4.

⁵ GEOFFROY 1736, p. 248.

Preparation

SALMON 1701 mentioned mummy only on one occasion, namely when he recommended burning it in a luted crucible to improve its flow. He said that burnt mummy made a good black colour in limning.⁶

Use

Only a few references to mummy can be found in the painting treatises throughout the 17th Century in England. It was recommended for shading.⁷

In medicine *this [embalmed] Mummy is reckon'd a good Resolvent of coagulated Blood after Falls or Blows, and a good Antiseptick; acting not only by its Bituminous and Balsamick Parts, but also by the volatile Salts of the Carcass from which it is made. By dissolving it in Spirit of Wine, we easily obtain a Tincture which contains its Balsamick Qualities.*⁸

Mineral Mummy was used externally as a cure for carcinoma.⁹

⁶ SALMON 1701, p. 97.

⁷ HARLEY 2001, p. 153.

⁸ GEOFFROY 1736, pp. 385-386.

⁹ GEOFFROY 1736, p. 248.

Conclusion

This dissertation concerns a collection of fine art materials from 1704 kept in an oak cabinet in the Long Gallery of the President's Lodge of Queens' College, Cambridge, UK. These materials were described with reference to their provenance, trade, manufacture, significance, and use in relation to painting techniques of the 17th and 18th Centuries. This sample collection is an extremely valuable resource for many disciplines such as art technology, archaeometry, conservation science, and art history due to its detailed record of acquisition and untainted storage:

John Francis Vigani, who taught at Queen's College and was the first professor of chemistry at the University of Cambridge, ordered a cabinet in 1704 to fit material samples as a study collection designed to accompany his materia medica course of lectures and experiments. The items included samples of chemical, alchemical, medical and general natural scientific interest - all of which Vigani dutifully labelled before changing colleges later that year. The collection was established during a time when the systematic reporting of scientific discoveries was first being promoted and the field of chemistry had more clearly dissociated from alchemical theories. Such popular scientific interest had just led to the formation of the Royal Society in England and others throughout Europe. Also distant trade routes, operated by the East India Company, catered for an ever-expanding range of commodities and the period was further characterized by the rise of an outstanding era of English Art, leading eventually to the formation of the Royal Academy of Art.

As three centuries passed Vigani's cabinet remained virtually undisturbed at Queens' College, in several secluded locations before arriving at its current place in a corner of the Long Gallery. The 700 materia medica samples, most of which were purchased from two suppliers in London, as the surviving invoices show, were virtually untouched, and thus preserved in excellent condition. Only occasionally had the doors been opened to reveal 26 small flat drawers of which one or the other was pulled open to show the intriguing contents to a curious crowd. It was on one such occasion when the author "re-discovered" the cabinet and its contents.

A joint research project then ensued between Queens' College and the Academy of Fine Arts in Dresden that highlighted the historical and scientific importance of this collection. From the research several benefits were gained. A detailed inventory including photographs and illustration of the cabinet's contents was compiled. Within

the collection was a rare assembly of fine art materials, which were described and researched thoroughly to provide new insight into raw painting materials of that time. This included the compilation and analysis of unique resource materials in fields and disciplines that had not been considered up to this point. Thus the resources provided relationships between the painting materials and the natural sciences and other disciplines that had not previously been realized and which may encourage future scholars to explore sources outside the traditional paradigm. A biography of Vigani and review of his works was compiled as well as transcriptions of his personal letters, invoices, and lecture notes. The resources compiled provide the foundation and will serve as an excellent reference for future research and analyses of Vigani, his cabinet, and its contents. It will also offer the basis for the creation of a virtual online cabinet, which will be an easily accessible resource to scholars of many disciplines who wish to gain access to the information without disturbing the integrity of the samples.

Such a complete and organised record of Vigani's cabinet and relating papers had never before been compiled. Therefore, in order to provide a systematic and accurate key to access Vigani's cabinet as well as the related written sources several steps were required. First minimal intervention procedures were designed to assure the integrity of the cabinet and samples would be maintained. Next, an assessment of the condition and design of the cabinet was documented followed by an inventory of its contents of over 700 individual samples with transcription of all the labels. The unique and somewhat unusual organisation of the drawers was noted and the original construction was measured and examined to conclude that no other arrangement of the drawers within the cabinet had been possible. It was a well-planned design, which the carpenter most likely carried out according to Vigani's specifications.

Measurements were made of every sample and the various containers within the cabinet. Afterwards each drawer and individual item was documented using digital imaging equipment. A full set of the reference images is available on the CD included with the thesis.

The manuscripts and printed media contained within the bottom drawer of the cabinet were identified, put in chronological order, and recorded using digital imaging. These documents comprise invoices and letters from Vigani's time and papers from the late 19th and 20th Centuries that indicate interest or research on Vigani and/or the cabinet. All manuscripts and letters were transcribed and made available in the appendix of the thesis. In addition, the manuscript notes on Vigani's lectures, which are kept in Queens'

College Old Library and the Cambridge University Library, were transcribed and added to the appendix. The manuscript from the Cambridge University Library contained many alchemical symbols so a glossary was compiled to assist the reader in interpreting Vigani's use of symbols and expressions for chemical manipulations. A great effort was made to select the definition which represents as close as possible Vigani's vocabulary, since chemical terminology and the use of symbols had not yet been standardised in the early 18th Century.

An investigation of the materia medica collection would not be complete without a biography of its originator, John Francis Vigani. Biographical references in previous research had been unclear, incomplete, or partly inaccurate so the author referenced biographical and textual links regarding Vigani and assembled the most accurate and concise appraisal of Vigani's life and work to date. The resources used in this appraisal included Vigani's documents and publications, assessment from his colleagues, posthumous consideration, and more recent research, which was compiled to create an estimate of his teaching and reputation amongst his contemporaries. As a result of this review Vigani could be established as a well-travelled 'European' who settled in England, maintained a pharmacy and, after years of teaching materia medica in Cambridge, became the University's first Professor of Chemistry, a chair that still exists today.

We know now that Vigani was a good experimenter and had a wide network of contacts, including famous scientists such as Sir Isaac Newton. His practical chemistry was already far removed from alchemy even though alchemical symbols were still part of his everyday chemical vocabulary, as can be noted from his set of materia medica lecture notes kept at Cambridge University Library. His sample collection was not a curiosity cabinet, which was the fashion for many of his contemporaries, but a true study collection for his materia medica students. He also subscribed to assemble a collection of British insects.

Furthermore, it is important to note that the evaluation of Vigani's writings, including his *Medulla Chymiae*, which had been published in several editions, made it possible to demonstrate the existence of the doubted 1687 edition through an existing copy of the book at Sächsische Landes- und Universitätsbibliothek Dresden. A detailed analysis of Vigani's work in terms of chemical knowledge is still outstanding.

To investigate the collection's importance regarding art technology the author first identified samples such as pigments, dyestuffs, other colourants, binding media, raw materials, and chemical reagents needed to manufacture painting materials. In the same manner such materials were identified in the invoices and Vigani's lecture notes. In a few cases unusual samples could only be identified via secondary sources of the period, which mentioned art materials using Vigani's terminology or other names. Although careful assessment and research most likely identified a vast majority of these materials, further scientific analyses are required to confirm the classifications and may reveal more relevant materials within the cabinet's collection.

Pigments, lake, and other colouring matter in the cabinet

Each of the 121 samples including pigments, lake, or other colouring matter from Vigani's cabinet was described and a photograph indicating the size of each item was included next to the description. A note was also added to the text if the sample was included in the invoices or any of the transcribed lecture notes.

The samples were described and background reflecting the knowledge of that time was provided using sources from the 17th and early 18th Centuries. The materials were assessed by means of the following categories:

Terminology

Composition

Provenance

Trade (with reference to the invoices)

Adulteration

Properties

Manufacture

Preparation

Use in oil painting, limning, and medicine

Describing these samples using precise historical texts from various disciplines not only supported the previous knowledge that existed concerning painting materials from the 1700's but provided an even further and perhaps more thorough assessment of the materials. The most obvious resources were examined first and included English art technological sources such as painting treatises, which have been the foundation of intense study in the past (for example in Rosamund Harley's work). However, the meticulous approach, in which the author adhered closely to the original text without

ever interpreting or revising its details helped to gain new insight regarding both the text and materials. For example, a focus on fine points such as comparative spellings, embedding of the pigment within the immediate context, use of the pigment and pigment vocabulary across the works was able to transform colloquial knowledge and propel insight into pigments around 1700.

For this reason, a preference for original text quotes was maintained throughout the thesis, and original pigment spellings were written in italics. The reader should always bear in mind however, that the term a writer chose to use describes only the idea that he had of the matter he described. One does not know for certain whether he actually described the material we know under this name today or even the pigment that was generally known by that name during the writer's time.

The author's interrogative and cautious approach to the original manuscripts and publications allowed for the purposeful pursuit of comparative studies and provided a comprehensive link between various texts and Vigani's samples. Additional literature reviews concentrated primarily on botanical and materia medica sources. Of particular interest was Richard Bradley's *Course of Lectures upon the Materia Medica [...] upon the Collections of Doctor Addenbrook and Signor Vigani, deposited in Catherine Hall, and Queens' College* from 1730. Literature pertaining to the history of pharmacology and medicine was also consulted to establish the significance of the materia medica cabinet in its time and aspects of the collection in context to drug use and medication in the 17th and early 18th Century. These sources and others, which had previously been neglected, also provided insight in relation to painting materials, particularly resins, gums, and oils.

This helps to advance the understanding of such materials, however, no matter how detailed and accurate the reporting, comparisons between texts, expressions, wordings, shades of colour, coarseness, and suitability of a pigment offer only a sufficient description of the materials in the absence of true scientific analyses. Therefore, further technical research is required to confirm the identity of the material samples and complete the identification and description process.

Nonetheless, these comparative descriptions did offer new awareness although the desire to standardise the terminology and its precision from a variety of sources became a recurring challenge throughout the dissertation. Spelling inconsistencies were noted for several samples that were stored and labelled in several places within

Vigani's cabinet. Moreover, spelling differences occurred between Vigani's labels and the druggists' invoices for the same items. So one may conclude that a homogeneity of terms by these two parties was being employed at this time for these specific materials within the collection but the precise spelling had not yet been standardised. This could be further perpetuated as Vigani lectured to his students about the *materia medica* samples. The students would learn terms that they would relate with a certain image of colour, shape, size, structure, and smell of a material to be able to identify and recognise it throughout their professional careers. If the term eventually became standardised, its spelling remained subject to good intuition, which can be seen for several examples within this collection.

However, standardised terminology remained a problem when examining painting treatises. For example, there is a pigment featured in Viganis cabinet referred to as 'Dutch pink'. At this time, 'pink' was not a descriptive term but a specific name for a pigment of light yellow colour. In fact, almost half a century earlier Norgate had provided a detailed recipe regarding the manufacture of the yellow pigment termed 'pink'. However, in a much later treatise by Bardwell an inconsistency in terminology is noted which is representative of the irregular use of terminology observed from many painting treatises of that period. Bardwell used the word 'pink' to describe a hue in colour, which is still yellow in one of his mixtures but of reddish hue in another. So throughout the treatise he was not actually discussing the pigment pink but using the term generally to describe other pigment mixtures. Bardwell's remarks may be an early indication of the change in perception from 'pink' as having a yellow colour to the modern day term where 'pink' describes red as noted by Harley¹. This example reinforces the fact that when a treatise is read, one cannot assume that the pigments and other terms were well defined and supports this thesis author's need for meticulous review of each source to assure the terminology applied is correct.

Further detailed evaluation of the treatises and resources from the natural sciences and other peripheral disciplines may be highly fruitful for art technological research in the future. Non-traditional sources such as those from the natural sciences have yet to be explored to their full potential. This thesis sheds - if not the first - then clearly an important light on such sources, their availability and importance at the time, as well as their reliability as information concerning actual material properties, provenances, and the framework of thoughts of the time.

¹ HARLEY 2001, pp. 108, 109.

To begin with, a resource review was performed to provide a general background and examine the development and trade of drugs in the 17th and early 18th Centuries. From these enquiries it can be established that commercial pharmacology flourished and that systematic experiments regarding the effects of drugs had begun. In addition, efforts were made to standardise nomenclature and the active ingredients of specific drugs, although units of measurements still varied greatly. New drugs were also being introduced mainly from distant countries, and adulteration was common practice.

A further example of the importance of a multidisciplinary research approach to such a collection can be noted via examination of the invoices. In addition to a historical perspective the invoices provided specific information, which included:

The suppliers of drugs

The invoice date

The cabinetmaker

The recipients

The commissioners were Vigani or the College

Inspection of these invoices offered further information suggesting that Vigani bought for his own apothecary's shop in parallel with buying goods for the Queens' College collection and that the exchange of parcels, bills, and receipts worked through carriers. Also the time spans between each order, delivery, and payment were considerable and unpaid bills were politely resent/repeated. Nonetheless Francis Porter continued to honour new orders.

Eventually, the evaluation of the invoices provided a unique opportunity to compare and contrast the values of the painting materials from the early 18th Century. First, the total values of all the invoices were tallied up and compared with the original calculations by Queens' bursar to confirm that the College indeed had retained nearly all the original invoices. Then the cost of all the painting materials that occur in the invoices were converted to price per ounce and ranked according to expense. Individual groups were examined regarding aspects of quality, availability, and price levels and additional analyses noted several examples of the same material appearing in multiple invoices. Finally, the sum cost of the cabinet and its contents was converted to reflect a modern day price.

Ultimately, upon matching the painting materials with their respective invoices in the cabinet it became evident that they are almost completely located outside of group 'I' which is the main drawer containing the pigment collection, metal powders and glass

flakes. This seemingly small detail could, in fact, indicate that perhaps the pigments and other colouring matter may not have originated from a druggist shop but instead from a specialist art materials retailer. The fine art materials that occur in the invoices were truly considered to be drugs or drug components. With this in mind it is interesting to note that multiple holdings of lead red labelled 'lead red' in drawer 'I' and 'minium' in another location are listed in the invoices as just 'minium'.

The fact that lead red appears within the cabinet under two separate names can lead to the following interpretations: First, that the minium in the cabinet probably refers to the minium in the invoice and red lead was bought separately from a different source. If this was indeed the case perhaps Vignani did not know that they were actually the same material, which would explain the dual purchase, once as a drug and once as a pigment. The second interpretation suggests that there were differences in the material properties for the red lead used in a drug and the red lead used as a painting material. Furthermore, this could have led to two different retailers specialising in the sale of these items. The third option is that the material could have been purchased from the same retailer and divided into the various compartments. This raises the question as to why Vignani would assign two names to the pigment and whether he thought red lead was a more colloquial name used by the artists. These three theories cannot be confirmed but further scientific analysis may provide more insight into this specific conundrum.

When focusing on the collection's fine art samples specifically, to highlight their many details in this conclusion would essentially restate the central component of the thesis. Therefore the reader is referred to the comprehensive inventory section containing the specific items of interest. However, several pigments of particular interest which were singled out for closer investigation are highlighted below:

Vignani's cabinet provides several key samples of contemporary interest. These include blue and green verditer, verdigris, all the vitriols, and blue bice. Green and blue pigments, with particular interest fixed upon copper greens and blues, have been the focus of many investigations in the past and more recently in the Munich Tax project. This venture noted the lack of original samples and raised many questions regarding the pigments' manufacture and terminology.

There are seven types of natural cinnabar samples in the cabinet together with an example of synthetic cinnabar and a sample of vermilion. These provide the potential

for comparative analyses including problems of terminology, ways of manufacture, and questions regarding the blackening upon ageing.

Lead white and cerusse were present as three samples, which created an incentive to study the terminological distinction between the two and whether this would be reflected in their composition and quality.

Orpiment was present in the cabinet as a pigment of red and yellow type. However, two samples of yellow and red arsenic had been part of the collection but are no longer present. This was the basis for a comparative study of the terms as they appear in painting treatises and publications from the natural sciences. Moreover, the research regarding orpiment provided detailed questions for chemical analysis based on the samples in the cabinet combined with the evaluated sources: For example, further technical research may help determine whether artificial orpiment was known and produced in England around and prior to Vigani's time. So far it is speculation since it is not explicitly mentioned in the standard sources and could not be analysed to the detail required due to the small scale of samples available from paintings. The collection with both orpiment and red orpiment as well as the three colours of 'arsenicum' could be evaluated as a promising means to clarify these problems.

Organic red pigments and lakes, which were preserved in their original trade form help to understand Vigani's labelling to solve terminological uncertainties.

Glass flakes have been observed in the past in various works of art, mural paintings, and interior decorations. More recently such flakes were noticed in Venetian canvas paintings but to date this material has not been described extensively. The presence of glass flake samples in the cabinet creates a unique opportunity for thorough examination and review.

Concerning the large array of metal powders within the collection it was observed that they existed in varying grades of fineness. There is astonishingly very little literature on the subject and most often if treatises are concerned with it, the reason is mainly focused on the techniques available for making metals of lesser value appear as silver or gold. Descriptions of how to achieve the pink, purple, brown, and orange shades that occur in the cabinet collections did not appear in the literature. This warrants a further literature search and analysis as to how these shades of the fine metal materials were prepared. In addition, further comprehensive research regarding the origins of the

metal samples is important for analytical quests into pigment provenance and decorative metal elements in art. Vigani's cabinet features numerous metal samples and several sources within the bibliography provide a good starting point for indications about provenance, quality, and manufacture.

The collection was also assessed to determine if Vigani actually had the full assortment of pigments that were available during that time. Indeed the collection did reflect the usual range of products available but a few important pigments such as lead-tin yellow and Naples's yellow did not appear in the cabinet. These were key pigments in the 18th Century and their absence reflects Harley's theory² that they may not have been known in England during this time or were covered by other terms such as massicot of which there are three examples in Vigani's collection.

Additionally, after examining the manufacturing technique for red precipitate a new proposition was made concerning the introduction date of wet-process vermilion or mercury sulphide. In *Medulla Chymiae* 1693, Vigani described a new method used in Holland to make *praecipitatus rubrum*, a material which is understood in modern terms to be mercuric oxide [HgO]³. Vigani explained that the Dutch technique involved adding sulphur to a heated solution of mercury and nitric acid.⁴ The editor of the 1693-edition of *Medulla*, commented that he had produced considerable amounts of red precipitate this way in 1658.⁵ If what was generally described as *praecipitatus rubrum* was in fact mercury sulphide following the addition of sulphur, then wet-process vermilion had been known and produced in Holland before 1658, which would be a much earlier reference documenting the material than has previously been assumed. However, this remains speculation, which could be confirmed by chemical interpretation and further analysis.⁶

Also, the thesis uncovered a wider spectrum of materials that went by the same name as in the case of mummy. Apart from the "real", organic material a synthetic, inorganic "mineral" mummy also existed. It may be assumed that for painting purposes the organic matter was customarily used, and that this was the type being referred to when

² HARLEY 2001, p 98.

³ See Glossary of Chemical Terms in the Appendix, Vol. 4 of this dissertation.

⁴ VIGANI 1693, p. 81.

⁵ Stam's commentary reads: *Confeci rubri praecipitati magnam quantitatem anno 1658. & frequentibus; Collegiorumque Chemicorum membris ad initio usque ad finem demonstravi.* VIGANI 1693, p. 81.

⁶ Sample *Praecipitatus* E/19 of the cabinet could be a start, yet its colour appears too orange to resemble vermilion.

painting treatises mention mummy. However, the research here suggests that the modern interpreter of manuscripts and printed media from previous centuries must be aware of and be able to deal with two separate materials identified by a single name.

Other terminology issues involved vocabulary regarding natural red dyestuffs caused by a misunderstanding of the materials and incorrect synonyms used in the literature of the period. The issues were clarified after comparable samples were evaluated and various invoices were examined to confirm that cochineal and *cocc indicus* K/6 are two different materials, one of animal the other of plant origin

This study also reminds researchers that the vessel in which a sample was contained or produced often contributed to the material's chemical reaction process, which has not been considered much in past investigations. Sometimes clay pots were used and closed with tightly fitting tops to keep out moisture but water could still be absorbed through the clay. Vigani was aware of such an impact as well as the effects that furnace design would have regarding its influence in the manufacture process. In fact, Vigani himself provided numerous drawings of different set-ups for furnaces and later published them. He was subsequently acclaimed for having achieved a transportable furnace that could be adjusted to many purposes and fine-tuned for each heat application needed in a process. His contemporaries also devoted much time to the development and refinement of furnace types and different set-ups can be noted in the recipes for particular pigment manufacture. Therefore, future investigations should pay more attention to the furnaces used to further understand manufacture and its results. Additionally, more emphasis should be given regarding the containers used in such a process. For example, in the manufacture of lead ashes - as a first step in the production of massicot and red lead - an unglazed earthen platter was used, while other product recipes were to be carried out in glazed pots or iron crucibles. In the recipe for lead ashes the same platter was in use throughout the burning process on a charcoal fire to gain massicot, whereas for minium it was required to change to a reverberatory furnace.⁷

Further research

The conclusion has alluded up to this point that additional research and analysis is warranted to address the many questions that this thesis investigation has thrown up. Detailed physiochemical analysis of trace elements and structure results in a sample-

⁷ See *Minium* E/23, Manufacture.

specific pattern of characteristics. Thus Vigani's collection is a valuable source to expand analytical standards and reference spectra for historical fine art materials. The analytical identification of the main compounds of each sample is intended to confirm Vigani's terminology and a direct link between the historic material and the attributed historic name can thus be established. This is usually impossible, because the analysis of painting materials is predominantly based on samples taken from the actual works of art, unless the artist himself left written evidence.

The suggested analyses should strongly support this investigation, as they will provide the conclusive connection between research based on literature and the materials in question. Also, the technical examinations are a means to verify or dismiss gathered information from primary and secondary literary sources and therefore will be of outstanding importance to the final interpretation of the contents of Vigani's cabinet, the longevity and stability of painting materials, and the course of art history.

Detailed identification of pigments and binding media may lead to a deeper understanding of deterioration processes and the mechanisms of decay. For example, a range of oxidising conditions are represented in each of the samples according to depth from the surface. Studying the properties of these materials and comparing them with samples from works of art of the same period, which are subject to various ways of ageing, will further the knowledge on their chemical reaction processes. Realising the exact composition of Vigani's samples may help to underline the artists' concerns with the stability of a particular painting material or their favour for another, as can be witnessed in English treatises from the 17th and early 18th Centuries.

Furthermore, once the connection between Vigani's fine art material samples and the names he assigned to them is established, supplementary attributes given to these samples due to their acquisition and storage history bear significant relevance:

Provenance, price (as an indication of quality), and differentiation in hue, amongst others, are to be considered for the specialised distinction between "multiple holdings".

An additional objective of the research was to distinguish between closely related samples thus allowing for a very specialised definition of properties, for example in the cases of the samples listed in the following figure:

Samples	Number of Samples	Variation in
massicot	3	hue: 'pale', 'deep', 'yellow'
native cinnabar	5	country of origin
artificial cinnabar/vermilion	2	manufacturing process
'Roset', 'Russet', 'Ross-Pink'	3	terminology
smalt	5	hue, terminology, and perhaps manufacturing process
lead white, cerussa	3	manufacturing process
litharge	2	manufacturing process
metal powders	19	colour
glass speckles	7	colour
succinum	4	colour
turpentine Oil	6	place of origin
Venice turpentine	2	ageing
shellac	4	manufacturing process
dragon's blood	3	confection

The collection as a data reference for the identification of artists' materials of the period can thus be augmented and refined with information on provenance, trade, and manufacture gained on natural scientific grounds.

The cabinet, of course, provides a rich basis for research beyond the scope of painting materials in fields such as modern and historic natural sciences, for which it is hoped this thesis will be a starting and reference point. As interest in this collection grows, it must be emphasised that every intervention with the cabinet and its contents is an intrusion and thus changes its authenticity. Such changes may be hardly noticeable at first but continued assessment of the collection can alter the well-preserved assembly and thus influence its purity and value. Therefore, it is paramount that visits to the cabinet be limited and that each remains as non-invasive as possible. Queens' College will thus need to produce a policy accordingly.

While continued physical access to this entity of cultural heritage is an issue regarding its long-term preservation it is understood that evaluation of its painting materials would benefit the future conservation of works of art.

In summary, the meticulous assessment of the cabinet and its contents including the fine art samples and documents along with thorough analysis of original multidisciplinary texts and resources reassuringly confirmed what was previously accepted about painting materials from the 1700's. Additionally, the investigation provided insight that enhanced and fine-tuned the current understanding of painting materials from this time. For example, sources from the natural sciences, which had not previously been considered in publications on the subject, help augment the knowledge base and, moreover, expand the understanding particularly in the fields of history, colours, provenance, properties, and trade of binding media and varnishes. The impact of such insight provokes questions that could be further confirmed by more scientific analyses. Further technical research and interpretation will not only provide a better understanding regarding these materials in the field of art technology but also in chemistry, botany, and the history of medicine. Also, official protocols to preserve the integrity of the cabinet and its contents are necessary as the far-reaching value of this collection becomes apparent to other disciplines. Vigani's well preserved cabinet provides a truly a remarkable glimpse into many aspects of the academic life and trade that was taking place in England more than three centuries ago. May Vigani's cabinet stay preserved in such excellent condition for many more centuries.

**Fine Art Materials in Vigani's Cabinet, 1704,
of Queens' College, Cambridge**

dissertation

in four volumes

submitted by Lisa Wagner

Volume 4

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Appendix

Glossary of Chemical Terms

Transcription of lecture-notes (undated)

Cours De Chymie. Joan : Francis : Vigani Veronens ;
MS CUL Dd.12.53

Transcription of lecture-notes (1707)

*Course of Chemistry under Signior Vigani Professor of Chemistry
in the University of Cambridge at the Laboratory of Trin. Coll.
November & December 1707*
MS Quns Old Library

Transcription of MS Quns Vig. 1- MS Quns Vig. 18

Containing invoices and other correspondence

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Glossary of Chemical Terms

This glossary explains the most frequently occurring terms in Vigani's writings in their original spelling. Different spellings of the same term are listed in their respective place in the alphabet with reference to the synonym. Cross-references are marked with an →arrow.

The explanations are tailored to the specific meaning of the terms in the context of the LECTURE-NOTES undated, from Cambridge University Library, and of the LECTURE-NOTES 1707 from Queens' College. This is particularly important in respect to the symbols, since these were not thoroughly standardised at Vigani's time. A symbol can stand for either the English or the Latin term with their respective endings for nouns (and their cases in Latin), adjectives, or verbs, as for example in:

~ ^{atio}	destillatio
~	distil
~ ^{ed}	distilled
~ ^{on}	distillation
~ ^{ons}	distillations

In interpreting the recipes it has always to be taken into consideration, that the ingredients carried impurities or naturally do not only consist of the main compound, given in this glossary. These by-products may take part in the reaction process. Attention should be paid to the vessels, in which the experiments are carried out, and the instruments (for example an iron ladle) and circumstances (humidity and air of the environment, or their exclusion) to assist the process. These, additional to the list of ingredients in a recipe could account for the result and the observations that Vigani knowingly or not consequently recorded. It might have led him to wrong conclusions or interpretations of chemical processes, properties, and the assumed composition of a reaction product.

Works of reference for this glossary are:

ABRAHAM 2001, CROSLAND 1962, SCHNEIDER 1962, TRAPP 1996, the online version of the Oxford Dictionary of English, 1989² (© Oxford University Press 2004), and Adam McLean: The Alchemy Website (<http://www.levity.com/alchemy/>).

acid for Vigani the acid was the active part in a reaction between acids and alkalis. He was aware of the different strengths of acids and that the stronger acid was the more “active”. He knew that acids only react when diluted with water, what is known today by dissociation of the acid in water.

ad consistentiam mellis to the consistence of honey

afores, afores^d aforesaid

△ **air**

alcohol is not only used for fine spirits, but also of impalpable powders, i.e. *a body reduced into as small parts as it is capable of being divided into.* (LECTURE-NOTES 1707, p. 119)

∇ **alcohol vini** alcohol from wine, gained via one or several distillations. According to LECTURE-NOTES 1707, p. 24 alcohol vini covers →‘spiritus vinosi’, ‘vini rectificati’, and ‘alcohol vini oleumvini’. In LECTURE-NOTES undated, p. 3 it is specified as the distillate of →spiritus vini rectificatus, which is the third distillate of wine.

✕ **alembic, alembick** a vessel with a beaked cup or head, which carries vaporous substances to the receiver

alkahest the ‘universal solvent’ of the alchemists

alkali, alcali, alcalick in early chemistry alkali was supposed to be a specific substance, which existed, fixed (in soda, potash), and volatile (in ammonia). Before the middle of the 18th Century it was shown that there were distinct alkalis, and these were distinguished as mineral alkali (soda), vegetable alkali (potash), animal alkali (ammonia). This distinction can already be traced in Vigani’s experiments.

‡ **alom, alum** double sulphate of aluminium and potassium $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

āāā **amalgame, amalgamate, amalgamation** Vigani explains that *amalgamation is nothing but a division of the metallic body into small parts by the help of mercury* (LECTURE-NOTES undated, p. 13). The result is a soft mass, a mixture of a metal with mercury, a mercurial alloy, as gold amalgam, copper amalgam, etc.

‡ **antimonium, antimony** a silvery metalloid chemical element of which stibnite is the main ore. In alchemy and material medica the term was originally applied to the stibnite, the native trisulphide, which was also called gray antimony, or when calcined and powdered, crude or black antimony. Vigani seems to have used the term in the latter sense.

∇_{on}: **aqua fontanae** spring water

∇ **aqua fortis** more or less concentrated nitric acid, HNO_3

aqua frigida cold water

∇ **aqua regia** concentrated mixture of nitric acid HNO_3 and hydrochloric acid HCl

∇_{ep}: **aqua tepida** lukewarm water

argentum vivum = quicksilver, →mercurius

aromaticks any substance or plant emitting a spicy odour; a fragrant drug; a spice.

balneum **balneum arenae** a bain-marie with warm sand being used instead of water


balsamum, balsam, balsamick an aromatic oily or resinous medicinal preparation, usually for external application, for healing wounds or soothing pain

balsamum sulphuris Vigani makes this balsam from *good salad oil* or from *Florence oil* and sublimed sulphur. The Philosophical Transactions recommend oil of turpentine and →brimstone (Phil. Trans 1694, XVIII., p. 200), the product of which Vigani calls Balsamum sulphuris terebinthinatum.

benzoin a dry and brittle resinous substance, with a fragrant odour and slightly aromatic taste, obtained from the Styrax benzoin, a tree of Sumatra, Java, etc. For scientific distinction it is now termed gum benzoin. Also called by popular corruption 'benjamin'. Bitter-almond-oil camphor is one of the constituents of gum benzoin; it is a ketone, $C_{14}H_{12}O_2$, of the di-phenyl group.

bezoar (minerall) natural bezoar is a concretion found in the stomach or intestines of some animals, formed of concentric layers of animal matter deposited round some foreign substance, which serves as a nucleus. The original sort was the lapis bezoar orientale, obtained from the wild goat of Persia and various antelopes, etc. The lapis bezoar occidentale, obtained from the lamas of Peru, was less valued. The chamois yielded German bezoar. It was said to be sudorific and diuretic, and thereby free the body from any poison (the word bezoar comes from the Persian word for antidote). Mineral bezoar describes types of artificial sudorifics, which are mostly preparations of antimony, like antimonyteroxide (Sb_2O_4).

blind head a cover for an alembic or retort

bole armoniac armoniac (amoniak) is a corruption of armeniac. Bole armoniac or the Armenian bole is a soft friable fatty earth, usually of a pale red colour.

brimstone vernacular name for sulphur, usually unrefined or un-purified.

butyrium a mass of the quality of butter

butyrium antimonii butter of antimony, the trichloride $SbCl_3$, a translucent fatty mass of crystals

butyrium benjamini a variation of →flores benzoin that is less pure

C.C.: Lat. Cornu Cervi, hartshorn

calcinate to break down a substance by fierce heating and burning usually in an open crucible. The final product of a calcination is a calx. These products were often metallic oxides, as for example a →crocus

calomel mercurous chloride, or 'protochloride' of mercury (Hg_2Cl_2); a preparation much used in medicine in the form of a white powder with a yellow tinge, becoming grey on exposure to light. In pharmacy the name was also given to mercurius dulcis, further sublimated to a fourth time, or upwards.

calote =? culot: which is a stand for a crucible in the furnace.

capitellum caecum Lat. for →blind head

☺

caput mortuum the residuum remaining after the distillation or sublimation of any substance, more specifically the ferric oxide Fe_2O_3 which remains in the retort in the distillation of sulphuric acid from iron sulphate (see also →colcothar)

cathartick a medicine which has the power of purging or evacuating (the bowels)

↪

cineration reduction to ashes

coagulum a substance that coagulates a liquid (especially milk)

cohobation frequent removal of the moist component of a substance by heating (for example in distillation). Often the moist component or liquid is poured back again and again upon the matter from which it has been distilled (or other matter of the same kind).

colcothar The brownish red peroxide of iron Fe_2O_3 , which remains in the retort after the distillation of sulphuric acid from iron sulphate. In the 18th Century it was the same with caput mortuum from vitriol, colcothar vitriolatum. Colcothar could also be red (cobalt-) vitriol, which was deprived of the spiritus vitrioli by distillation. This preparation was known as Colcothar Paracelsi. Colcothar was used in medicine, in the mechanical arts, and in a finely powdered form by jewellers under the name of rouge.

colcothar
⊕^{latū}

colcothar vitriolatum it is the caput mortuum of iron-vitriol, Fe_2O_3 . (compare →colcothar)

com: Lat: communis, -e; Engl: common

corroborative a strengthening or fortifying agent or measure

cream of tartar, cremor tartaris purified crude tartar, which forms white crystals; the purified and crystallised bitartrate of potassium $\text{KHC}_4\text{H}_4\text{O}_6$

crocus a name given to various yellow or red powders obtained from metals by →calcination

crocus martis crocus of iron, rust prepared in different ways. The main component is ferric peroxide Fe_2O_3 . If prepared from ferrous vitriol it also contains varying proportions of sulphates. (compare with →caput mortuum and →colcothar)

crocus metallorum = crocus of antimony, a more or less impure oxysulphide of antimony $\text{K}_3\text{Sb}_5\text{O}_7\text{S}_2$

+

crucible a melting pot, usually of earthenware, made to endure great heat, used for fusing metals. etc.

used for fusing metals, etc.

crude tartar → tartar

crystal This term was used in the names of various chemical salts of crystalline form, as crystals of →alum, copper, →mars, silver, tartar, →venus, etc.

cucurbita a vessel or retort, originally gourd-shaped, forming the lower part of the distilling apparatus.

o

day

decant, decantation

decoction the digestion of a substance in the flask without the addition of any other material

decrepitate to calcine or roast a salt or mineral until it no longer crackles in the fire. These substances make a crackling noise when suddenly heated, accompanied by a violent disintegration of their particles.

dia sulphuris synonymous with 'hepar sulphuris' (LECTURE-NOTES 1707, p. 20) = liver of sulphur, an old name for a metallic sulphide, having a reddish-brown or liver colour. Also, for compounds of sulphur with other substances. More precisely subdivided into hepar sulphuris kalinum (an old name for potassa sulphurata, the type described in Vigani's recipes) and hepar sulphuris calcareum (the name commonly given in homoeopathy to calcium sulphide).

diaphoretick, diaphoreticum having the property of inducing or promoting perspiration; sudorific.

8

digest, digestion the refinement, maturation, or preparation of a substance by gentle heat, often together with a liquid for the purpose of extracting the soluble components.

dissolve, dissolution the dissolving or transforming of a substance into a liquid. In Vigani's terms it is the *whole body*, which has to be dissolved in the →menstruum.

~2

distil, distillation the separation of a volatile component from a substance by heating so as to drive off the component as a vapour, which is then condensed and collected in a cooler part of the apparatus.

diuretick having the quality of exciting excessive discharge of urine

dulcify to wash the soluble salts out of a substance; to neutralise the acidity

▽(then)

earth (earthen)

edulcorate to free and purify from harsh and acrid properties by agitation or trituration in water, or by washing on a filter.

elixir a strong extract or tincture

emetick a medicine which has the power to excite vomiting

- emphyromatic, empyreumatic** having the quality of tasting or smelling of burnt organic matter
- = **equal** for example of quantities
- extract** *This word extract does comprehend all chemical extractions, but when we speak of extract, we must not understand it in a general sense, but peculiarly i.e. either →decoctions, or →tinctures by evaporations, or distillations, whereby liquids are reduced →ad consistentiam mellis. (LECTURE-NOTES 1707, p. 40)*
- fermentation** rotting of a substance, usually of an organic nature, accompanied by the release of gas bubbles. Fermentation could also be the decomposition of a salt under the influence of an acid, when this causes bubbles (and heat).
- ∫ **filter, filtrate, filtration**
- △ **fire** also heat
- ⊕ **fixation, fixed, fixatis** the process of reducing a volatile spirit or essence to a permanent bodily form (so that it can endure the fire)
- fixed salt** not easily volatilised salt, which does not loose weight under the influence of fire.
- flores benzoin** sublimation product of →benzoin
- flores salis ammoniaci** one of the products in the distillation of ammonium chloride and potassium carbonate with water
- flores salis armoniaci chalybeati** sublimation product of ammonium chloride with filings of iron
- Flos ♀^{is} **flores sulphuris, flowers of sulphur** volatile oxides of sulphur (CROSLAND 1962)
- flores, flowers** (Lat. sing: flos) the more subtle, powdery parts of a substance separated from the grosser by sublimation
- gum armoniac, gum ammoniac** i.e. 'gum of Ammon,' a gum-resin, of peculiar smell, and bitterish taste, the juice of the plant Dorema Ammoniacum, which is found wild from North Africa to India. Employed in medicine, and as cement. (See also →sal armoniac)
- ℥ss **half an ounce**
- hepar** an old name for a metallic sulphide, having a reddish-brown or liver colour. Also used for compounds of sulphur with other substances.
- hepar antimonii** according to Vigani it is powdered →crocus metallorum $K_3Sb_5O_7S_2$
- hepar sulphuris** synonymous with →dia sulphuris
- X **hour**
- humours** the four chief fluids (cardinal humours) of the body (blood, phlegm, choler, and melancholy or black choler)

- impregnate** to fill a substance with some active principle, element, or ingredient, diffused through it or mixed intimately with it
- in fluore** in liquid/flowing state
- ♂ **iron nails** also for filings of iron
- ♂ **jupiter** tin, stannum, (^{vis} could stand for 'iovis', Lat. for Jupiter in the second case)
- lac sulphuris** milk of sulphur, a suspension of amorphous powdered sulphur in water or the precipitated sulphur obtained from this (OED 1989²)
- lb ♂ **libra semissis** half a pound
- ♂ **lime**
- liquor glacialis** is perhaps the same with Lemery's Glacial oil of antimony, which is antimony chloride
- lotion** the 'washing' of metals, medicines, etc. in water to cleanse them from impurities, etc.
- Ⓒ or Ⓓ **luna** argentum, silver
- lute** to close or stop an orifice or joint of vessels with lute, usually in order to render it air-tight. Lute commonly consists of clay or cement composed of various ingredients.
- macerate** to soften by steeping in a liquid, with or without heat, or to separate the soft parts of, by steeping or partial digestion.
- magisterium, magistery** a term taken over from alchemy, where it designated a master principle of nature, free of impurities, a potent transmuting. Vigani only uses this term for a preparation of 'testaceous' materials, which has more virtues attributed to it than Vigani considers justified.
- magisterium tartari** → tartarum vitriolatum
- ♂ **mars** iron
- matrass** a glass flask with a round or oval body and a long neck
- menstruum** a solvent
- mercurius dulcis** mercurous chloride Hg_2Cl_2 , the same with → calomel
- Mercurius vitae** mixture of antimony oxychloride and oxide. The name is misleading since the composition does not contain mercury, but it is part of the preparation process.
- ♂ **mercurius, mercury** elemental quicksilver, but also the mercurius as the substance from which all other metals are created (although it is not imminently obvious, even Vigani still believes this to be true as can be seen in 'regulus of antimony' (LECTURE-NOTES undated, p. 12). It seems that sometimes the term '(crude) mercury' describes the ore, which would be the same with crude cinnabar, and that 'quicksilver' is

applied where the pure liquid elemental mercury is meant.

♀

night

①

nitre originally applied to natron, native sodium carbonate; Later, and definitely in the 18th Century it stands for artificial potassium nitrate KNO_3 . It was also a supposed volatile substance or chemical principle related to saltpetre, said to exist in the air or in plants and to give rise to various physico-chemical phenomena. Usually applied by Vigani in the former sense, it occurs once in this latter sense in the 'cineration of lead' (lecture notes, undated, p. 23).

nitrum fixum potassium carbonate, K_2CO_3 (chemically the same with →salt of tartar)

Ob: observation, observe

oil of sulphur sulphuric acid or perhaps alkaline sulphide of ammonia

oil of tartar concentrated or saturated solution of potassium carbonate

oil of vitriol concentrated sulphuric acid H_2SO_4 with some sulphurous acid, concentrated →spirit of vitriol

⊙

oil, oleum

⊙ ♀^{ri} p.
del:

oleum tartari per deliquium lye of potassium carbonate K_2CO_3 in water. It is called per deliquium because the salt dissolves itself by taking up water from the air.

⊙ ⊕^{li}

oleum vitriolis synonymous with →oil of vitriol

℥

ounce

p. se per se

panacea a medicine reputed to heal all diseases

panacea antimonii = →regulus antimonii medicinalis

per campanam combustion under a glass cover in the shape of a bell, for example in spiritus sulphuris per campanam

per deliq;, **per deliquium** obsolete form for 'by deliquescence': the melting or liquefying of a salt by absorption of moisture from the air.

per retortum by refining (the substance) in a →retort

phlegm, phlegma the term was used for one of the five 'principles' of bodies, also called water; It could be any watery inodorous tasteless substance obtained by distillation.

lb

pound

p or ℥

powder, to powder the second symbol occurs far less frequently in LECTURE-NOTES undated: once in the main section and three times in the added recipes in the back of the book.

℞

precipitate, precipitation any substance which, by the action of a chemical reagent, or of heat, etc. is separated from the liquid in which

it was previously dissolved, and deposited in the solid state.

precipitatus albus white precipitate, which is mercurammonium chloride, $\text{HgH}_6\text{N}_2\text{Cl}_2$, or dimercurammonium chloride, $\text{Hg}_2\text{H}_4\text{N}_2\text{Cl}_2$. In RESENBERG 2005, p. 46 it is given as NH_2HgCl .

precipitatus rubrum red precipitate, mercuric oxide or red oxide of mercury, HgO

p^t, p^{ts} part, parts

purgative causing evacuation of the bowels

q.v. (Lat.) quantum vis, as much as you like

quick lime calcium oxide, CaO

Rad. (Lat.) radix = root

rarefy to lessen the density or solidity of a substance

receiver a vessel for receiving and condensing the product of distillation

refrigeratorium, refrigeratory a vessel at the head of a still filled with cold water through which the worm passes, for condensing alcoholic and other vapours

Reg: **regulus** generally the purer or metallic part of a mineral, which sinks to the bottom of a crucible and is thus separated from the remaining matter, or more specific the metallic form of antimony

Reg: ♂ⁱⁱ **regulus antimonii (medicinalis)** the simple element antimony, which crystallises in a star-shape.

Reg: ♂ⁱⁱ
♂^{ati} **regulus antimonii martiati** like →regulus antimonii (medicinalis), but with the addition of iron.

regulus metallorum a product of the smelting of various ores, as copper, lead, and silver, consisting of metal in a still impure state. Vigani uses all the imperfect metals, plus →regulus antimonii for the presence of sulphur in it.

♂ **retort** a vessel with a long neck, bent downwards, generally made of glass, but occasionally of metal or earthenware, in which liquids, etc. are heated in distillation.

reverberatory furnace a furnace in which the flame or heat is forced back upon the substance which is already being heated by it.

roche allom thin-bedded rocks found in various formations, from which →alum is manufactured

rosin resin *in reality is nothing else but solid oil of vegetables, as oil is really nothing but liquid resin rarefied by distillation* (LECTURE-NOTES 1707, pp. 104-105).

S.A. secundum artem, to art

saccharum saturni synonymous with →sugar of lead

⊖

sal salt in general

sal ad calculum calculi are stones which can occur in various parts of the body, for example in the kidneys or intestines.

⊖ *^{ci}

sal ammoniaci, sal armoniack i.e. salt of Ammon, a hard white opaque crystalline salt, supposed to have originally been prepared from the dung of camels near the temple of Jupiter Ammon. The corruption to armoniac found in medical Latin, French, and English, was perhaps due to an association with the Greek ἀρμωία 'fastening' or 'joining', from the use of gum ammoniac as a cement, or of sal ammoniac in the joining of metals. Chemically ammonium chloride NH_4Cl . [OED 1989²]. *Ammoniacum, or Sal Ammoniac, we receive from Alexandria in Ægypt, by means of the Ships belonging to the Turkey Company; as likewise from the Venetian and the Hollanders, who trade to the Levant. We have two Sorts in the Shops, one which they call the natural, and another which is artificial. They tell us, that the first is found in such Ground as has imbibed the Urine of Animals; But it is not at all reasonable to judge in this Way, since what we receive as such, is constantly in the same Shape, and about the same Bigness, in flat Planes or Cakes. We have an account in the Philosophical Transactions, that they are factitious, and the Way of making them, Notwithstanding this, we have a manner of making them under the Name of Sal Ammoniacum factit. compos'd of Urine, Sea Salt, and Wood Soot. This is what we generally meet with in the Shops.* (BRADLEY 1730, pp. 51-52)

sal communis common salt, NaCl

sal lunae salt of silver, silver nitrate

sal martis salt of iron, iron sulfate

sal nitri, sal nitrum = →saltpetre

⊖ ⊕^{tri} ♀^{atis}

sal nitri fixatis synonymous with →nitrum fixum

sal prunellae here the name for a preparation of fused nitre (potassium nitrate + sulphate), but also the term for the plant prunella and the medicine made thereof.

sal solis salt of gold

sal sulphuris =? potassium sulphate →impregnated with sulphuric oxide

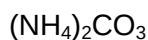
sal tartari synonymous with →salt tartar

sal urinae salt of urine; distinguished between sal urinae volatile, a salt of ammonia, gained in the sublimation; and the sal urinae fixum, extracted with water from the material left behind in the distillation. One of these two is likely to be urea, a soluble crystalline compound, forming an organic constituent of the urine: carbamide, $\text{CO}(\text{NH}_2)_2$.

sal veneris salt of copper

sal vitrioli martis ferrous sulphate, vitriol in crystalline form

sal volatile in general any volatile salt; particularly: ammonium carbonate $(\text{NH}_4)_2\text{CO}_3$



sal volatile salis ammoniaci = →salt of hartshorn

salt of hartshorn ammonium carbonate $(\text{NH}_4)_2\text{CO}_3$

salt of wormwood mainly K_2CO_3

salt peter, saltpetre potassium nitrate KNO_3 (see →nitre), also calcium nitrate $\text{Ca}(\text{NO}_3)_2$

salt tartar salt which mainly consists of potassium carbonate K_2CO_3 , which is chemically the same with →nitrum fixum.



sand



saturn(us) plumbum, lead

scoria the slag or dross remaining after the smelting out of a metal from its ore.

s^d said



sol aurum, gold (auratum, golden)

spirit of hartshorn or simply hartshorn: the aqueous solution of ammonia, ammonium hydroxide solution (whether obtained from harts' horns or otherwise)

spirit of sal ammoniac = ammonia: A colourless gas with pungent smell and strong alkaline reaction, NH_3

spirit of vinegar =? acetic acid

spirit of vitriol a distilled essence of vitriol, diluted sulphuric acid H_2SO_4 with varying amounts of SO_2 . The proportion of acid is ca. 3%.

Sp: Sp^t :Sp^{ts} spirit, spiritus, spirits; a liquid of the nature of an essence or extract from some substance, especially one obtained by distillation, which carries the smell or taste of the initial products.

Sp: CC

spiritus cornu cervi = →spirit of hartshorn

spiritus nitri spirit of nitre, nitric acid, HNO_3 , ca. 50%

spiritus salis armoniaci synonymous with →spirit of sal ammoniac

spiritus sulphuris sulphuric acid, H_2SO_4 , of varying concentration with sulphuric oxide, SO_2 , when freshly made.

spiritus tartari the liquid obtained by dry distillation of tartar; it contains acetic acid, pyrotartaric acid and other substances. The proportion of acid is ca. 1%.

spiritus veneris spirit of copper = ?



spiritus vini rectificati the second distillation of wine = the first distillate of →spiritus vini vulgaris

^sV vulgaris

spiritus vini vulgaris product of the first distillation of wine, brandy

spiritus vinosi a spirit like “true French brandy”

S.Q. a sufficient quantity

stellatus star-shaped

SSS (Lat.) stratum super stratum, in layers

℞

sublimate, sublimation

sublimate corrosive corrosive sublimate: mercuric chloride or bichloride of mercury HgCl_2 , a white crystalline substance, which acts as a strong acrid poison. (see also →sublimate mercury)

sublimate mercury mercury sublimate; bichloride HgCl_2 or perchloride of mercury, a white crystalline powder, which acts as a violent poison. In early times also used for arsenic; (see also →sublimate corrosive)

sublimation totum, sublimation in parte total sublimation where all the material is turned into a sublimate in contrast to a partial sublimation

succus a juice, applied to fluid secretions in an animal or vegetable body, or juices extracted from plants. Vigani uses this word in both its meanings.

sugar of lead lead acetate $\text{Pb}(\text{CH}_3\text{COO})_2 \cdot \text{H}_2\text{O}$

⚞

sulphur sulphur in the modern sense, but also one of the two principles of metals, and therefore contained to some degree in every metal

sulphur aureatum diaphoreticum purified sulphur prepared from the dross, which is left in the preparation of regulus of antimony. This sulphur has sudorific properties.

sulphur martis sulphur of iron

sulphur veneris sulphur of copper

superficies the outer surface of a body, which is apparent to the eye, or is immediately adjacent to the air or to another body, but also that which constitutes the outermost part of a body; the surface layer. (OED 1989²)

℥

take/recipe

♀

tartar, tartarus mainly bitartrate of potash (acid potassium tartrate, $\text{KHC}_4\text{H}_4\text{O}_6$), present in grape juice, deposited in a crude form in the process of fermentation, and adhering to the sides of wine-casks in the form of a hard crust, which in the crude state varies from pale pink to dark red.

♂^{rū} ⊕^{latū}

tartarum vitriolatum quite a pure form of potassium sulphate, K_2SO_4 , produced of →salt tartar and →spirit of vitriol; also called magisterium tartari

terra foliata tartari potassiumacetate CH_3COOK

℞a

tinctura, tincture a solution, usually in a →menstruum of alcohol, chiefly vegetable, but sometimes animal, or mineral. According to Vigani it is

the menstruum impregnated with the most essential parts of a body.

torrifaction the process of drying or roasting a substance by fire

turbith minerali the basic sulphate of mercury $\text{HgSO}_4 \cdot 2\text{HgO}$, obtained as a lemon-yellow powder from the normal sulphate by washing with hot water. Turpeth mineral has emetic, cathartic, and sternutatory properties. (OED 1989²)

☐

urine

♀

venus copper

virtue, virtue power to affect the human body in a beneficial manner

vesica a large copper body, tinned within-side, which was commonly used in the distillation of ardent spirits.

⊕

vinegar

⊕

vitriol various native or artificial sulphates of metals, used with adjectives of colour: blue, green, red, and white vitriol, as for sulphate of copper $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, iron $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, cobalt, and zinc respectively. The natural mineral copper vitriol always contains a proportion of iron vitriol.

vitriolated tartar synonymous with →tartarum vitriolatum

vol: volatile

volatile salt of hartshorn presumably the same with →salt of hartshorn

volatile salt of sal ammoniac synonymous with →sal volatile salis ammoniaci

▽

water

w^{ch} which

wⁿ when

w^t what

wth with

y^e the

yo^ε, yo^{es} your, yours

y^t that, yet

Cours De Chymie. Joan: Francis: Vigani Veronens;

Cambridge University Library, classmark: Dd.12.53

This manuscript, which is kept at Cambridge University Library, is a record of a course of chemistry lectures. The small volume in the format of a pocket size notebook (ca. 15cm x 9.8cm) bound in leather contains 57 pages of text and a couple of observations on pages [295-297], further recipes on pages [299-301], and mentions two doctors on the last page [304]. The pagination up to page [57] dates from the time of the text, further pagination from there to the end of the book is in pencil, from a later period.

The course of lectures is designed as an annotated recipe collection, which gives record of special observations during the reaction process, alternative methods, and guidelines on chemical operations. Although the order of the recipes looks more or less random, coherent groups can be recognised, such as:

- sequences of recipes where an ingredient of one recipe is produced in the preceding recipe
- recipes centred around one substance or element, such as a metal
- recipes with a similar reaction principle, such as formation of salts from acid-alkali reactions
- recipes of predominantly organic nature, such as tinctures or vegetable oils.

The course must have been written down to completeness, since the last recipe is underlined with a sequence of quill strokes to mark the end of the text. Whether the additional recipes and observations in the end of the book were included at the same time with the writing of the course or at a later period remains unknown. Hence the dates 1699 and 1700 for two weddings on page [304] are not indicative of the dating of the manuscript, neither can they be related to as a terminus ante or post quem. In LECTURE-NOTES 1707, from Queens' College, which are much longer and better grouped, some recipes of this manuscript reappear in an extended and clearer version. Furthermore, Queens' lecture notes do not use alchemical symbols. Therefore it might be inferred that the lecture notes from Cambridge University Library predate Queens' lecture notes from or shortly after 1707.

With the same arguments as for LECTURE-NOTES 1707, from Queens' College¹ we can assume a copyist as the writer of the manuscript, although it has to be noted, that two different characters in the writing seem to be present, with a first section in brown ink from pages [1-23] in a steady and more rounded writing. Pages [24-57] look more jagged and weary in writing with a rather blackish ink. It could not be established whether the text is by two different hands, though stylistically they are identical, as well as in the extensive use of alchemical symbols and abbreviations. Assuming that the text was copied from an original version this is not surprising. Whether the original version was by Vigani himself or some person closely associated with Vigani's teaching cannot be established.

The transcription accurately follows the original text in spelling, abbreviations, grammar, and capitalisation of words. Punctuation, lines, paragraphs, and page-breaks were kept as given in the manuscript. Original corrections of text passages with strike-through were kept. When in doubt about the correct reading of words in the manuscript, these words were marked with [?]. Pagination at the beginning of each page enclosed within square brackets was added.

For the interpretation of (al)chemical expressions in the document refer to the Glossary of Chemical Terms in this appendix.

¹ See its introduction and transcription in this Appendix.

[i-ii empty pages]

[iii]

*Cours**De Chymie.**Joan: Francis: Vigani**Veronens;*

[iv empty page]

[v]

1	$\ominus^{lis} \oplus^{tri} \Psi^{atis}$ -----	1
2	$\ominus$ <i>Prunellae</i> -----	<i>idem</i>
3	$\ominus \mp^{ri}$ -----	2
4	$\nabla^{\wedge}$ -----	3
5	<i>Resina Glapii</i> -----	4
6	<i>Crocus Metallorū</i> -----	5
7	<i>Balsamū</i> ∇^{ris} -----	<i>idem</i>
8	<i>Magisteriū Corallii</i> -----	6
9	<i>Reg</i> : $\mathfrak{G}^{ii} \mathfrak{G}^{tus}$ -----	8
10	$\mp \oplus^{atū}$ -----	9
11	$\nabla^{tū}$ <i>corrosivū</i> -----	7
12	$\odot \mp^{ri}$ <i>p. deliq</i> : -----	10
13	$\odot$ <i>Sem: Carui</i> -----	11
14	<i>Colcothar</i> $\oplus^{atū}$ -----	<i>idem</i>
15	<i>Reg</i> : $\mathfrak{G}^{ii}$ <i>p. se</i> -----	12
16	$\overline{aaa} \mathfrak{X}^{ii} \& \mathfrak{Y}^{is}$ -----	13
17	$\ominus$ <i>vel</i> $\oplus \mathfrak{G}^{tis}$ -----	14
18	$\mathcal{K}_a$ <i>Croci & Aloës</i> -----	16
19	$\mathcal{K}_a$ <i>Myrrhae</i> -----	17
20	<i>Elixir Proprietatis</i> -----	18
21	<i>Dia</i> ∇^{ris} -----	19
22	<i>Flores</i> $\ominus^{lis} \ast^{ci}$ <i>chalybeati</i> -----	20
23	∇ <i>Regin</i> : <i>Hungaricae</i> -----	22
24	$\cup^{atio} \mathfrak{H}^{ni}$ -----	23

[vi]

25	<i>Sp: C.C.</i> -----	24
26	<i>p fulminans</i> -----	27
27	<i>De Coloribus</i> -----	<i>idem</i>
28	<i>Sp: & Θ volat : Θ^{lis} *^{ci}</i> -----	<i>idem</i>
29	<i>Reg : †ⁱⁱ medicinalis, vel</i> <i>Panacea †ⁱⁱ</i> -----	31
30	<i>Margaritū minerali</i> -----	32
31	<i>Flores Benzoini</i> -----	33
32	<i>Coagulū Helmontii</i> -----	34
33	<i>⊙ Camphorae</i> -----	36
34	<i>⌘^{tū} albū & rubrū</i> -----	37
35	<i>⊙^{rū} mosaicū</i> -----	38
36	<i>℥^{tio} Guaici</i> -----	39
37	<i>℥^{tio} ♂^{ri}</i> -----	41
38	<i>℥^{us} dulcis</i> -----	44
39	<i>Butyrū †ⁱⁱ</i> -----	46
40	<i>⊖ Absinthii</i> -----	48
41	<i>⊖ ♀^{nae}</i> -----	49
42	<i>vitrificatio ℥ⁿⁱ</i> -----	51
43	<i>Turbith minerale</i> -----	52
44	<i>āāā ♀^{ris}</i> -----	53
45	<i>⊖ volat: ⊙^{tū}</i> -----	<i>idem</i>
46	<i>Extractū Gentianae</i> -----	54
47	<i>Sp: ⊙^{tri} Philosophicus</i> -----	55
48	<i>℥_a †ⁱⁱ</i> -----	56

[vii – x empty pages]

[1]



Ÿ. $\oplus^{tri}$ q.v. melt it in a + in a plain furnace, w^n melted, cast in a piece of Charcoale, a Detonation will follow, w^{ch} being ceased, throw in an other piece, Repeat this till $y^e \oplus$ is ψ^{ed} , w^{ch} will be w^n y^e Charcoale causes no more Detonation.

Ob This preparation is nothing elce but a ψ^{on} of $y^e \oplus$ into an Alkalick $\ominus$ by the help of $y^e \nless$ of ye Charcoale.

It is supposed that in y^e Detonation y^e volatile p^{ts} of $y^e \oplus$ flie off, & leave y^e Alkalick $\ominus$ behind: w^{ch} may be proved by reducing this $\ominus$ into $\oplus$ by y^e affusion of Sp: $\oplus^{tri}$ till it be quite saturated.

This is y^e only Experiment whereby y^e Doctrine of Acids & Alkalis is clearly explained. Yet, if thoroughly examined 'tis much to be questioned whether these by any separation of y^e Sp: $\oplus^{tri}$, as we shall show hereafter in y^e Explanation of it /---



*Melt q.v. $\oplus^{tri}$ in a +, w^n melted, put thereon A small Quantity of Flos $\nless^{is}$, w^n y^e Deto=
=nation is over put on more, and w^n you see yo^e matter very clear, pour it out into a mortar a little heated, then take it out & keep it for use.*

*Ob Although $y^e \nless$ causes a Detonation as well as y^e Charcoale, yet it does not alter the Quality of $y^e \oplus$ but onely diminishes its Quantity, because $y^e \nless$ being very pin=
=guious does only play upon y^e superficies of $y^e \oplus$; and from non Experiment whatever*

[2]

does it appeare to be different from
 $\ominus \oplus^{tri}$ onely that it is more puri=
 =fied. And this is proved by y^e conti=
 =nuation of putting in ∇ till half
 or all $y^e \oplus$ be flown off in Flores.

$$\ominus \nabla^{ri}.$$

$\mathcal{U}$. of ∇ & $\oplus$ an = Quantity, let y^e
 + be heated in y^e afores^d Furnace
 then pour in of y^e mixture a spoon=
 =full at a time, permitting y^e Detona=
 =tion to cease between y^e putting in of
 each spoonfull, Repeat this till y^e
 matter is exhausted or y^e + filled, then
 pour it into a warm mortar, p it,
 & put it into a glasse well stopt,
 otherwise 'twill run p. deliq: as other
 Alkalick $\ominus^s$ will.

Ob. This $\ominus \nabla^{ri}$ in severall uses produces
 not different Effects from that $w^{ch} y^e$
 made w^{th} unmixt ∇ , as we shall shew
 in $y^e \mathcal{U}^{on}$ of ∇ .

That 'tis compounded of $y^e \oplus$ as well
 as $y^e \nabla$ is evident from y^e Quantity
 of y^e mixture.

Besides, $y^e p$ fulminans w^{ch} is made w^{th}
 This $\ominus \nabla^{ri}$, in y^e Explosion does not
 make so great a noise as that w^{ch} is
 made of $\nabla p.se$.

If you exactly observe y^e difference of
 colours. this has not so fine a colour
 as that of $\nabla p.se$.-----

[3]

V̇

Ȳ. of Claret q.v. put it into a ve=
 =sica Cuprea, so that it may be
 $\frac{2}{3}$ empty, & having luted thereto
 y^e Capitellū Rostratū cū Refrigi=
 =ratorio, in an ordinary furnace
 Ȳ^{1/3} pt. This first Ȳ^{on} is called
 V̇ vulgaris. Then wth this V̇ fill
 y^e vesica as before, & with a mode=
 =rate Δ Ȳ^{1/2}. This is call'd V̇^{tus}.
 Put y^e aforesd quantitiy of V̇^{tus} into
 y^e vesica cuprea, & to every Gallon
 add Θ commun: lbij. Stirr them well
 together & wth a gentle Δ Ȳ^{2/3} away,
 this last is call'd V̇.
 If you manage y^e Δ rightly, you'll
 have a better V̇ Ȳ^{ed} in a plain vesi=
 =ca cuprea wth an ordinary neck than
 by y^e help of any twisted X. For to
 raise y^e Sp: in a twisted X requires a
 violent Δ w^{ch} carries off a considera=
 =ble pt of y^e Phlegm wth the Sp^t.
 If you put to y^e V̇ some Θ Ȳ^{ri} or any
 other Alcalick Θ it will absorbe all
 y^e Phlegm.
 The Reason of putting in Θ commun:
 is y^t it may imbibe y^e Phlegm & make
 it more difficult to rise by that small
 Δ w^{ch} will raise y^e Sp^t.
 The Θ Ȳ^{ri} or any other Alcalick Θ is y^e
 onely tryall of y^e Diphlegmation of
 y^e V̇.

[4]

∇, though it has in it some Phlegm
will set Gunpowder on Δ; & there=
=fore it can be no proof of its good=
=nesse.

In all √^{ons} observe to keep yo^e Re=
=frigeratoriū full of cold ∇.

Resina Galapii.

℥. Rad. Galap: q.v. p it grossly, then
put it into a matrass & pour upon
it √ad 4^{tuor} digitorū supereminentiā.
̄ it 24 ℥ over a sand furnace or till
yo^e menstruū be thoroughly impreg=
=nated wth y^e Resinous p^t of y^e Galap,
w^{ch} will be wⁿ y^e Liquour is well tinc=
=tured, then ȝ y^e ℞a, & √^{3/4} of y^e Sp:
in a ∅, & that w^{ch} remains in y^e ∅
pour into a Bason of cold ∇, & yo^e
Resin will ⇐ to y^e bottom, which
you may separate from y^e ∇ & dry
for use.

Ob. This is y^e method not onely of draw=
=ing y^e Resin from Galap, but also
from all other pts of y^e vegetable
Kingdome.

The √^{on} is necessary onely to preserve
y^e Sp^t: for y^e same use wth y^e Resin.
If you ⇐ y^e ℞a in cold ∇ without
√^{on} or Evaporation of y^e Sp^t yo^e ∇
will turn milky & a p will be at
y^e bottom not differing from the

[5]

Rosin, w^{ch} for y^e difference of y^e Pre=
 =parations is call'd Magisteriū Gala=
 =pii. /-----

Crocus Metallorū.

Place a + in a melting furnace, w^n
 red hot put therein $\frac{1}{2}$ lb.1. bruised
 small pieces: augment $yo^e \Delta$ so as
 $y^e \frac{1}{2}$ may melt, & w^n it be fluid pour
 on't by little & little lb. $\frac{1}{2}$. of $\ominus \oplus^{trū}$,
 staying always till y^e Detonation be
 over, then let it coole. Break $yo^e +$ &
 separate y^e Crocus from y^e Scoria, w^{ch}
 may easily be done because y^e Scoria
 does not stick very fast w^{th} y^e Crocus.
 This preparation may be done in
 a mortar according to Lemery, &
 other Autho^{es} before him: But y^e Sco=
 =ria is not then so easily separated,
 lying more confused than before;
 and that's y^e Reason why this is a more
 violent Emetick than y^e former.

Balsamū $\frac{1}{2}$ ^{ns}.

$\frac{1}{2}$ f. pure Florence $\ominus$ lb.1. Flores $\frac{1}{2}$ ^{is}
 $\frac{1}{2}$ i $\frac{1}{2}$. put them into an Earthen Pot
 well glazed, fit it over a moderate
 Δ & let it boyle gently, Stirr it con=
 =tinually w^{th} a Stick till it acquires a
 red $\frac{1}{2}$ w^{ch} is a Sign of a perfect union
 of the $\frac{1}{2}$ w^{th} $y^e \ominus$: you will also see on
 it a red froth; remove it from $y^e \Delta$ &
 let it coole, and 'twill be of a balsamick

[6]

consistence. Keep it for use.

Ob. W^n common $\odot$ is used in this Balsam

it bears y^e name of Balsamū $\triangleleft^{is}$ =

= vulgare. W^n it is made w^{th} $\odot$ Terebinth:

it is call'd Balsamū $\triangleleft^{is}$ Terebinthina=

=tum; w^n w^{th} $\odot$ of Aniseeds. Balsamū

$\triangleleft^{is}$ Anisatu; w^n w^{th} $\odot$ of Amber, Bal=

=samū $\triangleleft^{is}$ Succinatū, &c. But these

last must be made in a matrass

w^{th} a long neck, because y^e $\odot^s$ are

too volatile.

The Ebullition is here necessary, not

so much for y^e union, as to deprive

y^e $\odot$ of its accidentall moisture with=

=out w^{ch} separation y^e $\triangleleft$ would never

unite. /-----

Magisteriū Corallii.

Dissolve Corall in any Blando=Acid,

as Sp: of ∇ , Suc: Limon: or $\odot \oplus^i$

well diluted with ∇ : wn dissolved, z it, &

yo^e Liquo^e will be very transparent,

drop into yo^e Dissolution $\odot \nabla^i$ p.del:

or $\odot \nabla^i$ diluted in ∇ , or any other

Ψ^{id} Alkali; a Fermentation will

follow, & consequently a ∇^{on} of y^e

Corall. And w^n y^e Alkali is well sa=

=tuated w^{th} y^e Acids, y^e whole Quantity

of Corall w^{ch} was in y^e Dissolution

will ∇ , z it & y^e Corall will be

in y^e z . Edulcorate yo^e p by Lotions

w^{th} ∇ ep:, then dry it for use.-----

[7]

Ob. By magistery is understood an im=
=palpable p made by the help of an
Acid menstruum, & separated from
it by help of an Alkali.

This rule is to be observed in making
magistery of Pearles, Egg=shels, Crabs=
=Eyes, oyster=shels, &c.

These would have been much esteem=
=ed in Physick, but that y^e Acidce
particulce w^{ch} are intermingled w^{th}
 y^e Alkalick body are inseparable
by Lotions; These so alter y^e Tex=
=ture of y^e body that it does not act
as an Alkali as before: And this is
easily demonstrated by pouring up=
=on the magistery any Acid for
then it will not ferment.

Corrosivū .

Corrosive is nothing but entan=
=gled w^{th} y^e Acid Sp: of ⊖ & ⊕ as you
may observe in Lemery. This is
easily dissolved in ∇ep : the Acids
being diluted that hold y^e ☿ , as in y^e
case of y^e Dissolution of y^e Corall.
If upon this Dissolution you drop
some ⊙ ☿^{ri} p : deliq: it will ☿ to
a red p by freeing y^e ☿^{riall} pts from y^e
Acids w^{ch} did support it. And this truth
Appears by pouring on't some Acid

[8]

w^{ch} will reduce it to its transpa=
=rent form, i.e. sustain y^e ☒ as
before.

All these Dissolutions & ☒^{ons} are Ef=
=fects of Acid & Alkalick $\ominus^s$.

By an Acid we mean y^e Activ=
pt & by Alkali y^e passive. And
though oftentimes two Acids will
☒ one another & ferment as Acid
& Alkali doe, yet this does not
destroy y^e foundation of Acid &
Alkali, because y^e stronger is to
 y^e weaker as an Acid to an Alkali.

Regulus ☒ⁱⁱ ☒^{tis}.

Place a large in a melting fur=
=nace & put therein ☒viiij of nailes
 w^{ch} being red hot, put in ☒ ☒xij. &
 w^n it be melted, pour in by little
& little ☒iiij of $\oplus$; then shut up y^e
furnace, & let them infuse for $\frac{1}{2}$
an $\mathbb{X}$, w^n y^e matter is cold break
 y^e + & separate y^e Reg: from the
Scoria. Then put y^e Reg: separated
from y^e Scoria into a new +, melt
it & pour thereon ☒iiij of $\oplus$ as be=
=fore: repeat it y^e third time, & so
will y^e Regulus be very fine.

Ob. This Reg: ☒ⁱⁱ is impregnated w^{th}
 y^e ☒^{tis}, w^{ch} appears from y^e Quan=

[9]

=tity, it being double to that made

p. se.

This wth mars is not so strong an

Emetick as that p. se.

$\varphi^{ri} \ominus^{latu}$.

℥. $\ominus^{lis} \varphi^{ri}$ ℥iiij dissolved in a S.Q. of ∇ ,

or $\ominus^{\bar{u}} \varphi^{ri}$ p. deliq: w^{ch} is better. Put it

into a glasse & pour upon it $\ominus^{\bar{u}} \ominus^{li}$

till y^e Alkalick $\ominus$ be thoroughly satu=

=rated wth it; then evaporate y^e mois=

=ture by a $\triangle$ furnace, & wⁿ dry, put

it up for use.

Ob. This $\varphi^{\bar{u}} \ominus^{latu}$ although it seems to be an

easy preparation, does yet require a

great deal of care. For 'tis not enough

to put Acids upon Alkalick Liquo^{es},

till y^e fermentation be over; if so, y^e

Acid will predominate, & it will not

then be a Neutr^u as was intended. And

therefore you must be very cautious

in y^e saturation of it, for a drop of

Acid too much will spoile y^e prepara=

=tion, and if there be too little y^e Al=

=kali will predominate, so that an

exact Quantity of each is required.

Let yo^e Liquo^e stand 3 or 4 $\circ$ that it

may sufficiently ferment w^{ch} you

may perceive from a bitterness in it.

Wⁿ it is dry, if rightly prepared, it is diffi=

=cult to dissolve in cold or hot ∇ ; but if

either of y^e $\ominus^s$ predominate 'twill easily

dissolve. -----

[10]

*This $\ominus$ if well done, is an Anti-Eme=
=tick. But if either $\ominus$ predominate
it is Emetick.*

*Mixt wth cathartick Potions it cures
ye Gripings if well done; if not, it
increases them.-----*

$\odot^i \varphi^i p. deliq.$

*This in severall preparations is pre=
=ferable to y^e Dissolution of $\ominus \varphi^i$ in ∇ .
especially if you intend to volatilize
this φ^t body, because $\odot \varphi^i p. deliq.$ by
gentle Evaporation will chrystallize
where y^e particulce aëris have begun
to volatilize it.*

*If you dissolve it in ∇ it will not chrys=
=tallize at all & is y^e only $\ominus$ that
will not chrystallize by dissolution
in ∇ .*

*Nothing will volatilize $\ominus \varphi^i$ like a
 $\triangle^{ous}$ body, y^e easiest method of doing
it is by its own faetid $\odot$, w^{ch} mingled
wth it to a Paste will heat & ferment,
keep it in a warm place for a ffort=
=night & then $\mathcal{J}$ it in a $\mathcal{C}$ & y^e $\ominus \varphi^i$
will rise in Flowers. But because this
volatile $\ominus$ will have some faetidity
from y^e Emphyreumatick $\odot$, you must
separate it by pouring on ∇ , $\bar{\delta}$ ing
it in a $\triangle$ furnace & the Alckool will
take out y^e $\odot$, w^{ch} you'll perceive by
a red $\mathcal{K}_a$: Decant yo^e Alckool & re=
=peat it y^e 2nd or 3^d time till y^e $\ominus$ be*

[11]

absolutely devested of its faetid ☉.

☉^ū Sem: Carui.

☿ Sem: Carui lbij. macerate them in
6 Gallons of ∇, wth 2 handfulls of
☉ com: for 3 or 4 ℔. √ them in a
Ves. Cupr: cū Refrig: keep a briske
∇ under & you'll have in yo^e Reci=
=pient a ∇ wth an ☉ on y^e top of it, se=
=parate it p. Infundibulū, & keep it
for use.

Ob This is y^e method of extracting y^e
essentiall ☉ of all Plants & Roots
whatever. It is call'd Essentiall ☉ to
distinguish it from those w^{ch} are drawn
by dry √^{on}.

Always make use of dry Plants & Roots
From plants fermented there comes
no ☉, but a vinous Sp^t. because their
☉^s are exalted by Fermentation & vola=
=tiliz'd.

From Plants not fermented comes
no Spt.

All plants don't afford y^e same Quan=
=tity of ☉, but more or lesse according
to their different natures.

Colcothar ☉^{latū}.

This is nothing but y^e ☉, after y^e √^{on} of
y^e Phlegm, Ros. Sp^t & ☉ of ☉.

But for quicknesse, Fill a + wth ☉. & in
in a strong melting furnace keep it for
6 ℥; or till it becomes a red p. w^{ch} is a

[12]

*Signe that 'tis then deprived of all y^e
other principles.*

*If you edulcorate this p. by Lotions,
& add thereto a quadrupli quantity
of $\ominus \ast^{ci}$, & so $\rightleftharpoons$ it & beat y^e Flo=
=res wth y^e $\odot$ & then repeat yo^e $\rightleftharpoons^{ons}$.*

This $\rightleftharpoons^{ate}$ is call'd Ens veneris.

*The use of this is much commended
in y^e Rickets.*

Reg: $\dagger^{ii}$ p. se.

$\mathcal{J}$. crude $\dagger$ 16. $\boxminus$ 12. $\oplus$ viij.

*p. them separately, then mix
them very well together, & ha=
=ving placed yo^e + in a melting
furnace on a Culot, wⁿ it be
red hot, pour in a spoonfull
of yo^e mixture wⁿ y^e Detonation
is over, & y^e matter melted, pour
in another spoonfull, & continue
y^e Detonation & fusion till yo^e
+ be full or matter exhausted; let
it coole, then break y^e + & sepa=
=rate y^e Reg: from y^e Scoria.*

*Ob. This Regulus is often made by ad=
=ding to y^e $\dagger$ onely $\oplus$ & charcoale
p^d.*

*The Reg: consists of nothing but
y^e $\mathcal{J}$. & y^e most φ^t & pure ∇ of the $\dagger$.*

*The Scoria consists of $\oplus$ & $\boxminus$ w^{ch}
are reduced to an Alkaline*

[13]

Substance, & impregnated wth the
most impure & volatile Θ of y^e ∇
of y^e ∇ . I say impure in compari=
=son to that w^{ch} flies off in the
Detonation.

If you dissolve y^e Scoria in ∇ ep; &
 ∇ it, you'll have a Liquo^e impreg=
=nated wth y^e s^d Alkalick Θ ^s sup=
=porting a Quantity of y^e ∇ of ∇ ,
which by pouring on any Acid
is easily ∇ ^{ed}. If you ∇ y^e Liquo^e
y^e ∇ will remain in y^e ∇ ; & that
in y^e ∇ ep: must beedulcorated, &
then dried. This last is call'd ∇ ^{ur}
 Θ ^{ratū} Diaphoreticū. though in rea=
=lity it is nothing elce but a nau=
=seous & violent Emetick.

$\overline{aaa}$ ^{ma} ∇ ^{rii} & ∇ ^{vis}.

∇ . ∇ ∇ ij. Block-Tin ∇ ij, melt
this last in a +; & in another +
warm y^e ∇ . then pour it into y^e
+ of melted ∇ , Stirr them ~~well~~
together wth a pipe, & let them coole.

Ob $\overline{aaa}$ ^{tion} is nothing but a division
of y^e metallick Body into small p^{ts}
by the help of ∇ , in order to a cal=
=cination, as in Θ or ∇ , &c.

Wⁿ you would separate y^e ∇ from the
Mettal, let it evaporate over y^e Δ .

[14]

All kinds of mettall will ad=
 =mit of an $\overline{aaa}^{tion}$ except ♂ &
 ♀, yet even these may be
 forc'd to $\overline{aaa}^{ate}$ by other methods.
 $\overline{aaa}^{ma}$ is much used amongst
 mechanicks in Looking-Glasses
 Gilding &c. Onely they put in
 More or lesse ☿ & metall accor=
 =ding to their severall purposes.

$$\ominus \text{ vel } \ominus^{li} \text{ ♂}^{tis}.$$

℥r. ♂ not rusty ☿iiij, put them
 into a matrass, pour upon
 them $\ominus \ominus^{li} \text{ ☿}vj$, then put in
 2 or 3 spoonfulls of ∇ rigid: a
 fermentation will follow, w^{ch}
 w^n it begins to cease, augment
 by pouring on 4 or 5 Spoon=
 =fulls of ∇ more, repeat this yet
 2 or 3 times, then let it stand
 24 $\mathbb{X}$, $yo^\epsilon \text{ ♂}$ will be turned into
 a $\ominus^{line}$ substance. Then pour on
 a Quart of ∇ epid: $\overline{8}$ it for 24
 $\mathbb{X}$, then $\text{☿ } yo^\epsilon \text{ mentstruū } w^{ch}$ will
 be of a very fine green $Colo^\epsilon$, &
 by Evaporation on a $\overline{8}^{ing}$ furnace
 chrystallize it. y^e manner of
 doing w^{ch} shall be shown hereafter
 in y^e Chrystallization of $\ominus^s$.
 Ob $\ominus \ominus^{li}$ if well rectified, will cause
 no fermentation at all upon

[15]

$y^e \delta$, because it is too viscous, & can't
act upon y^e Alkaline p^{ts} of the
 δ , except it be first diluted $w^{th} \nabla$
as in y^e case of ζ , w^{ch} though it
abounds w^{th} Acid & Alkaline
 $\ominus^s$, yet they don't act before they
be diluted $w^{th} \nabla$.

In y^e Fermentation there will
be a great stink w^{ch} proceeds
from $y^e \nabla$ of δ forc'd out by y^e
violence of y^e fermentation.

This $\ominus$ is not really drawn from
 $y^e \delta$, but is rather a Regeneration
of $y^e Sp^t$. of $\ominus$ in $\ominus$ by ye help of
 $y^e \delta$. And this may be prov'd frō
 $y^e \mathcal{J}^{on}$ of $y^e \ominus$, for then you'll have
the same Quantity of $\ominus \oplus^i$, and
little remaining in $y^e \mathcal{C}$: howe=
=ver it is more exalted by Re=
=generation.

The Dissolution of this Acid in ∇
 $w^{th} y^e \mathcal{K}_a$ of Galls or Oak-leaves
will being mixt together, produce
a black colo^e, as well as $\mathcal{K}_a$ of
Tea & others bounding with Alkali
Austerū. w^{ch} also happens in ~~all me=
tallick~~ y^e dissolution of common
 $\ominus$ as may be observ'd in all metal=
=lick ∇^s , $w^{ch} w^{th}$ an Alkali austerū
make a deeper or weaker black, accor=
=ding as they have a greater or lesser
Quantity of $\ominus$.

[16]

*In all preparations of ♂ never
use rusty filings, because they
being once opened by the Δ,
it will hinder all other Bodies
from penetrating into them
& so cause an alteration in
y^e Experiments. -----*

℞ Croci & Aloës.

*℥℥. Saffron or Aloës ℥i, put it
in a matrasse, & pour thereon
℥ ℥viij. ̄ it for 3 or 4 ʒ till
ye Lique^r be thoroughly impreg=
=nated wth y^e Saffron or Aloës, then
ȝ it & preserve it.*

*Ob. By ℞a we understand a proper
menstruū impregnated wth the most
essentiall p^{ts} of y^e body, separated
from y^e grosser.*

*But in Aloës it is not so, because
wⁿ y^e whole body is dissolv'd in the
menstruū, it can't properly be call'd
a ℞a but rather a Dissolution.*

*After y^e first ℞a, severall attempt
to make a 2^d & 3^d &c. that they
may draw y^e whole ℞a from y^e
Saffron or other such Aromatick
Body: then they √ through a ♂
2/3^{ds}, & y^e ℞a will remain very*

[17]

fine at y^e bottom of $y^e \mathcal{C} w^{ch}$ then
 they $\bar{z}^{ate}$. This indeed is good Hus=
 =bandry, but I don't approve on't.
 ffor in $y^e \mathcal{J}^{on}$ of $y^e s^d \mathcal{K}_a$, $y^e Sp^t$. car=
 =ries w^{th} it $y^e \mathcal{K}_a$ more volatile p^{ts}
 or $y^e \mathcal{K}_a$, & render it very weak and
 imperfect; unlesse you take $y^e Sp^t$.
 & so $\mathcal{J}$ it, & make w^{th} it a $\mathcal{K}_a w^{th}$
 new saffron as before, & use that
 instead of $\mathcal{V}$, for then $yo^e \mathcal{K}_a$ will
 be fare better than y^e former, when
 you draw $\mathcal{K}_a$ from a $\mathcal{V}^{ed}$ body.

 $\mathcal{K}_a$ Myrrhae.

$\mathcal{J}$. Myrrhe & $\Theta \mathcal{F}^i$ an = Quantity,
 mix them together in an earthen
 Pot set in a Sellar or such like
 coole place, till y^e Myrrhe be open'd
 by $y^e \mathcal{F}$, which will be w^n 'tis become
 a Paste; put this Paste int a Recei=
 =ver & pour on it $\mathcal{V}$ ad 4^{tuor} digito=
 =rū Supereminentiā, the place it
 upon a $\bar{8}^{ing}$ furnace, having stopt
 y^e Receiver; & there $\bar{8}$ it for 24 $\mathcal{X}$,
 now & then shaking it, & you'll have
 a red $\mathcal{K}_a w^{ch}$ you must $\bar{z}^{ate}$ &c.
 Ob. The $\Theta \mathcal{F}^i$ preys upon y^e gummy p^t of
 y^e Myrrhe & so $y^e \mathcal{O}^{ly}$ & balsamick p^{ts} are
 easily diluted by $y^e \mathcal{V}$, w^{ch} before were in=
 =tangled w^{th} y^e aqueous gumm; So that if
 y^e myrrhe was not open'd by $y^e \Theta \mathcal{F}^i$, $y^e \mathcal{V}$
 would produce but a very weak $\mathcal{K}_a$.

[18]

Elixir Proprietatis.

℥℥. ℞*a* of Saffron & Aloës an
 = Quantity, ℞*a* of Myrrhe a
 double Quantity, mix them toge=
 ther & keep for use.

Ob. Some take this Elixir & ℥¹/₃
 p^t of y^e Sp: from it to give
 it a consistence, because Elix=
 =irs are properly ℞*ae* Spissae.
 But here 'tis not necessary, be=
 =cause y^e Menstruū is sufficiently
 saturated alone & so has a
 sufficient consistence.

The myrrhe is y^e Basis of this
 Elixir; y^e Aloës, y^e Adjutorium;
 & y^e Saffron, y^e Correctivum.

Some make a ℞*a* of these bodies
 confusedly. But == 'tis to be obser=
 =ved y^t y^e Myrrhe does not then
 impregnate y^e menstruū, & so y^e
 main Ingredient of y^e Elixir is
 lost. The reason of w^{ch} is because
 y^e Aloës & Saffron easily give
 a deep ℞*a*, so that then the
 Menstruū is saturated, & con=
 =sequently incapable of dissolving

[19]

*y^e Myrrhe. To remedy this, some
 put in Sp: or $\ominus \Theta^{\text{li}}$ to help y^e dis=
 =solution of y^e Myrrhe, but to no
 purpose. & wth lesse successe than
 those who put in Sp: CC.
 Any Acid will ∇ y^e $\overline{\text{Ra}}$ of Myrrhe
 & Saffron, but not of Aloës.*

Dia ∇^{ris} .

*℥. $\ominus \nabla^{\text{ri}}$ puri $\overline{\text{ijij}}$; beat it small,
 put it into an Earthen Pot, & put
 thereto Flos ∇^{ris} $\overline{\text{ij}}$. then over a
 gentle Δ melt it, keeping it with
 stirring till it be turn'd to a red
 masse; then take it off y^e Δ & stirr
 it till it be well cool'd; keep it in
 a glasse close stopt, left [?] y^t too
 much Δ getting in should alter
 y^e colo^r of it, or y^e ∇ run p. deliq:
 Ob. This is a method to open y^e ∇ by
 ∇ . which is perform'd by dividing
 y^e ∇ into its minima.
 If you boyle 4 p^{ts} of ∇ . & one
 Of ∇ in an Earthen Pot wth a S.Q.
 of ∇ for 3 or 4 $\overline{\text{X}}$, or till it looks red,
 and then $\overline{\text{z}}$ yo^r Liquo^r, & pour*

[20]

therein any Acid it will turn
 white like milke, & a white *p.*
 will $\rightsquigarrow$ to *y^e* bottom which is
 call'd Lac $\text{\textcircled{A}}^{\text{ris}}$. Decant *y^e* Lique ^{ϵ}
 from *y^e* *p.* & wash it wth clean
 warm ∇ till all *y^e* $\ominus \text{\textcircled{A}}^{\text{ri}}$ be
 separated, then dry it gently
 & keep it in a glasse for use.
 If you dissolve Dia $\text{\textcircled{A}}^{\text{ris}}$ in ∇ ep:
 & $\rightsquigarrow$ it as before, you'll have
 also Lac $\text{\textcircled{A}}^{\text{ris}}$, & this is better,
 & sooner done than *y^e* former.
 If you put $\text{\textcircled{Z}}^{\text{ij}}$ of Dia $\text{\textcircled{A}}^{\text{ris}}$ into
 a Quart of Sack & after a
 $\text{\textcircled{P}}^{\text{s}}$ $\text{\textcircled{B}}$, $\text{\textcircled{Z}}$ it, & wth a S.Q. of Sugar
 bring it to *y^e* consistence of a
 Syrrup. This is then called
 Dr Willis's Syrupus $\text{\textcircled{A}}^{\text{ris}}$.
 Further, if you *p.* $\text{\textcircled{Z}}^{\text{ij}}$ of Dia $\text{\textcircled{A}}^{\text{ris}}$
 & put it into a matrasse, & pour
 thereon $\text{\textcircled{V}}$, to *y^e* height of 3
 fingers, & $\text{\textcircled{B}}$ it for 24 $\text{\textcircled{X}}$, you'll
 have a red $\text{\textcircled{R}}^{\text{a}}$ of $\text{\textcircled{A}}$. -----

Flores $\ominus^{\text{lis}}$ $\text{\textcircled{*}}^{\text{ci}}$ chalybeati.
 $\text{\textcircled{J}}$. $\ominus^{\text{lis}}$ $\text{\textcircled{*}}^{\text{ci}}$ $\text{\textcircled{Z}}^{\text{viii}}$, $\text{\textcircled{J}}$ $\text{\textcircled{Z}}^{\text{ij}}$, put them
 into a matrasse or fflaske

[21]

so $y^t \frac{2}{3}$ of it may be empty, then
 set it into a Calot plac'd on a
 proper ffurnace, so $y^t y^e \triangle$ may
 stand 2 fingers above y^e matter,
 heat it gradually & after y^e Exal=
 =tation of y^e humidity y^e Flores
 will begin to rise; continue yo^e
 $\triangle$ for 6 or 7 Σ , let yo^e matrass
 coole, & separate y^e upper p^t of y^e
 vessel w^{ch} is not covered $w^{th} y^e \triangle$,
 because as y^e heat of $y^e \triangle$ raise
 them, y^e cold pt of y^e glasse con=
 =dense them.

Ob. In any H^{on} whatever, stop y^e
 mouth of yo^e matrass w^{th} a piece
 of paper onely to keep out y^e dust
 because y^e matter melts before it H ,
 & before it melts it loses its acciden=
 =tall humidity, w^{ch} will by dilating
 break y^e glasse, if stopt close; & w^n
 y^e matter is melted if it has not a
 little $\triangle$ to raise y^e fflores it will
 also break.

In breaking y^e vessel to separate y^e
 H^{ati} , take care $y^t y^e \odot$ mix not w^{th} it
 w^{ch} makes it impure: neither must the
 vessel be moist w^n you put in y^e matter
 to H^{ate} because then $y^e p$ will stick to
 y^e inside of it, & so mix with the
 fflores.

[22]

*These flores diluted in a S.Q.
Of ∇ epid: will wth a $\mathcal{K}_a$ of Galls
or Tea turn black, which
plainly demonstrates that they
are impregnated with $\ominus$.*

∇ *Reginae Hungaricae.*

*Fill yo^e $\mathcal{X}$ $\frac{1}{2}$ full of dry Rose=
=mary, then cover it wth good
Nantz-brand, & wth a gentle
heat $\sim \frac{1}{2}$ y^e Quantity: then $\sim$
y^e Sp: over again with other
dry Rosemary in y^e same $\mathcal{X}$
by y^e help of $\ominus$, & you'll have
an Alckool impregnated wth y^e
Essentiall $\odot$ of Rosemary: This
is y^e common method of making
 ∇ *Reginae Hungaricae.**

*Ob If you impregnate yo^e $\mathcal{V}$ with
 $\odot$ of Rosemary, it comes to the
same thing.*

*Dry Rosemary is necessary in
this preparation.*

*But y^e true method of making this
 ∇ is as follows: Gather a Quan=
=tity of fflowers of Rosemary
when their prime, put them*

[23]

into an Earthen Pot, & pour upon them as much ∇ epid: as will suffice to steep them as also a little Quantity of yeast. Then cover y^e pot wth a cloth onely to keep out y^e dust, for y^e intromission of y^e Δ is necessary to their fermentation. Keep y^e pot moderately warm, either by y^e Δ , or by the heat of y^e Son for y^e space of 10 or 14 d^s, or till you perceive a sowish smell; then pour all out of y^e Pot into a $\mathcal{C}$. & over a gentle Δ $\mathcal{L}$ $\frac{1}{2}$ of it, then rectifie it y^e 2^d or 3^d time, till you reduce y^e Sp: to an Alckool, which is y^e true Q.H. ∇ . call'd so because by it a Queen of Hungary was cured of y^e Palsie.

This is y^e method not onely to make an Alckool of Rosemary, but also of Roses, & all other odoriferous flowers.

$$\mathcal{L}^{atio} \mathcal{H}^{ni}.$$

Melt $\mathcal{H}$ in a +, q.v. & stirr it continually with an Iron Spatule, till it cooles, & 'twill then become a greenish p.

Ob. This is improperly call'd $\mathcal{L}^{ation}$ because it is nothing but a Division of y^e pts by motion, & y^e $\oplus$ of y^e Δ . This method is used wⁿ you would dissolve $\mathcal{H}$. for y^e facility of y^e Penetration of y^e Menstruum.

[24]

Sp: C.C.

Fill yo^e $\mathcal{C}$ w^{th} CC cut into small
 Pieces, place it in a proportion=
 =able Calot in a Reverberatory
 ffurnace. Then lute to it a large
 Recipient. & begin yo^e $\mathcal{L}^{on}$ with
 a gentle heat, first you'll have
 Phlegm, then y^e Sp: in vapo^{es}
 will ascend together w^{th} y^e vol: $\ominus$.
 Augment yo^e Δ gradually to
 y^e last degree, & you'll have a
 viscous $\ominus$; w^n nothing more comes
 into y^e Recipient, let yo^e Δ goe
 out: then unlute yo^e vessels &
 shake all together, pour y^e Liq
 into a $\mathfrak{z}$, & y^e viscous $\ominus$ will
 remaine in y^e $\mathfrak{z}$. Pour into
 yo^e $\mathcal{C}$ a little ∇ep : to wash
 off y^e vol: $\ominus$, which together
 with y^e Liq: you before $\mathfrak{z}^{ed}$ put
 into a clean small $\mathcal{C}$, & lute
 to it a small Receiver; $\mathcal{L}$ a=
 =bout $\frac{1}{4}$ w^{th} a very gentle heat,
 & you'll have cleare vol: $\ominus$ &
 very pellucid without any $\ominus$,

[25]

of w^{ch} if there be any, repeat
 y^e Rectification.

Ob. This is a generall Rule of $\sim^{ing}$ all
 hornes, bones, blood & flesh, one=
 =ly y^e 2 last w^{th} this distinction.
 that they must be dry'd, because
 their Phlegm is so nauseous y^t
 if once intermingled w^{th} y^e Sp:
 or vol: $\ominus$, it will scarce ever be
 pure.

No p^{ts} of Animals produce any
 Ψ^d Alkali $\ominus^s$, but a vol: so that
 in y^e $\odot$ you'll not finde that
 Ψ^d Alkali Substance, as in vege=
 =tables

In this $\sim^{on}$ D^r Willis's 5 princi=
 =ples are demonstrated, The $\odot$ is y^e
 ∇ , the Phlegm w^{ch} $\sim$ first is y^e
 ∇ , y^e $\odot$ y^e Sulphur; y^e Sp: y^e $\times$;
 y^e vol: $\ominus$ is y^e $\ominus$. The 2 first are
 call'd y^e passive: y^e 3 last y^e Active,
 w^{ch} others make but 2 principles,
 viz. acid & alkali. That w^{ch} is
 combustible is an acid, because $\triangle^{reous}$,
 The Sp: & vol: $\ominus$ are Alkali's; &
 between y^e Sp: & vol: $\ominus$ there is

[26]

*no difference, onely y^e one is
diluted in Phlegm, the other
not.*

*The degrees of Δ in this $\mathcal{J}^{on}$ are
4. y^e first is when y^e matter
onely $\mathcal{J}$ in drops; y^e 2^d w^n it
comes in white vapo^{es}, y^e 3^d w^n
reddish vapo^{es} appear, which
is a Signe of a great Quan=
=tity of $\odot$ intermingled: this
4th is w^n y^e nauseous thick $\odot$
comes & y^e vapo^{es} cease.*

*Observe that y^e first degree
of Δ in $\mathcal{J}^{on}$ is y^e last in Rec=
=tification, so that yo^e Δ
must be managed according to
 y^e nature of yo^e $\mathcal{J}^{on}$, there=
=fore 'tis impossible to give y^e
certain degree of heat to all
bodies, unlesse y^e nature of the
things to be $\mathcal{J}^{ed}$ were known.*

*The best Rule is exactly to ob=
=serve y^e severall operations
& rather let yo^e Δ be too slow
than too fast because then
you proceed safely, although
 w^th some losse of time. This
is the onely Rule I could ever
in y^e degrees of Δ in $\mathcal{J}^{ons}$.*

[27]

 $\mathcal{O}^{vis}$ fulminans. $\mathcal{J}$. $\mathcal{A}^{ris} 1 p^t$, $\mathcal{O}^{tri} 2 p^{ts}$, $\mathcal{O}^{lis} \mathcal{F}^{ri} 3 p^{ts}$ $\mathcal{O}$ all very fine, put 1dram upon

a fire=shovell, & set it over a

gentle $\equiv \Delta$, a fulmination

will follow in a short time.

De Coloribus.

If to Brandy tintured with

Cochenilia, you add a dissolu=

=tion of $\mathcal{O} \mathcal{F}^{ri}$, it will be pur=

=ple, into which if you put

any Acid, it will become a

Scarlett-colo^e.-----Sp: & $\mathcal{O}$ volat $\mathcal{O}^{lis} \ast^{ci}$. $\mathcal{J}$. $\mathcal{O}^{lis} \mathcal{F}^{ri}$ purissimi lb 1, $\mathcal{O}^{lis} \ast^{ci}$ lb 1. p them well, separately,

then mingle them (in the mix=

=ture you'll finde an exhalation

of y^e volat: Alkali of $y^e \mathcal{O} \ast^{ci}$) putthis mixture into a $\mathcal{C}$ filling it $\frac{1}{3} p^t$, place it on a Calot in an

ordinary furnace, (because in

these $\mathcal{Q}^{ons}$ there is no need of a

Reverberatory) having first

[28]

put into $\text{yo}^{\epsilon} \mathcal{C} \mathfrak{z}$ vi of Spring
 or Rain ∇ . y^{ϵ} purer it be, the
 better it is: lute yo^{ϵ} Receiver
 w^{th} Whites of Eggs and flower
 mix'd together & spread on a
 paper, w^{ch} w^{n} dry, $\mathcal{L} y^{\epsilon}$ matter
 over a gentle Δ , & there will
 arise a Sp: & vol: $\ominus w^{\text{ch}}$ will
 Stick to y^{ϵ} Receiver; Augment
 $\text{yo}^{\epsilon} \Delta$ to a good degree to=
 =wards y^{ϵ} latter end, and there
 will arise flowers, then permitt
 it to goe out & w^{n} y^{ϵ} matter
 is coole, unlute y^{ϵ} Junctures
 & separate y^{ϵ} Sp: from y^{ϵ} vol: $\ominus$.
 then break $\text{yo}^{\epsilon} \mathcal{C}$ & Scrape
 off y^{ϵ} fflowers, w^{ch} you must
 preserve in a glasse well stopt.
 Dissolve $y^{\epsilon} \odot$ in ∇ epid: $\mathfrak{z}$ it,
 evaporate & chrystalliye it.
 Ob. Any $\mathfrak{z}$ Alkali, if well puri=
 =fied, will serve in this pre=
 =paration as well as $\ominus \mathfrak{z}^{\text{ri}}$.
 If not well purified, it will
 Infect y^{ϵ} vol: $\ominus w^{\text{th}}$ an impure

[29]

Δ^{rious} smell; for instance Ψ in an
 = Quantity is sufficient to ab=
 =sorb y^e Acid of $y^e \Theta *^{ci}$, w^{ch} a little
 before did incarcerate y^e vol: Al=
 =kali contained in $y^e \Theta *^{ci}$ as
 appears from y^e smell as soon
 as these 2 bodies are mixt toge=
 =ther.

If you $\sim^l$ without ∇ , you'll have
 nothing but a vol: Θ , except
 some few drops of Sp: procured
 either by y^e accidentall moisture
 of $y^e \Theta *^{ci}$, or by $y^e \Delta$ working
 upon $y^e \Theta \mp^{ri}$, which moisture
~~having the name of~~
 being impregnated wth a vol: Θ ,
 has y^e name of Sp: for distincti=
 =ons sake; This is to be observ'd
 not onely in this $\sim^{on}$, but also
 in $y^e \sim^{on}$ of all other Alkali
 vol: Θ^s .

The fflores are nothing elce but
 ye more vol: p^{ts} of $y^e \odot$, a body
 quite different from y^e vol: Θ , in
 smell, taste &c.

The $\odot$ consists of some p^{ts} of Θ ,
 some of $y^e \Psi$ fuliginous Θ , & some
 of $y^e \Theta$ of $\sqsupset$, which are y^e three

[30]

Ingredients w^{ch} compose y^e arti=
 =ficiall $\Theta *^{ci}$, in imitation of
 y^e naturall $\Theta *^{ci}$ of y^e Ancients.
 It is not to be thought $y^t y^e$ vol:
 Θ of $\Theta *^{ci}$ is all of it y^e vol:
 Θ of $\Theta *^{ci}$ per se, because out
 of ζ_{12} of $\Theta *^{ci}$, one may
 draw more than ζ_{13} of vol:
 Θ , which can't be imagined
 to be all in $y^e \square$, But really
 y^e vol: Θ of $\square$ in $y^t \mathcal{L}^{on}$, does
 raise w^{th} it a great Quantity
 of $\Theta \mp^{ri}$: and this is y^e reason
 that $w^n y^e$ vol: Θ is exposed to
 $y^e \Delta$, it loses it's smell, & leaves
 behind it a Θ not att all of
 a $\square^{nous}$ smell; Whence we con=
 =clude that though y^e Sp: be
 very piercing, it does not
 predominate in Quantity, as it
 does in Quality, And 'tis very
 probable that w^t is mixt with
 y^e vol: Alkali in y^e Receiver
 & augments y^e Quantity, is of
 y^e nature of y^e fflores, though
 y^e fflores are somewhat more

[31]

Ψ^{ed} being separated from y^e vol:

Θ .

The Sp: of $\Theta *^{ci}$ is also drawn
by y^e addition of 4 p^{ts} of Ψ
being Λ^{ed} as before; but it will
produce no vol: Θ at all, being
attenuated by y^e subtile acrimoni=
ous p^{ts} of $y^e \Psi$, and for y^e same
reason this Sp: is more sharp &
acrimonious than y^e other, &
therefore not so safe to be used.

The Sp: of $\Theta *^{ci} \Lambda^{ed} w^{th} \Theta \Xi^{ri}$
& mixed $w^{th} \Psi$ is coagulated
upon w^{ch} if you drop Sp: Θ^{tri} it
will become fluid, w^{ch} is likewise
done in y^e Dissolution of Camphire;
And this shews $y^t y^e$ particulce of
 $y^e \Psi$ that keep y^e Sp: fluid is of
 y^e same nature $w^{th} y^e$ Sp: Θ^{tri} which
keeps y^e Camphire fluid. ----

Reg: $\S^{ij}$ medicinalis, vel

Panacea $\S^{ij}$.

$\mathcal{J}$. $\S^{ij} \mathcal{J}v$. Θ^{lis} com: $\mathcal{J}iiij$, $\Theta^{lis} \Xi^{ri} \mathcal{J}i$.

p them & mix them together

put this mixture into a red hot +

in a melting furnace by

a spoonfull at a time, let it

[32]

be in fusion $\frac{1}{4}$ of an Σ , then
break $y^e +$, & separate y^e Reg:
from y^e Scoria, beat y^e Reg: very
fine, edulcorate it by severall Lotions
& dry it gently.

Ob. In this preparation it is ob=
=served that y^e validity of $y^e \ominus$
fixes $y^e \nless$ of $\mathfrak{d}$, & all other
metallick $\nless^s$, and this makes
it to be neither Cathartick
nor Emetick, but Diurethick
& diaphoretick, -----

Margaritū minerale.

$\mathcal{J}$. Reg: $\mathfrak{d}$ per se $\mathfrak{z}$ iij, $\oplus^{tri}$ $\mathfrak{z}$ 16.
 p them fine & mix them,
put this mixture by degrees into
a red hot $+$, as it grows white,
 y^e Detonation will be small,
because $y^e \nless$ in y^e Reg: is more
 $\nless$ & pure than in crude $\mathfrak{d}$, w^n
 $y^e +$ is full, close y^e ffurnace
& let it coole, then take it out
& put it w^{th} $y^e +$ into ∇ ep: de=
=cant $y^e \nabla$. Edulcorate & dry it
by a moderate heat.

This p is call'd Margaritum
because it has y^e same quality

[33]

as is attributed to Pearles.

If you make use of y^e same

Quantity of $\frac{1}{2}$ vulg: instead of

Reg: it will then be $\frac{1}{2}$ diapho=

=reticum.

In y^e preparation of y^e Mar=

=garitum you lose but little

of y^e Reg: having almost y^e

same weight in y^e p , after y^e

Θ^s are consumed by Lotions.

Flores Benzoini.

$\mathcal{J}$. Benzoini $\frac{1}{2}$ iij, put it into

an ∇^{then} pot well glaz'd to whose

brim fix a Coffin of brown

paper. then let it melt over

a === very gentle Δ , & y^e flores

will ascend & stick to y^e sides

of y^e paper, which you must

separate, & so repeat y^e same

till no more flores arise.

Ob. Take care y^t y^e Δ be not too fierce,

for, if so, y^e $\odot^{ly}$ particles of the

Benjamin will rise, & tinge y^e

Flores w^{th} a red colo ^{e} .

This flores, if rightly managed

will not be $\odot^{ly}$, which is evident

[34]

by y^e affusion of $\mathbb{V}$, for then
there will be no $\mathcal{K}_a$.

Benjamin, wⁿ depriv'd of its
fflores, will = afford a
deeper $\mathcal{K}_a$ than before, but
lesse gratefull: Because 1st
it has then lost its more
ffragrant & vol: particles.
& 2^{dly} because that in $y^e \rightleftharpoons^{on}$
it has contracted some Em=
=pyreuma.

These fflores are very com=
=mendabe in Phthisicks [sic!].
But I have seen better Effects
produc'd by Benjamin alone
burnt in a Room well shut,
than by large dosis of flores.

Coagulū Helmontii.

$\mathcal{J}$. $\mathbb{V}$ puri. Sp: $\boxminus^{ae}$ vel $\ominus^{lis} *^{ci}$
ana. $\mathcal{Z}_{ij}$. Mix them in a
glasse, stirring them a little
& immediately you'll have a
Coagulū in a white masse.
upon w^{ch} if you pour Sp: $\oplus^{tri}$
it will be dissolv'd: & by ad=
=ding $\ominus *^{ci}$ you'll have another

[35]

Coagulum &c.

from this Experiment Hel=

=mont concludes y^t y^e Stone in

man is generated of y^e Sp:

of a vol: Alkali & vinous Acids.

& therefore that Sp: $\textcircled{D}^{tri}$ is

proper in curing that disease

viz. by dissolving y^e Coagulum.

As 'tis found by Experience that

a Stone taken out of a hu=

=mane body has oftentimes

been dissolv'd by means of this

Sp^t.

Because this Sp^t. can't be given

p. se. therefore Physicians have

a way to edulcorate it, w^{ch} is

by adding 4 p^{ts} of $\textcircled{V}$ to one of

of Sp^t. of $\textcircled{D}$, & by $\textcircled{L}^{ing}$ in a $\textcircled{C}$

over a gentle Δ till all y^e li=

quo^e be extracted.

But this Encheiresis is more

properly call'd Dilution than

Edulcoration.

Sp: of — $\textcircled{\Theta}^{*ci}$ or $\textcircled{\square}$, made by

the addition of $\textcircled{\Psi}$ produces

no Coagulum at all. -----

[36]

⊙¹ Camphorae.

℥℥. Sp: ⊙^{tri} ℥ij, & put these in
Camphire ℥℥. Stirr it easi=
=ly. & y^e Camphire will
soon dissolve & swim on y^e
top of y^e Sp^t. of ⊙ in y^e form
of an ⊙, w^{ch} then you may
separate after the common
way, &c.

Ob. This is nothing but y^e dissolution
of y^e body of y^e Camphire (& not
really an ⊙) w^{ch} is kept fluid
by y^e sub^{till} p^{ts} of y^e Sp. of ⊙.
And this truth is thus demon=
=strated: After you have sepa=
=rated y^e ⊙ from y^e Sp: if into
y^e same Sp: you pour in more
Camphire, it will dissolve, though
not so easily as y^e former,
because y^e Sp: is now grown
weaker. After y^e separation
of y^e 2^d dissolution, put in more
Camphire, repeat this often
& at last y^e Sp: will become
insipid, w^{ch} proves y^t y^e Sp: is in
y^e Camphire.

[37]

If you pour y^e $\odot$ of Cam=
 =phire into ∇ , it will dissolve
 y^e particulce nitrosae, & the
 Camphire will then return
 to its former body: & there=
 =fore we conclude that simple
 Camphire is preferable to this
 $\odot$.

By any $\mathcal{J}^{ons}$ whatever pre=
 =scribed by Autho^{es}, no $\odot$ is
 to be drawn from Camphire.

$\mathcal{H}^{tu}$ albū & rubrū.

==== $\mathcal{J}$. $\mathcal{Z}$ ij. ∇ . or Sp. $\mathbb{D}^{tri}$ $\mathcal{Z}$ iij
 but of these last more or lesse
 according to their strength to
 dissolve y^e $\mathcal{Z}$. put them into a flaske
 to dissolve. Then dissolve in ∇ ep:
 as much com: $\ominus$ as is sufficient
 to saturate y^e ∇ . pour y^e dissolv'd
 $\mathcal{Z}$ into this ∇ , & it will ,
 then decant y^e . & edulcorate
 y^e $\mathcal{H}^{tate}$ by Lotions, dry it and
 keep it for use. This is call'd
 $\mathcal{H}^{tu}$ albū.

Some Autho^{es} hold y^t y^e reason of
 This $\mathcal{H}^{tion}$ is because it is an Alkali,

[38]

*Others because it is an ~~A~~ Acid:
Others because it is a Neutrum,
as Pachenius.*

*But I believe y^t 'tis because y^e
 $y^e \ominus$ absorbs $y^e \nabla$ of $y^e \oplus w^{ch}$
supports $y^e \text{X}$.*

*$\mathcal{J}$. of y^e above s^d Dissolution,
dry it to a white p . then
break y^e Glasse, & put the
 p into a + & in a melting
furnace heat it ad rubedinem;
This is call'd $\text{R}^{t\bar{u}}$ Rubrū,
though improperly.*

*The $\ominus^s w^{ch}$ are in $y^e \text{X}$ are not
onely y^e cause of $y^e \text{X}^{on}$ of y^e
 X , but also of its colo^e. The
truth of this does easily ap=
=pear from y^e encrease of its
weight, w^{ch} is not found to
be so great in y^e album.*

$\odot^{\bar{u}}$ Mosaicum.

*$\mathcal{J}$. X^{ii} . $\mathcal{Z}^{vis}$. ana $\mathcal{Z}ij$. — make there=
=with an $\overline{aaa}$, $w^{ch} w^n$ cold, p
very fine, $w^{th} \nabla$ & $\ominus *^{ci}$ ana $\mathcal{Z}ij$
then put this mixture of p .
into a fflaske, w^{ch} place on*

[39]

a Calot in a H^{tory} furnace, & by
 degrees heat y^e matter till y^e whole
 body be fluid, continue it in fu=
 =sion for 4 to 8 X , then when
 'tis cold, break y^e fflaske, & y^e
 O^{a} mosaïcū will be at y^e bottom,
 w^{ch} you must separate from y^e
 H^{ed} matter. If y^e O^{ru} has not
 a fine colo ϵ , repeat y^e operation
 again; keep it in a vessell
 well stopt because y^e Δ will
 alter its colo ϵ .

Ob. This is a kind of Ψ^{on} of X by
 y^e help of A , not much unlike
 (although in colo ϵ) that of com:
 Cinnabar. And y^{t} w^{ch} H is
 Partly O^{ci} & partly A .
 You must observe y^e same method
 in this ~~preparation~~ H^{on} as in
 that of Flores O^{is} X^{ci} chalybeati.
 This preparation given in Epilep=
 =sies exceeds all sorts of Cinna=
 =bars. -----

J^{io} Guaici.

Fill a $\text{C}^{\text{2/3}}$ w^{th} Guaicū, lute
 To it a Receiver w^{th} common Lute
 & J it over a gentle Δ by ye
 same Rules w^{ch} shall be given

[40]

in $y^e \sim \mathcal{Q}^{on}$ of φ . And you'll have
 1st a Phlegm, 2^{dly} a Sp^t . and
 then an $\odot$ of a yellow pel=
 =lucid colo^e swimming on y^e
 Top. & at y^e latter end of y^e
 $\sim \mathcal{Q}^{on}$ you'll have a blackish
 $\odot$ at y^e bottom, more viscous
 and terrestrious.

Ob. This is a generall method of
 $\sim \mathcal{Q}^{ing}$ all woods especially re=
 =sinous.

In this & such like $\sim \mathcal{Q}^{ons}$ be cau=
 =tious in managing $y^e \Delta$, be=
 =cause $y^t \odot^s$ from woods being
 nothing elce but liquid Rosins,
 do easily take an Empyreuma,
 which not onely alters y^e Qua=
 =lity, but also y^e flavo^e and
 Sweetnesse of y^e afore $s^d \odot^s$.

Put all y^e matter so $\sim \mathcal{Q}^{ed}$ into
 into [sic!] a new $\mathcal{C}$ & rectifie it
 with a gentle Δ ; ffor in this
 as well as all other Rectifica=
 =tions it's not necessary to have
 y^e 6th degree of Δ required in
 $y^e \sim \mathcal{Q}^{on}$ of y^e same body, because
 $w^n y^e Sp^t$. is separated from the
 grosse body, it rises more ea=

[41]

= sily.

It is necessary in this prepara=

=tion for y^e above s^d reasons

to take 18 Σ , though y^e

$\mathcal{L}^{on}$ may be performed in 6 .

$\mathcal{L}^{io} \varphi^{ri}$.

$\mathcal{J}$. φ^{ri} as much as will fill $1/3$ of

$y^e \mathcal{C}$. then place it in a Rever=

=beratory ffurnace, luting thereto

a large Recipient, and you'll

have 1st a Phlegm, 2dly a Spt. &

then an $\odot$, which for distincti=

=ons sake from $\odot \varphi^{ri} p$. deliq.

is call'd $\odot \varphi^{ri}$ foetidū [?], which

you may rectifie according to

y^e generall Rule. After the $\mathcal{L}^{on}$

is perform'd, w^{ch} you'll perceive

to be w^n no more vapo^{es} rise,

(though this as well as others is

pushed to y^e last degree of Δ ,

w^{ch} must be more or lesse accor=

=ding to y^e different natures of y^e

Bodies), w^n y^e matter is coole, un=

=lute y^e Receiver, & pour ∇ er:

into the $\mathcal{C}$, $\bar{\delta}$ it, & decant $y^e \nabla$

[42]

w^{ch} will be impregnated w^{th} y^e
 Alcalick $\Psi \ominus$ of y^e Ψ . pour
 in more ∇ till all $y^e \ominus$ be sepa=
 =rated, then $\exists$ all y^e Lique^{es}
 together, & so evaporate to a
 dry $\ominus$.

The black $\odot$ in this operation
 although it be very dry, does yet
 containe in it some ∇^{ous} particles,
 w^{ch} may be demonstrated by Stri=
 =king upon it w^{th} flint and
 Steel, for it will quickly take
 Δ .

But this is to be observ'd that
 if $y^e \mathcal{C}$ should break (though
 in y^e latter End of y^e Experiment)
 & happen to take Δ at y^e Crack
 & so consume $y^e \nabla$, it will ren=
 =der this last Experim^t ineffectuall.
 Ψ calcin'd in an open $+$ does not
 produce so much $\Psi \ominus$ as that
 in $y^e \mathcal{C}$, which is observ'd not
 onely in this body, but in all
 vegetables; and this truth is so
 cleare, y^t if you cohobate $y^e \mathcal{L}^{ed}$
 matter upon $y^e \odot$ 3 or 4 times,

[43]

or as often as is requisite, it will
be all reduced to an Alcalick $\ominus$;
because $y^e \Delta$ by these repeated
operations does $\varphi y^e \nabla$ into an
Alkalick $\ominus$.

Observe likewise in proof of
this last *Experim^t*, y^t if you take
 $\ominus^s$ of any vegetables, & $\mathcal{V}$ and
cohobate as before, they'll be tur=
=ned into a φ Alkali which
clearly shows that all vegetable
 $\varphi \ominus^s$ are not really φ^d in the
bodies but produc'd by the Δ .

If you pour a quadruple Quan=
=tity of $\ominus$ foetidū [?] well rectified
upon this $\ominus \varphi^{ri}$ purified, it
will raise a ffermentation, even
as crude φ does upon δ , as in
 y^e case of δ Willisianus, which
by keeping it in a moderate heat,
& then $\mathcal{V}^{ing}$ it p. $\mathcal{C}$, will volatilize
 $yo^e \ominus \varphi$, this $\ominus \varphi^{ri}$ is y^e only
 $\ominus$ among vegetables, w^{ch} will not
chrystallize a $suā$ [?] φ^{tate} , and it
is the greatest φ Alkali. -----

[44]

 Z^{us} dulcis.

Zf. Z^{rii} A^{ti} lb1. crude Z Z 12
 & in a stone=mortar rub them
 together till y^e matter be tur=
 =ned black & y^e Z perfectly
 united, then put it in a ma=
 =trasse wth a short neck, A
 it for 8 X , keeping y^e matter
 constantly in an equall fusion
 as in all A^{ons} , set it coole,
 then break y^e matrass &
 separate y^e A^{ed} matter w^{ch} is
 in y^e neck because it is more
 corrosive than y^e rest; beat the
 remainder & repeat y^e sepa=
 =ration of that in y^e neck of
 y^e matrass & so a 3^d time &c.
 keep it for use.

Ob. The well mixing ye matter is
 a great p^t of y^e preparation
 because y^e better it be mix'd, y^e
 better will y^e acid p^t of y^e A^{ate}
 be diluted.

Z^{us} dulcis w^{ch} is very white may
 be suspected not to have been
 well dulcified, because it is the
 quantity of y^e acid $\ominus$ y^t causes

[45]

*y^e whitenesse, w^{ch} is demonstrated
by depriving it too much of
its acid $\ominus$, for then it will turn
blackish, even to Revivification.
It is true y^t y^e H^{on} has been often
repeated, still retaining its
whitenesse, but wth addition of $\ominus$
decripatatū, w^{ch} $\ominus^s$ Acid supports
y^e X , so y^t y^e labo^e is quite lost.
If you mingle y^e X in a rainy b
the moisture of the Δ diluting
y^e $\ominus$ makes it unite y^e sooner,
whereas some times in dry wea=
=ther we put in $\frac{1}{2}$ a spoonfull
of ∇ .*

*Some Autho^{es} order it to be sprin=
=kled wth H , others wth ∇ , others
wth Sp: O^{tri} , but none of these are
to be approv'd of, because they
make it more acrimonious.*

*We observe of *Æthiops mineralis*
as well as of this and others, that
they are fit to be prepar'd in
moist weather, In other prepara=
=tions, especially metallick Kas ,
if some of them be made in moist
weather, they will not be clear &
fine.*

*© Camphorae made in moist weather is
muddish & in clear weather recovers,
but 'tis not so in y^e afore s^d Kas .*

[46]

☿^{us} *dulcis* wⁿ prd y^e *yellower it be
the better is it.*

*It must always be kept in Lumps
and not in p, because I have
observ'd that wⁿ in p, though well
prepar'd & very yellow, it will
turn white by keeping.*

Ob. ☿ after so many ☿^{ons}, & look
on't with a microscope, and you
may discern plainly globulis
of ☿. -----

☿^{io} ☿ⁱⁱ

Butyrū ☿ⁱⁱ.

☿^f. ☿^{ate} *corrosive, crude ☿ ana
lb 1. p them fine & mingle them,
put y^e mixture into a ☿, lute
to it a Receiver ½ full of ∇;
☿th a very gentle heat, and y^e
Liquor ☿ⁱⁱ *glacialis* will rise,
w^{ch} you'll see transparent in y^e
neck of y^e ☿ like Chrystalls;
wⁿ it begins to be reddish at y^e top
of y^e ☿, leave y^e △ & put 2 or 3
coales at y^e neck, y^t y^e Liquor
glacialis may melt down into
y^e Receiver, let y^e matter cooke
& unlute y^e Receiver, & lute
another in its room, then cover
y^e ☿ wth a reverberatory Dome
& augment y^e △ as before for*

[47]

5 or 6 ℥, after w^{ch} let all
 coole, then break y^e ⚗ & se=
 =parate y^e pure Cinnabar ℥^{ed}
 to y^e upper p^t. from y^e Drosse
 & ℥^{ch} will be in y^e neck,
 this Cinnabar must be ℥^{ed} once
 or twice to purifie it. Decant
 y^e ∇ in y^e first Receiver, & ℥ it
 for feare there should goe any
 ℥^{th} it, put y^e ∇ into a ⚗ &
 ⚗ by a gentle heat into a Recei=
 =ver not luted, there will come
 from it an insipid ∇; but w^n by
 tasting you perceive it come
 sharp, coole y^e matter & reserve
 y^e sharp Lique^e in y^e ⚗, & this
 is a good menstruum call'd Sp:
 Ⓞ^{tri} philosophicus; The p from
 y^e ∇ must beedulcorated by seve=
 =rall Lotions. This is call'd ℥^{us}
 vitae.

If you put no ∇ into y^e ~~Recei~~
 ⚗ you'll have y^e Liquor glaci=
 =alis or Butyrū Ⓞⁱⁱ in a massa
 Chrystallina. If y^e Butyrū should
 not be clear, rectifie it in another
 ⚗; This Butyrū is used in y^e com=
 =position of Bezoard minerall
 w^{ch} is made of this & Sp: Ⓞ^{tri}.

[48]

*If you put thereto any mettall
it has ye addition of that name;
In y^e neck of y^e Ⓒ after y^e ⚭^{on}
you'll have a quantity of ☿
among y^e drosse, which if
you separate by Lotions & clean
it, it is better than y^e common,
because it is a revivification of
y^e ☿ w^{ch} was let loose by the
acid in y^e operation. -----*

⊖ Absinthii.

*℥℥. Wormwood & burn it in a hot
Oven. & in ∇ep: dilute y^e ashes,
ꝛ it, add more ∇ till you have
drawn off all y^e ⊖, evaporate
ad cuticulam, then let it coole
& chrystallize; Decant y^e Lic=
=quo^ε, & repeat y^e operation as
before.*

*Ob. This calcination performed
in a hot Oven saves y^e labo^ε
of Cineration.*

*This is a generall rule of draw=
=ing all ☿^d Alkali ⊖^s of
vegetables.*

*Some make this Calcination by ☿
and get more ⊖, & y^e Chrystalls*

[49]

larger, but this alters y^e nature
of $y^e \ominus$. So that w^n this way is
used there must be other Inten=
=tions. -----

$\ominus \mathbb{C}^{ae}$.

$\mathcal{J}$. filings, or small thin pie=
=ces of $\mathbb{C}$, & put them into a
glasse, pour upon them ∇ or
Sp: $\mathbb{D}^{tri}$ $\mathfrak{Z}$ ii, & let them dissolve
over a gentle heat (take care
of y^e vapo^{es}, for they are very
pernicious) then let y^e Dissolu=
=tion coole. & you'll see a great
 p^t of $y^e \mathbb{C}$ turn'd into fine
Chrystalls of a greenish colo^e.
If you would have any more
Chrystalls, decant y^e Liquo^e.
Ob. This is onely a Dissolution of a
metallick Body by y^e help of
Sp: $\mathbb{D}^{tri}$. And this as well as all
others of y^e same nature is im=
=properly call'd $\ominus^s$ of y^e solid
body. The — easy reducing this
mettall separated from $y^e \ominus$
shows y^t 'tis onely a Dissolution
& not a $\ominus$. And y^e figure of y^e
Chrystalls demonstrate y^e nature
of y^e menstruū of $w^{ch} \ominus^s$ are made.

[50]

$\ominus$ $\mathfrak{J}^{tis}$ chrystallizes in y^e figure

$\oplus$, & $\ominus$ $\mathbb{C}^{ae}$ in y^e figure of $\oplus$.

If you put this dissolution into
a matrasse on a Calot over a
brisk Δ , till y^e matter grows
into a grey hard substance,
This is call'd Lapis Infernalis
from its caustick nature.

If you $\sim$ these Chrystalls w^{th}
a strong reverberatory Δ ,
you'll have almost y^e whole
Quantity of Sp: again, ex=
=cept some which is entangled
 w^{th} y^e $\mathbb{C}$, which may easily be
forc'd from it by an Alka=
=lick $\ominus$.

It is observ'd that all Dissolu=
=tions of $\mathbb{C}$ are of a greenish
colo^e, which proceeds not from
 y^e $\mathbb{C}$, but from y^e $\mathfrak{F}$ or other
Alloy mixt w^{th} it.

The Pilulae Lunares w^{ch} are
made w^{th} these Chrystalls are
by autho^{es} much applauded,
but I think might very well
well [sic!] be let alone, since we
want no medicine for Lunaticks.

[51]

If you warm ∇ in a clean ♀
 Bason & pour in y^e Dissolution
 $yo^e \mathbb{C}$ will $\rightsquigarrow$ to y^e bottom in
 p . Decant $y^e \nabla$ & pour on
 more, & by diluting $y^e \ominus^s$ you'll
 make $y^e \mathbb{C}$ y^e finer, but $y^e \ominus^s$
 are not absolutely diluted, but
 some is still contained in it,
 w^{ch} you'll perceive in y^e fusion
 for it will be harsh & brittle
 & difficult to melt, except
 you pour $\ominus \ast^{ci}$ to absorb y^e
 $\oplus^{trous} p^{ts}$.

If there be any $\odot$ in $yo^e \mathbb{C}$, it
 will sink to y^e bottom in a
 black p . & not dissolve, w^{ch}
 if you would preserve, de=
 =cant y^e Dissolution, & wash
 $y^e p$ with ∇ep :

If you'll not perserve it, pour
 on it $\nabla \mathcal{R}$. & it will quickly
 be dissolv'd.

Vitrificatio $\mathfrak{h}^{ni}$.

Fill a + full of red $\mathfrak{h}$, bury it
 in $\triangle$, lay a Tile over it, &
 make a strong $\triangle$ about it.
 y^e matter will melt by degrees
 & vitrifie into a yellow glasse
 in 4 $\mathbb{X}s$ time. -----

[52]

Turbith minerali.

Put ℥^{ii} ℥^{viiij} into a ℥ , pour
 upon it ℥^{xvi} of $\text{⊙} \text{⊕}^{\text{li}}$,
 ℥ it. S. A. ad siccitatem, and
 you'll have in y^e bottom y^o^e
 ℥ reduc'd into a white p . w^{n}
 y^e matter is coole, break y^e ℥
 & take out y^e masse, & pour
 it into a Bason of $\text{∇} ep$. and
 assoon as y^e ∇ dilutes y^e Exte=
 $=rio^e$ *particulae salinae* of y^e
 massa, it ↯ yellow, w^{ch} colo ^{e}
 proceeds from y^e ⊕ of y^e ⊕ .

The Quantity prescribed is
 sufficient to divide y^e particles
 of y^e ℥ into its minima; though
 a greater quantity of ⊕ has
 been order'd by some; which
 although it does not hurt y^e
 preparation, yet it shews
 small judgement in those
 who use so much.

It's call'd *Turbith minerali*
~~because~~ from y^e Root Tur=
 $=bith$ because they are both
 Catharticks.

[53]

*This preparation is nothing
elce but a φ^{on} of $\wp$ p. $\ominus$ $\ominus^i$.*

$\overline{aaa}$ φ^{ris} .

$\overline{aaa}$ φ^{ris} is made wth $\wp$ $\wp$ $\wp$ $\wp$,
verdigrease $\wp$ $\wp$ $\wp$, crude $\ominus$ $\wp$ $\wp$,
& 2 Gallons of Smiths ∇ , boyl
these in an $\wp$ pot, & stirr them
continually wth a Spatula
for y^e Space of 4 $\wp$, yo^e $\wp$
will $\overline{aaa}^{ate}$ & wⁿ coole, be hard,
wⁿ hot it is soft. & so like
wax capable of Receiving
an impression. -----

$\ominus$ volat: $\ominus^{t\bar{u}}$.

This follows margar: miner:
 $\wp$. Cloves, nutmeg, Cardamū
seeds ana $\wp$ i. Cinnamon
 $\wp$ $\wp$. dry mint M.1. Bran=
=dy li. [?] 4. mingle them. & make
a $\mathcal{K}_a$ by a $\bar{\delta}^{on}$ for 24 $\wp$ in
a $\triangle$ furnace, pour this upon $\ominus$
 φ^{ri} et $\ast^{ci}$ put into a $\mathcal{C}$, lute
to it a Receiver wth clay & $\triangle$.
Ob. This is ye ~~not~~ most common
method, but there are a great
many wayes of making by
adding what Aromaticks y^e

[54]

Operato^e likes best.

*It has this name because y^e vol=
 =atile Alkali $\ominus$ is impregnated
 wth y^e Essentiall $\odot$ of y^e Aroma=
 =ticks. -----*

Extractū Gentianae.

*Make a strong Decoction of Gen=
 =tian, decant y^e Liquo^e presse
 y^e Root, boile again wth fresh ∇
 twice more. z all y^e Decoction
 & evaporate it to y^e consistence
 of honey.*

*Ob. By Extract wee understand
 any composition of this na=
 =ture; wⁿ wee extract an Aroma=
 =tick or rosinous body, wee use
 V as y^e properest menstruū, & y^t
 by infusion onely, as in Extractū
 Rudii.*

*But Extracts of Aromaticks are
 Very much impair'd in their vo=
 =atile p^{ts}, if they should be evapo=
 =rated, as in Extract ofCrocus; so
 y^t $\mathcal{T}$ as are much more to be preferr'd.*

[55]

Sp: $\textcircled{D}^{\text{tri}}$ Philosophicus.

$\mathcal{U}$. $\textcircled{D}^{\text{tri}}$, $\textcircled{\ominus}$ $\textcircled{\ominus}^{\text{li}}$ ana. lb 1. put them
into a large Receiver to $\mathcal{C}$
to w^{ch} lute a large Receiver w^{th}
Clay & sand = lute (for observe
 y^{t} all corrosive Sp^{ts}: must have
this Lute) $\mathcal{V}$ w^{th} a gentle Δ till
nothing be left in y^{e} $\mathcal{C}$ but a
black $\textcircled{\ominus}$.

Ob. This Sp: is more volatile & pene=
=trating than y^{e} common, or
 y^{t} per se, & is impregnated w^{th} y^{e}
 $\mathcal{A}$ of y^{e} $\textcircled{\ominus}$ $\textcircled{\ominus}^{\text{li}}$, and in effect is no=
=thing but a liquid Gun=powder,
because if you add to this an =
Quantity of Aromatick $\textcircled{\ominus}$ or Sp:
of Turpentine, it presently takes
 Δ , w^{ch} could never be without y^{e}
help of y^{e} s^{d} $\mathcal{A}$.

In y^{e} $\mathcal{V}^{\text{on}}$ of this and all other
Acid Sp^{ts} you must lute w^{th} Clay
because they'll corrode a paper
lute. Be carefull in unluting y^{e}
Receiver, y^{t} y^{e} fumes hurt you not,
for they are very pernicious. This
 $\mathcal{V}^{\text{on}}$ is perform'd by a small heat be=
=cause these 2 bodies mix'd will
almost $\mathcal{V}$ w^{th} their own heat. That
per se requires a stronger heat, &
longer time, concerning which
you may consult Lemery.

That per se will not flame, because
there is no $\mathcal{A}$, all y^{e} $\textcircled{D}$ here will fly
up in Sp^{ts}. if you continue y^{e} Δ long

[56]

enough: if it should not, & there re=
 =maine some $\ominus$ among $y^e \odot$, wash
 it wth ∇ ep: $\mathfrak{z}$, evaporate & chrys=
 =tallize it. This $\ominus$ is not of an Alka=
 =lick nature, for if you put to it
 3 p^{ts} of Brick=dust & $\mathfrak{z}$ it in a $\mathcal{C}$
 it will all rise in acid Sp^t. -----

$\mathcal{K}a \mathfrak{z}^{ii}$.

$\mathcal{J}$. Reg. $\mathfrak{z}^{ii} \mathfrak{z}^{tis} \mathfrak{z}^{iii}$, $\mathbb{D}^{tri} \mathfrak{z}^{xvi}$.

beat them singly, then mix them,
 put ~~of~~ this mixture, by spoonfulls
 into a red=hot + in a melting
 furnace, continue y^e matter in fu=
 =sion for $\frac{1}{2} \mathbb{X}$, then pour it into a
 warm mortar, p it fine, & put it
 into a Receiver or flaske, add to
 it $\mathfrak{V}$ ad eminentiam 4^{tuor} digitorū,
 $\mathfrak{z}$ it 24 $\mathbb{X}$, & you'll have a red $\mathcal{K}a$.
 Ob. This $\mathcal{K}a$ is generally made by
 y^e help of Acids, w^{ch} I wonder at
 since Acids will rather $\mathfrak{z}^{tate}$ than
 absorb it, as is observ'd in other
 $\mathfrak{z}^{ons}$ & Dissolutions.

It may be said in this prepara=
 =tion that it has a $\mathcal{K}a$ from y^e
 $\ominus$, & not from $y^e \mathfrak{z}$ of $\mathfrak{z}$.

But this is easily prov'd that if
 you put but one spoonfull ~~of~~ into
 a glasse of ∇ , it will retaine a $\mathcal{K}a$
 from $y^e \mathfrak{z}$ of $\mathfrak{z}^{ii}$, which if it had
 been produced from $y^e \mathfrak{z}$ of $\mathbb{D}^{tri}$, or

[57]

any other Θ^s , it would have produced no $\mathcal{K}_a$ in y^e Glasse of ∇ , that having diluted $y^e \Theta^s$, as in $\mathcal{K}_a$ of $\Theta \mp^r$, which is made by y^e bare fusion of $\Theta \mp^r$ per se, & so proceed as in $\mathcal{K}_a$ of $\mathfrak{z}$.

In The $\mathcal{K}_a$ of Corall which is made by Corall & $\mathbb{O}$ it is certaine there is a great deale of $y^e \mathcal{K}_a$ of $\mathbb{O}$, but I can't perswade my selfe, but there must also be something from y^e Corall, because in y^e Calcination y^e Corall not onely loses its color, but it also emits an Effluviū from it, w^{ch} is plain in $y^e \mathcal{Q}^{on}$ of y^e Corall.

This is a generall Rule to draw metallick $\mathcal{K}_a$ s, but w^{th} this distinction, $y^t y^e$ bodies are to be opened by severall Θ^s , according to their several natures; and $\mathcal{K}_a$ s are to be drawn out by menstruums agreeable to their natures.

$\Theta \mp^r$ would have been a better Θ to have opened y^e body of this Regulus. -----

[p. 58-294 left empty]

[295]

*Signa quaedā quibus dignosci potest
in mulieres conceperint nec ne.*

1. *In partibus externis post conceptū
Frigiditas et alor calor enim in trorsū [?]
se subducit ad con conceptione faciend.*
2. *Venter complanatur in primis diebus
ob uteri constrictione ad semen
alend: & nutriend.*
3. *Mammae indurescere & turgescere
incipiunt cū teneritudine et dolore.*
4. *Papillara extremitatis intensiori
rubedine quam antea per funduntur.*
5. *Tormina [?] et vermina in ventre
et circa umbilicū.*
6. *In appetentia et post cibū aegrosatis [?]
cū stomachi debilitate.*
7. *Mamillarū venae solito clarius con=
=spiciuntur .*
8. *Bene se Res habet cū oculorū venae
clari apparent et cum ipsi oculi
dicolores quadantenus videntur.*
9. *Picae gignuntur et Renū abs ?rdarū
appellitus [?].*
10. *Si sub ____ [?] cilio inferiori intumescit
venae et oculorū venae clari videntur
et oculos aliquanto sit dicolor, modo
eo tempore non fluant menses nec
praecedenti nocti mulier vigilatit,
procerto habeat eam concepisse,
hocq plane liquit et in ipso conceptus
tempore, et in primis 2 mensibus..
D^{us} Culpepper hoc semper verū esse assrit.*

- [296]
11. *Urinā Feminae in vitrum injicito
et obtusa [?], 3 ∪ maneat, hunc
per linteū puriss: cola, Si in ea
reperiantur parva animalcula
certū est praegnantum esse.*
 12. *Rp. virid. urticae summisat et in
urinam injicita bene obturitur
et totā ♀ maneat, sequenti mane
educito. Si rubris maculis scatet,
praegnans est, si non concepit,
negrecabit urtica.*

*These they say are Signs of conception
of males*

1. *The woman wⁿ she rises up From a Chaire,
or the like, doth sooner stay her selfe
on her right hand than on her left.*
2. *The belly lieth rounder & higher than
wⁿ it is a Female*
3. *The childe is First felt on y^e right Side
because (according to Hippoc.) y^e male
children lye on y^e right side of the
wombs.*
4. *The woman breeds Boys easier and with
lesse trouble & paine than Girls, and
carries her burden not so heavily, but
is more nembly [?] in moving.*
5. *the right breast is more plump and
harder than y^e left. and y^e right
nipple redder.*

[297]

6. *The womans complexion is more
cleare, and not so dull and swarthy
as wⁿ she beareth a Girle.*
7. *Let a Drop of her milke fall
into a Basin of faire ∇. if it
sinks to ye Bottom, she bears a Girle.
But if it swims and spreads abroad
it is a boy.*

Credat quicunq vult

*A decimo quarto ad vicesimū primū
aetatis annū fluunt menses tem=
=pore nove lunii.
A vicesimo primo ad Tricesimū,
in prima Lunae quadraturā.
A Tricesimo ad Tricesimum 7^ū vel
8^{vū} in pleni lunii tempore.
Et ab hoc tempore usq dum fluere
desierint. In ultima quadraturi
se obstendunt.*

[p. 298 was left empty]

[299]

Pilulae Terebinthinatae D^{ris} Brady

℥. Santali rubri subtiliter ℥^{ati}, &
 Terebinthinae venetae Q.S. commisce=
 =antur donec pilularem acquisierint
 consistentiam, deindi Balsami pe=
 =ruviani paucae adjiciantur guttulae
 f. massa S.A.

Vires Sanguinis mictionem sistunt &c.

Cataplasma Eiusdem D^{ris} Brady.

℥. Rad: Liliorū alb: loterū [?], & Rapa=
 =rū communiū Q.S. Separatim in
 lacte coquantur usq ad mollitiem,
 dein mortario lapideo cum pilo ligneo
 probe contundantur, postea commiscean=
 =tur lacte in quo coquebantur ad con=
 =sistentiam Cataplasmatidis. Ad colo=
 =randum, si vis, paululū Santali ru=
 rubri injicias.

Vires. Tumores in mammis vel disper=
 =git. vel maturat, vel rumpit.

∇^a quaedam Styptica. Ejusdem D^{ris}.

℥. Gallarū & O^{nis} [?] ana. ℥ij. coquantur
 in lb 1. ℥. ∇^{on^{ae}}. Donec tertia pars ∇^{ae}
 absumatur.

D^{ctor} noster (ni fallor) hanc ∇ in pe=
 =nem. Syringis ope injicit, ad Gonorrhoeā
 sistendam.

[300]

*An Ointment for y^e Itch.**℞. ☉ cibarii opt. ¼ of a Pint.**fflorū ☿^{ris} ʒi. Gingiberis ☼^{ati} ʒi. ʒ.**2 nuces moschatas ☼^{atas}. Misce omnia**et huic mixturae addas ☉ macis ʒ ¼.**Let y^e Party affected anoint wth this**Ointment. having on a clean shirt**& clean sheets; & 4 nights after**anoint again, & so again if need be.*

*Ad Rachitidem**℞. Ling. Cerv in Licheu [?], chamaemel.**Rut. aa M.1. confundant. Et**exprimat . succ. in 2 pint. zythogal [?].**tum paulisper coquant.**℞. Easd. Qantitat supradict. Herbas.**et cū S.Q. Butyri recentis coquant**ad unguent.**Cum hoc Unguent inungat. Infans**a cordis scrobiculo usq ad iⁿbilicū**ad 3 Septiman.**3^o vero ☽^o spatio hauriat. potus.**----- probat.**▽^a ophthalmic.**℞. Succ. Chelidon. maj. Hed. terrest.**Bellid. vulgar. ao. quib addat.**paululū Sacchar. purissim.*

*for an ague.**℞. Sapon. castit. Piper. Simit. Tritic. Acet. Vin.**reducant. in postam, carpis applicand.*

[301]

*Ad Hernia**℥j. Gum. Caran. Pic. Burgund. Q.s.**leni Δ liquefiant pro Emplast.**loc. affect applicand.**Insuper applicitur umbilico Emplast.**Pic. Commun. Pulvere Sem. Cymin. except.*

[pp. 302, 303 was left empty]

[304]

Nupta erat Dnd Breviter ♂^e ♀^{al}. 4. 10^{embris}. 1699

Nupta erat D^a Blofeld ♂^ε ♀^{ris}. 12. Aprilis 1700

A Course of Chymistry under Signior Vigani

The Manuscript in the Old Library of Queens' College

E. S. Peck gave this notebook of lecture notes to Queens' College in 1938.¹ It is a leather-bound volume with unlined pages, of which the first 122 pages contain a collection of chemical instructions and observations. The pages have a black or red pencil line drawn along each side to set margins. The margins are used for chapter titles, subtitles and occasional remarks, which form part of the main text body and are not expression of the opinion of the writer or personal annotations.

In contrast to the undated manuscript at Cambridge University Library² we know from the title page, that the contents of this book refer to a lecture course by Vigani, which he held in 1707 at Trinity College. We may infer that these notes were written soon after, most probably in the same year.

PECK 1934 assumed that these were lecture notes of one of Vigani's students. The manner, though, in which this text is written, makes one rather believe that these instructions were copied in several steps from a pre-existing compendium. The text was definitely not written hastily, as one would expect for lecture notes, because every word is properly spelled out. The writer never used any of the common alchemical symbols to abbreviate chemical terms and took time to erase wrong words and re-write them. The assumption that the text was copied from another source is supported by the fact that sometimes words are crossed out, which appear in the same place in proper context in the immediately following line, as if the copyist by mistake slipped one line. There are also instances where repeatedly occurring expressions, like '*this is nothing else but*' were corrected to '*this is nothing ~~else~~ but...*', indicating that the copyist automatically followed the expected pattern, and later noticed that in this instance the original version deviated from it. Corrections like these are more likely to happen when a text is being copied than on creating a text. It would also be uncharacteristic of a text dictated to the writer.

¹ Peck most likely acquired the notebook after 1933, when he gave the paper on Vigani and his cabinet to the Cambridge Antiquarian Society (PECK 1934), because this manuscript is neither evaluated nor mentioned in the paper.

² LECTURE-NOTES undated : *Cours De Chymie. Joan: Francis: Vigani Veronens;*, transcription in this Appendix.

The entire manuscript was recorded page by page in digital photographic format and the images added to the CD attached to the dissertation. Hence the transcription of the accurately readable manuscript was only partly done with the intention of providing wider and easy accessibility of the source material, as is the purpose for the transcription of the manuscript deposited at Cambridge University Library.

However, this transcription combines some degree of interpretation through moderate adjustment to modern spelling and terminology, with continuous text flow by ignoring the original line breaks in order to facilitate a more direct and less obscured approach to the contents of the text. This will make it easier for the reader to compare with and understand text passages of the manuscript at Cambridge University Library.

For (a)chemical expressions in the document refer to the Glossary of Chemical Terms in the appendix.

Contents

Unlike the other volume of lecture notes in Cambridge University Library, this set originally has no contents page. Subject headings were added for this transcription to help find materials and substances used and produced by Vigani. In this overview all those preparations are listed for which the manuscript has a recipe.

The numbers in brackets refer to the page numbers in the manuscript.

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Letter from E.S. Peck from 10.10.1938, on a small piece of writing paper which is kept safely between the pages of this book.³

³ This letter is referenced as MS Quns Vig. 15.

[00]

Course of Chemistry

under Signior Vigani

Professor of Chemistry

in the University of Cambridge

at the Laboratory of Trin. Coll

November & December 1707

[0]

lievroe [?] Salt

Stockton-on Lecs [?] 31.XII.35

[later pencil inscription by other hand]

[1]

Nitrum Fixum.

Take half a pound or as much as you like of nitre, and melt it in a crucible, when melted, put a small piece of charcoal to it, and it will cause a vehement detonation, which when over, put another piece of charcoal to it, and so continue the operation, till it will detonate no more, then take out the matter, and put it into a warm mortar, and by stirring it with a spatula, you will reduce it into a powder: keep it in a glass bottle well stopped, because this salt as well as all other alkaline fixed salts, if exposed to the air, will run per deliquium.

Observations.

That this nitre is really alkalized by this operation appears by many experiments because it will precipitate

[2]

the dissolution of sublimate as well as salt tartar, and it not only answers in this respect, but in all others, which we will prove in its proper places. The opinion of all authors concerning this fixed salt is this, that in these detonations the nitre is deprived of its volatile acid parts, which are drawn from it in the violent detonations, by the diminutions of the quantity of matter, and by the fixed matter that remains. But as to farther examination of this experiment it shall be explained by the regeneration of this nitrum fixum.

Regulus of Antimony

Take 16 ounces of antimony, 12 of crude tartar, and 8 of saltpetre, all well powdered and mixed, put a proportionable crucible in a melting furnace and when it is red hot, put about a spoonful of this matter at a time

[3]

into it, a detonation will follow after every spoonful, and so continue it till your matter is all in the crucible, then augment ye fire, and close your furnace, so that your matter may be an hour at least in liquid fusion, then let it cool and break the crucible; you will find the regulus at the bottom, separate from the scoria, which you must wash and dry to keep for use.

Remarks. Regulus is nothing else but the most metallic substance of antimony, and because it is a separation of a prodigious impure sulphur of the same mineral, it has been supposed, that regulus is the mercurial part of the same antimony founded upon

the hypothesis that all metals are the product of the sulphur and mercury, to which 2 principales they attribute the '**principia principiata**' of all minerals.

Sulphur aureatum Diaphoreticum

Dissolve as much as you like of the scoria of regulus of antimony, **per se**, in warm water, filtrate this dissolution, and drop upon

[4]

it any acid menstruum, a separation of the sulphur will follow, which you must filtrate again, and then the sulphur will remain in the filtrum, then with warm water you must separate **abluendo**⁴ all the saline particles from the sulphur, and dry your sulphur into powder upon a sand furnace, and so preserve it for use.

Observation: This scoria consists of the alkaline salt, which is produced from the nitre and tartar, which is impregnated with the sulphur of antimony, it being an effect of all alkaline bodies to absorb metallic sulphurs. When you dissolve the scoria in warm water, as you may easily do all alkaline salts, so they will carry with them all metallic sulphurs, and though, when the dissolution is filtrated the sulphur is not visible being supported with alkaline salts, yet as soon as you drop any acid to art upon the alkaline body the sulphur is manifest by

[5]

precipitation, as we observe that when any acid dissolves an alkaline body, the alkali will precipitate. The sulphur in all minerals is manifest not only by this but also by very many other experiments but the mercury, though so much defended by all authors, is only imaginary, because there are several recipes to separate mercury from minerals, yet it cannot be done, except you will make **cinnaberis nativum** produce both sulphur & mercury, but that is peculiar to quicksilver mines independent of any other minerals. The **sulphur auratum** has been commended by authors, and though it has the name of **diaphoreticum**; yet its operation is as nauseous as it is uncertain, because it is sometimes cathartic and sometimes emetic. This as well as all other

[6]

sulphurs chemically prepared are not imaginary, but real because they have the same qualities as common brimstone.

⁴ By washing away or carrying off impurities.

Regulus Antimonii Martiat

Take 8 ounces of iron nails, and 16 of antimony, place your crucible upon a strong melting furnace, put your nails in the crucible and when thoroughly hot, put in your antimony finely beaten, put a little powder of nitre upon it when it is near melting, and keep it in **fluore** at least an hour, then permit the matter to cool, break your crucible, and separate the regulus from the scoria.

Observation: The scoria of this regulus is not the same with that of the former, because it is intermingled with the scoria of the iron, and therefore you cannot expect the same

[7]

experiment with the former; as also you may observe in the making of the regulus, that what is done without the addition of any metals produces the less quantity of regulus, that which is done with the addition of mars produces a great deal more, because the sulphur of mars is impregnated with the regulus of antimony. If you take the regulus of antimony so prepared, & beat it to powder mixing with it an equal quantity of saltpetre, it will cause a new detonation in the crucible, and will purify the regulus and make it **stellatus**⁵. There is a great noise amongst the learned how the star comes upon the antimony, which should be no admiration to any man if he thoroughly considers that all

[8]

metals consist of salt and always crystallize.

Instance. Antimony always falls **rectā lineā ad centrum**, which lines of antimony consist of crystal as we observe in all metals, if you break them they are of a crystalline figure, in iron particularly, according to the nature and temper of metals. So we conclude that bodies **è sale prodeunt** and all salts are easily dissolved into water, for the water is supposed to be **naturalium rerū omnium principium**, because we observe in abundance of chemical experiments, that we see abundance of limpid matter, wherein are a great many solid parts imperceptible to the eye, as it is in the case of the dissolution of sublimate corrosive diluted in water, the water diluting the acid salts supports the mercury. This regulus of mars is not only used **per se** in physick, being as

[9]

emetic as the former, but also it is used in several other preparations.

⁵ = star-shaped.

Instance. In *tinctura metallorum et antihectico poterii*, and upon many other occasions, as we find in authors. Mechanics also make a great use of it, as pewterers to harden their pewter withal, and bell founders to give the metal a better sound, and for the better purpose of the last experiment they impregnate it over again with more sulphur of mars in the manner afore said, and sometimes repeat it a third time, and then your regulus will be so hard that you may strike it like steel upon a flint.

Flores Benzoin:

Take 2 or 3 ounces benjamini amygdalati, put it into a pot, and melt it upon a slow fire, cover it with

[10]

a conical paper, and melt the gum with a slow fire, the flowers will ascend in a white vapour, & adhere to the sides of the paper in a white crystalline substance, which you may shake out; then continue the operation till the flowers begin to grow yellow, which is a sign that the oil rises with the flowers; but if you do not take great care of the fire to keep it slow, the oil will rise at the beginning, so that this operation as well as all others consists in the graduating the fire, which you cannot very well order notwithstanding all directions, except you understand the nature of the body you work upon, and all the degrees of fire that have been mentioned by authors are of little use unless you take this animadversion.

Observation: It is observed that in moist weather you can perform this operation

[11]

better, because the dampness of the air will moisten the paper, and so condense the vapours better. These flowers are also made by distillation in a retort, which some authors for distinction's sake call *butyrium benjamini*, because it rises in the distillation like melted butter, and though this last is most profitable yet it is not so pure and clean from the oil as the former: it is used in physick amongst pectorals and in coughs and colds, because it is not only an excellent pectoral but also very balsamic to the lungs. But in this case we have observed it to be better to burn benjamin in the patient's room, where the flowers are expanded in the air, and drawn more directly upon the lungs, than by taking it inwardly. In making of these flowers we observe that there is a perfect sublimation, only it is

[12]

*to be observed that this sublimation is quite different from any other, whereas most chemical experiments depend one upon another, because no gums would produce **flores** but this, though several authors affirm the contrary, which experience proves otherwise, except you will make it of volatile salt of amber which is gathered by distillation of parallel experiments, because bitumen is not of the same nature with resinous gums, as benjamin is; besides in this sublimation and that distillation the effects are quite contrary, as we shall explain in the distillation of amber.*

Balsamum Sulphuris

Take 2 pound of good salad oil, put it into a pot, add to it 3 ounces of flower of brimstone, place it in a calote in a proper furnace and augment the heat, so that the brimstone may just melt,

[13]

*and observe that the very heat that will melt the brimstone will make the oil bubble, which by so bubbling will be deprived of its accidental humidity; which humidity as long as it is not separated by the ebullitions will hinder the union of the bituminous body of the sulphur with the oil, because it is plain that it must do so, while any moisture is interposed, as we do observe in these preparations that in the beginning the bubbles are very large by reason of the great quantity of moisture, but when the moisture decreases then the bubbles grow less, and the smaller they grow the sooner the brimstone unites with the oil, and so the oil opens the sulphur **dividendo per minimas**⁶, as we do perceive by the smell and the colour which is red, the true intrinsic*

colour of all metallic sulphurs. Balsam is made not only by the help of common oil, as this, but also

[14]

with the oil of anis seeds, caraway seeds, and cumin seeds, linseed oil, and often with oil of amber, and specially in asthmatics, which are used successfully both externally and internally.

⁶ = divided into the smallest particles.

Dia Sulphuris

Take 3 ounces of salt tartar finely powdered, and an ounce of flower of brimstone mixed well together; melt it together in a little pot upon a slow fire, and keep constantly stirring it, and it will have a red colour; then take it of the fire, and keep stirring till it be cold, you must preserve it close or it will run per deliquium. This powder is the basis of doctor Willis's Syrup of Sulphur, which is made by dissolving the powder in white wine, and afterwards filtering it with the addition of sugar after the same method that you use in making syrup of violets, this syrup is an approved medicine in asthmatics. Of

[15]

this powder is made also a tincture of sulphur, with the help of alcohol vini, but this tincture will not keep well, because in a little time it crystallizes, and grows pale: it is also used in powder with the conserve of roses with good success.

Crocus Metallorum

Take a pound of antimony and melt it in a crucible in a proper furnace, when melted, put upon it half a pound of saltpetre, powdered with a spoon, a detonation will follow every spoonfull, which when over, repeat the same quantity till you have put it all in, then let the matter cool, break your crucible, and separate the scoria from the crocus, which is the most solid part: this is a sort of vitrification of antimony done by the help of the salt, which gradually vitrifies the antimony from the superficies to the bottom, because we do

[16]

observe that if you put but 2 ounces of nitre upon that quantity of antimony, there will be but a 4th part vitrified and that in the superficies, because when it is cold and broken, we find the antimony at the bottom, and that which is vitrified in the top: this is the best method of preparing this crocus, because that which is done after the common method in a mortar is more impure, and its scoria very difficult to be separated, and therefore we choose this as the best and truest method. You [>Vinum Benedictum*< note on the left margin] may put an ounce of the powder of this crocus in a quart of white wine, which being well shaken let stand, till the powder be settled to the bottom, then decant your wine clean, an ounce or 10 drams of which is an excellent emetic, and indeed one of the best that we know, because it works without any ill effect; if you put upon the same powder a greater quantity of wine, it will produce the same effects, and so *in infinitum*.*

[17]

*But it is a question why the wine should be always emetic, and the antimony not lose its virtues, this is what they answer, that the sun does always warm, and yet it is the same sun still. However it is certain that the powder receives some small alteration in its virtue, otherwise an apothecary that has but an ounce of it, it will serve both him and all his successors for ever; but we observe that apothecaries do often buy fresh to renew it, and at the same time they will swear that they had it of their masters. It is called *crocus metallorum*, because when powdered it has a saffron colour, and then it is called *hepar*⁷ *antimonii* from the likeness it bears to the liver.*

Sal Prunellae

Take half a pound of saltpetre melt it in a crucible in a proper furnace, then pour upon it some

[18]

*flower of brimstone, and it will cause a detonation, which when over repeat it till your **massa**, which before was opaque, becomes clear, then pour it into a clean warm mortar, and keep it for use.*

*Observation: this is only a purification of nitre by the help of brimstone, because we observe in the detonations that the **flores** consume that **pinguedo**⁸, which you perceive in the superficies, when first melted, which is the occasion of the opacity, and so the salt nitre becomes more useful in physick than before: it is used generally in fevers, because it cools and extinguishes thirst, mixed with syrup of violets in **aquã borraginis vel portulaca**⁹. It is ordered by some authors to continue the detonation of the flower of brimstone and fill the crucible, till it will detonate no more, which is a gross mistake, because the detonation*

[19]

will continue as long as there is salt nitre in the crucible.

Sal Tartar

Take a pound of crude tartar and a pound of saltpetre, both being well powdered, mix them well together, heat gently your crucible, put the mixture into it, by little and little

⁷ An old name for a metallic sulphide, having a reddish-brown or liver colour. Also, for compounds of sulphur with other substances. But is it a metallic sulphide in this case? See *Hepar sulphuris* on p. [20].

⁸ = fatty matter.

⁹ = water of borage or purslane.

with a small detonation, till it comes to **nitrum fixum**, which is an effect of the sulphur of tartar acting upon the nitre, as it does in the sulphur of charcoal in the operation of **nitrum fixum**. The alkaline salt is improperly called salt tartar, because this fixed salt consists not only of salt tartar but also of salt nitre being mixed together, because a pound of each will produce a pound of fixed salt, and a pound of tartar when you make it a salt **per se** will produce but 4 ounces: it is true that this salt is useful in several experiments

[20]

and answers accordingly, yet if you examine it truly and philosophically, you will find a difference, as we shall have occasion to show, when we come to speak of fixed salt of plants.

Sal Sulphuris

Take 4 ounces of *dia sulphuris*¹⁰, commonly called *hepar sulphuris*, from its colour, boil it in an earthen vessel in 2 quarts of water slowly till it comes to a pint, then let it cool, and filtrate it, drop upon it gradually spirit of vinegar, and all the liquor will turn to a milky substance which proceeds from the acid acting upon the alkali, which supported the sulphur before, causes a separation of the sulphur, which appears in the milky substance floating in the liquor, an effect which in all cases antecedes the precipitation of bodies, as we observe in making the sulphur **auratum diaphoreticum**, as we have hinted before.

[21]

This experiment is more useful to examine the nature of bodies and how they act one upon another, than of any great moment in physick; though it is by the ancients highly commended, because the sulphur was much better before it received any alteration from the acid, as we may conjecture from the smell, because after the precipitation it both *leses* [*sic!*, either 'loses' or 'lessens'] its taste and sulphurous smell, and this is the fault in all authors, that they are so fond of any experiment of their own invention, to which they often attribute virtue more to humour fancy than reality will bear, without taking pains to examine the thing thoroughly. This **lac sulphuris** is made after another method, to wit by boiling powder of sulphur and quicklime in an iron pot full of water, and stirring it often till the water is dyed with

¹⁰ See p. [14] of the manuscript.

[22]

a deep yellow colour, then they take it of the fire, and let it cool, and filtrate and precipitate it as before, then they decant the liquor from the metallic precipitate, and pour warm water upon it, and stir it, then let it settle and decant it as before: this lotion is to be repeated till you perceive that the water is become insipid, then it is an evident sign that your powder is absolutely deprived of its saline particles. This lotion is used in both preparations, but this 2nd method is rejected more than the 1st, because we do not know what saline particles the quicklime may join with the sulphur, seeing it abounds with acrimonious salt: however this last experiment is very material, because it gives us an exact hint how sulphurous spas are produced in the earth, as well as in hot baths as other places; first it is

[23]

to be considered that these spas abound with sulphur, both by the smell and taste, 2^{dly} that this sulphur is not a plain sulphur but has been opened by alkaline bodies which the aforesaid experiment does also prove, and 3^{dly} that this is done by the help of subterraneous heat no man ever doubted, and 4^{thly} that the very same heat makes also limestone, which is the alkaline body that opens the brimstone, as we see by experience, lastly the vehement heat of springs which pass through the same cavities and are so full of sulphur proves likewise what we have said.

Alcohol Vini

Take 2 gallons of the best French brandy, put to it 4 pound of common salt, distil half a gallon in vesicâ copreâ cum sua refrigeratoriâ with a very gentle heat, what shall be distilled

[24]

*after you have had 2 quarts out of it keep by it self i.e.: the 3^d quart, this last may be reckoned amongst the spirits **vini rectificati**, because we make this distinction betwixt **spiritus vini rectificati** et **spiritus vinosi** that when authors mention **spiritus vinosi**, they mean true French brandy, when **spiritus vini rectificati**, is meant when you have distilled one quart out of two, because though it has lost 2 thirds of its phlegma in its rectification, yet it retains one third more than what is necessary to a pure alcoholization¹¹ because alcohol is supposed to be absolutely deprived of all its*

¹¹ In this context an obsolete form for: Refinement to an essence or essential spirit; rectification of a spirit; OED 1989².

phlegma, 1st because burning in a spoon it leaves no flame behind it, 2^{dly} if you put any gunpowder in the spoon, when consumed, it will set it on fire

[25]

which 2 experiments are fallacious, because the heat of the spoon caused by the flame, consumes the moisture that remains, as also we observe that gunpowder will burn notwithstanding a little moisture; but the true experiment whereby to know if the alcohol be deprived of its phlegm, is to put salt tartar to it, and by shaking them together let them settle, if there is but a drop of phlegm, in the alcohol, the salt tartar will absorb it, and though this last experiment plainly demonstrates that the alcohol is absolutely deprived of all its accidental humidity, yet it is no consequence, that there is no phlegm amongst the alcohol, because if you narrowly observe, no wine of spirits can be made without fermentation, and no juices let them be of what nature so ever before the fermentation produce any spirit, as

[26]

*they will do after it, because the fermentation dilutes attenuates and volatilizes their proper oil. This alcohol in reality is nothing else, but their proper oil diluted in phlegm, but only in such a proportion of phlegm as is absolutely necessary and no more to dilute it, because what is superfluous is separated by the distillation, and this is one of the reasons why some authors have called this **alcohol vini oleumvini**, as we do observe that before fermentation bodies will afford a viscous oil, but no vinous spirits, but after fermentation no viscous oil but all vinous spirits, and so consequently vinous spirit is nothing else but viscous oil rarefied: amongst all the vinous spirits the best and most piercing and fragrant is made of grapes, the next is that which is made of sugar, the worst that of grain*

[27]

*because in this last we observe that its alcohol if it be left for half a year in an open bottle, will have its oil fled and separated, from its flame, and **phlegma**, which will be very putrid: we observe a difference also in the alcohol according to the different sorts of wine from which it is distilled and that not only in the quantity but also in the quality, which effects are not only produced in this distillation, but also in their tartar, as we shall have occasion to speak in the distillation of tartar.*

Mercurius dulcis

Take 4 parts of sublimate corrosive and 3 parts of quicksilver, mix these exactly in a marble mortar with a wooden pestle, or in a glass mortar with a glass pestle, till the quicksilver disappears, then put your matter in a matrass with a short neck, and place your

[28]

matrass in a calote with above an inch of sand at the bottom, then cover your matrass about 3 parts with sand, put fire under it, and gradually warm your matter, till you perceive the sublimation beginning by the discolouring the glass upon the superficies of your matrass, then continue your fire at that degree and no higher for 8 [?] hours, then let your matter cool and break your matrass, and separate the lower part of the **materia sublimata**, from that which is next to the neck, because that which is next the neck is more corrosive and less dulcified than the rest, because it is more impregnated with the acrimonious particles, of which we design to deprive the **massa** by the sublimation; this sublimation is repeated a 2^d and 3^d time always separating that which

[29]

is next the neck as before, which may be all resublimed when you make new mercurius dulcis.

Observation: upon sublimate corrosive. [note on the left margin]

When we mention corrosive sublimate or mercury is to be understood that common sublimate mercury, which is made of vitriol, saltpetre, and quicksilver all ground together in a stone mortar till the quicksilver disappears (the vitriol must be first calcined ad albedinem¹²) then with all this powder put into a matrass you make your sublimation, as before. This mercury so sublimed is very corrosive, because it is wholly impregnated with the corrosive particles of nitre and vitriol, notwithstanding it is an excellent medicine being taken inwardly, if well diluted in water, because it cures all internal ulcers when nothing else can remove them; but to make a sure

[30]

remedy, dissolve 2 drams of sublimate in a quart of water, then pour upon it half an ounce of spirit of sal armoniack, it will turn all into a milky substance, because the alkaline spirit breaking the edge of the acid salt which supports the mercury must of

¹² Calcined to whiteness.

necessity precipitate in a white powder, which being shaken all together may be given without any damage.

Observation: upon mercurius dulcis. [text on the left margin]

In the intention of making this sublimate mercurius dulcis we ordered 4 parts of mercury to be put to 3 of quicksilver, because that quantity of salts which were included in 4 non [?] divided into 7 is more attenuated; besides in the sublimations there are a great many volatile and corrosive parts which are exhaled out of the vessel, and that is the reason why the sublimation

[31]

*is repeated 3 times; some pretend to sublime it 7 times and others 9 which is very fabulous, because by so doing and depriving the body too much of its acids it will turn into quicksilver. It is true you may sublime it an hundred times without this inconvenience by the addition of decrepitated common salt, but this is nothing else but depriving it of its acids and adding more by common salt. It is called **calomelanous**, which is supposed a way of correcting this **mercurius dulcis**: but the best method is to take it out and beat it in a mortar, and then moisten it with spirit of harts horn, till it turns very black; it will sublime as white as before, and this is the truest and best method of correcting mercurius dulcis.*

Of Camphire¹³.

Camphor is a gum brought to us from China, the best from Borneo and comes from a great tree; there are several different ways of gathering it, one is by incision, and another is spontaneous, but the most

[32]

common is by cutting the tree into chips and so boiling them in water, then the gum will swim like fat on the top, which they scum of and so preserve: the colour of this gum is first red, then by mingling it with bole or brick dust by sublimation it is purified into that colour and substance in which it is brought to us. The Venetian ambassadors were the first that could purify it, but now the Dutch. There are abundance of prescriptions set down by several authors for reducing this gum into oil, and they are attested by Kircher as well as others for infallible rules, but they are all fallacious. We have a certain method of dissolving camphor into an oleaginous substance, which is improperly called

¹³ Obsolete for 'camphor', in the following replaced with this.

oleum camphora, because it is plain that it is nothing else but the gum divided **per minimas** by the **particulae acutae** of the spirit of nitre,

[33]

which nitrous particles are mingled with the camphor and so remain on the top, in an oily substance, and this is evident, because if you pour this oil of camphor so made into water, the water diluting the acid particles of the nitre, the camphor resumes its proper form, so that the use of camphor per se in physick is far better than its oil, except it be used in surgery in carious bones, but even in this case if you take this oil of camphor, and pour more camphor into it, it will turn the camphor into oil, and so the acid particles will be more diluted.

Tinctura Myrrhae

Take half a pound of myrrh and an equal quantity of salt tartar, bruise them both pretty well, put them together in a broad earthen vessel, and expose them to the air, stir them once a day, till all the matter is become a soft paste, then put it all into a matrass with a large orifice and

[34]

put upon it spirit of wine, rectified, till it be covered 4 fingers high, cover your vessel with another, or a blind-head, and digest your matter in a sand furnace by stirring it now and then, till the menstruum is thoroughly impregnated with the balsamic quality of the myrrh, which you will perceive by the deepness of the colour in your menstruum, then when all is cool filtrate and decant the tincture, and so preserve it for use.

Observation: This myrrh does abound with two substances, the one is balsamic and the other is barely gummy, The balsamic quality is that which is required in all tinctures, and therefore we are often necessitated to divide it by the help of salt tartar, without which help the menstruum could not divide the

[35]

balsamic from the gummy quality, and so consequently could not be so thoroughly impregnated, neither could your tincture be so efficacious, because all the virtue of the myrrh consists in the balsamic; and this is the reason, why we always choose that myrrh which is more dark and fat rather than that which is transparent; now the ignorance of our age is such that they give six times more for the worst, than they do for the best. In this tincture we make use of spiritus vini rectificati instead of alcohol

upon this consi-deration, because the remaining humidity is necessary for farther diluting the alkaline salt, that the balsam may the more easily communicate its tincture to the spirit; neither is the menstruum

[36]

the weaker for it, because it dephlegms it self.

Tincture of Aloes

Take 4 ounces of succotrine¹⁴ aloes powdered, put it in a matrass, put upon it 16 ounces of alcohol vini, digest it till the succus is all dissolved in the menstruum which you must filtrate and preserve.

Observation: This is improperly called a tincture, for it is rather a dissolution; because when we speak of tincture is to be understood a proper menstruum impregnated only with the essential parts of a body, divided from the heterogeneous parts; but when the body is absolutely dissolved, then it deserves the name of tincture no longer, but of a dissolution.

Tinctura Croci

Take 2 ounces of the best saffron, and cut it small with a pair of scissors, put half a pound of alcohol vini upon it in a matrass

[37]

with a small heat in balneo=arenae, and you will have a good tincture, i.e.: your menstruum will be impregnated with the more volatile and sulphurous parts of saffron, and this last is truly a tincture.

Elixir Proprietatis

*With these 3 tinctures we make **elixir proprietatis** by taking 2 parts of the tincture of myrrh, an ounce of the tincture of aloes, and an ounce of the tincture of saffron, and mixing these together you make **elixir proprietatis**. We take 2 parts of myrrh, and only one of each of the other, because we consider myrrh to be the basis, aloes the **agitorium**, and saffron the **correctivum**, a maxim observed amongst all physicians as well ancient as modern to have a basis, an **agitorium**, and a **correctivum**, without which rule it is impossible*

¹⁴ A variation of socotrine: originally aloes obtained from the island of Socotra; OED 1989².

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to go methodically. It is true that Paracelsus the author of this *elixir proprietatis* orders an equal quantity of these 3 to be put in it, but this learned man must not be grossly¹⁵ taken, because a pound of some myrrh has not so much balsamic in it as 2 ounces of some other, and what is not balsamic is inutile in this elixir, so that Paracelsus will have an equal quantity of balsamic in this elixir with his aloes and saffron, and to be certain of this we make this tincture distinct. Now the reason of putting 2 ounces instead of one is upon this consideration, let your tincture of myrrh be never so deep it is impossible it should be so fully impregnated as the dissolution of aloes, whose whole body is diluted in the menstruum, or as

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the tincture of saffron which easily communicates itself, and so it will make an equal proportion though there be a double quantity of myrrh. The common way of mixing myrrh, aloes, and saffron together and drawing a tincture from them, and then using it for *elixir proprietatis* is very erroneous because it has little or nothing of myrrh communicated to the mixture, which is the main basis, for the same reason which we have given in *tincturâ myrrhae*; because some observe that the myrrh does not dissolve in this way of making this elixir, therefore they make use of oil of sulphur *per campanam*, which oil they put upon the mixture, before they put the alcohol upon it, in order to open the myrrh, others use oil of vitriol for the same reason,

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but these acids do really rather destroy than augment the quality of the myrrh, others use the spirit of harts horn, others *sal: volatile oleosum*, and others *tinctura salis tartari*; but none of these make an elixir, which does truly answer the intention of Paracelsus, like this method which I have given.

Of Extracts in general

This word extract does comprehend all chemical extractions, but when we speak of extract, we must not understand it in a general sense, but peculiarly i.e. either decoctions, or tinctures by evaporations, or distillations, whereby liquids are reduced ad *consistentiam mellis* when you make an aromatic extract as of marjoram, mint, and the like, you must make your fire slower than in other

¹⁵ In this context in the obsolete meaning of: In a plain or obvious manner; plainly; in plain terms; OED 1989².

[41]

extracts which are not aromatic as of gentian and the like; and this distinction of the degrees of heat gives also several denominations, as exhalations in one, and evaporations in the other; because what will damage the aromatic extract will not easily damage the other. An inconvenience is found in all extracts, especially in those which are made of aqueous menstruums, because they are apt to turn mouldy, and by so doing the bo-dies must of necessity receive an alteration inconsistent with your design. There is another inconvenience in those extracts that are made of spirituous menstruums, as there is also generally observed in extracts of aromatic plants, because being oily bodies, they easily join with oily menstruums, and though in these exhalations you be never so cautious, that you will lose a great deal of

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*what is most volatile and essential, as in the extract of saffron and the like: now to remedy this inconvenience, we put these aromatic tinctures in a retort, luting a proper receiver to it, and slowly distilling them in **balneo=arena**, we take of the most volatile part of the **menstruum** and the plant, then taking the liquid matter out of the retort we evaporate it in an open glass bottle upon the sand more than extracts are usually evaporated (but you must be very cautious of any torrifications) then take your volatile spirit which you have distilled from it, and mingle with your extract, and so your extract will not be deprived of any thing that is active, but only of that which is passive, which is the true intention of making extracts to separate*

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*the pure from the impure. In extracts of bodies that abound with saline particles more than resinous, as gentian, **bistorta**¹⁶, and the like we make use only of water for a menstruum, because though it is true that all bodies abound more or less with resinous particles, yet when the saline particles predominate, they carry along with them the resinous particles to the menstruum; in this extract we likewise find an inconvenience, viz. that the humidity of the water causes the extract to mould, to prevent which there is but one way, which is by drying it very well, but this method is hazardous, for it is hereby sometimes rendered empyreumatic, and so consequently its virtue must be altered; now to remedy this inconvenience, and at the*

¹⁶ =bistort: A species of Polygonum (*P. bistorta*), named from the twisted form of its large root, bearing a cylindrical spike of small flesh-coloured flowers; also called *Snakeweed*; OED 1989².

[44]

same time to separate the extract from the phlegma, that causes the moulding, when your extract is almost evaporated to a due consistence, put to it tincture of the same plants from which it is extracted made of alcohol *vini*, and so evaporate it till it be reduced **ad consistentiam mellis**, and by this means you will evaporate the superfluous moisture which otherwise would cause it to mould.

Aurum Mosaicum

Take half a pound of quicksilver and half a pound of block-tin, put them into a crucible, and they will amalgamate **lento igne**¹⁷ i.e. easily join together in one body, as we shall farther explain in its proper place, take out this amalgam, and put to it an equal quantity of sulphur, and sal armoniack, then powder the whole

[45]

matter very fine, put all the powder in a matrass; and place it to sublime after the same manner that we have shown before in *mercurius dulcis*.

Observation: upon aurum mosaicum. [text on left margin]

This sublimation rather deserves the name of fixation, than otherwise, because the matter that is required, remains fixed in the bottom of the matrass, and what does really sublime is but the scoria of this composition, therefore this rule must not be taken for a general one in sublimations; as in the case of sublimation of *mercurius dulcis* the whole body rises, and therefore it is called sublimation totum, as we have other sublimations in parte which we shall have occasion to speak of hereafter. This preparation in reality is nothing else but a

[46]

fixation of quicksilver not only by the help of the added brimstone, but also by the sulphur of the tin, which we may easily argue to be so, because all sulphurous bodies fix quicksilver as we observe that quicksilver is fixed by sulphur to a cinnabar in viscere terrae, which cinnabar is nothing but a composition of both, as experience demonstrates, because if you take *oleum tartari per deliquium*, and grind it finely with the cinnabar, and then put this massa in a retort luting a receiver full of water to it, the mercury *lento igne* will rise in white vapours, and it will precipitate to the bottom of the

¹⁷ By a slow fire.

water if your salt tartar be clear from all dregs, which you must make so by dissolution and filtration, then dilute that which is

[47]

commonly called the caput mortuum and filtrate it, and what remains in the filtrum is the pure sulphur of the cinnabar; but it is to be observed that this mineral sulphur is only to be extracted from your Persian cinnabar, which is the purest that we know, and freest from all earthly mixture, and better than any Spanish or Hungarian cinnabar, as we can easily perceive it, because the Persian cinnabar breaks fine like a ruby, other is more or less full of earth. Cinnabar is made artificially by the help of common brimstone and quicksilver mixed and sublimed, which sublimation does rise in a fine crystalline substance, and though it bears the colour of antimony, yet when powdered it is of a noble red colour, and is commonly called vermilion; this cinnabar is used in physick and so paralleled to the nativum persicum

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cinnabar, and some attribute to them both the same virtues, because both produce good effects without any manifest difference, if we do not mistake in our own observations: and especially if we thoroughly consider the nature of these two bodies, and what difference may be apprehended between the working of nature and art, as we do observe in very many other experiments. This aurum mosaicum is a certain remedy in epilepsies a dram to a dose 2 or 3 times in a day according as the patient is affected; and it is the same also in hysteric passions.

Sal Martis

Take 4 ounces of filings of steel, and 8 [?] ounces of oil of vitriol, and put both in a matrass, you will perceive the acid of the vitriol acting upon the alkali of the iron;

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by a vehement motion they grow hot, but if you pour some water upon these 2 bodies, the acid will operate more vehemently, because acid salts do not act nisi dissoluti¹⁸, and though it is true that the oil of vitriol and filings of iron do grow hot without any addition of water, yet it does not destroy that maxim, sales non agunt nisi dissoluti¹⁹, because if there was no moisture in the oil of vitriol, it would be impossible for it to act, and this we observe, that when we pour water upon this mixture, the fermentation is

¹⁸ = when not dissolved.

¹⁹ = salts do not (re)act unless they are dissolved.

the more violent, because when salts are diluted, they act the more vehemently; now whether this fermentation be caused by attraction or impulsion we leave to every man to judge; what all chemists say is the reason of it is this, that it proceeds

[50]

*from the alkaline nature of the iron and from the **particulae acidae pungentes**²⁰ of the vitriol, because the former being porous, the acid particles do penetrate the pores, and so cause the violent motion and heat. There is a false rule given us in making this salt especially in **Chymiâ Leidensis**, which is to pour a great quantity of water upon this mixture, which by experience we find to be erroneous, because the salts being too much diluted do not crystallize, but rather make the iron rust, which the chemists call *crocus martis* a colour; therefore you must be cautious of putting in too much water, and when your fermentation is over, place it on a sand furnace, and the whole*

[51]

*body will turn to a massa salina, then dilute your salt with the water, filtrate, evaporate and crystallize it and so it is called **sal martis**, not because it is truly and really salt of iron, as several imagine, for it is in reality **oleum vitrioli in vitriolum regeneratum** by the help of some metallic particles of the iron, because we know by experience, that a pound of this salt of iron distilled in a retort will produce the same oil, and very little of the iron remains; now this observation is not peculiar to this experiment only, but also to that which you call **sal veneris**, and to **sal lunae**, **sal solis** &c [?]. They are not really salts of these minerals but they are really liquid salts coagulated and regenerated. It is true we can make a salt of iron*

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[>aliud sal martis²¹< text on the left margin] without this regeneration, by exposing filings of iron to the air and then with rainwater making a digestion, filtration, evaporation, and crystallization, you may produce a vitriolic salt, but because we must not deceive ourselves even in this very experiment, it is to be considered, whether this salt be produced from the iron or the air, because this iron, as we find by experience, is very magnetic, which we may gather likewise from other experiments.

²⁰ = the pungent acid particles.

²¹ = another sal martis (salt of iron).

Instance. Calcined vitriol exposed to the air turns to vitriol again, and this we observe not only in minerals, but also in animals, because any parts of an animal, which are in motion will certainly attract the same succus, that they are deprived of, as in case of mad dogs, vipers and

[53]

the like; after they have bit, take out their livers, and if they have any motion, apply them to the bitten place and they will suck out again the venemous poison, and this action is called magnetical²²: and this is not only to be considered in this case but also in many other instances.

*Another instance. if you calcine vitriol in the sun in the dog-days, it will certainly become a sympathetical²³ powder, then if you bring some of the blood of any wound upon a warm linen cloth , provided also you keep the blood warm, and sprinkle some of this sympathetical powder upon the blood, and apply it instantly to the wound, it will infallibly heal it, though never so deep: and this is not only true in this case but also in **nimio menstruorum***

[54]

effluvio²⁴, as Mr Boyle testifies

Sulphur Soporiferum Vitrioli.

Take 4 ounces of vitriol, dissolve it in a proportionable quantity of warm water 4 to 1 (which rule is not only to be observed in this case but also in most others) then consider thoroughly the nature of bodies, and you will find that in this operation the active is the water, because it dilutes the salt, so that any active body must be always quadruple to the passive, and though it is true that 2 ounces of aqua fortis will dissolve an ounce of silver, yet it does not destroy this maxim, because though it is not the same in quantity, yet it is in quality, which is to be considered, as we shall have occasion to talk hereafter.

Observation: that this is really sulphur which is separated by the precipitation,

²² Obsolete for: Designating a medicine or treatment making use of the lodestone or of magnetic properties (real or assumed). OED 1989².

²³ Old for: pertaining to, involving, depending on, acting or effected by 'sympathy', or a (real or supposed) affinity, correspondence, or occult influence; OED 1989².

²⁴ = in excessive menstrual bleeding.

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*from the saline particles of the vitriol is plainly demonstrated, not only by this experiment, but also in making gas sulphuris, which by the smell manifests itsself, as also in the fermentation of oil of vitriol and oil of turpentine, which mixture causes a violent ebullition with a white fume, which we call **flamma densa** to distinguish it from **flamma rarefacta**, as we see in other experiments. That sulphur is in vitriol is manifest by this, if you take oil of vitriol, and grind it with antimony, and distil it in a retort, you shall have in the neck a plain solid brimstone nothing different from the common; now though this last experiment does in a manner prove the sulphur in oil of vitriol, yet it is to be considered, whether this sulphur be produced from the vitriol or from the antimony, because it is plain that antimony abounds with*

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a great quantity of sulphur as well as vitriol, and therefore this experiment cannot truly be demonstrated.

Regulus Metallorum

Take 3 ounces of regulus antimonii martiati, 1 of copper, 1 of block tin, and 1 of filings of iron, melt all this together in a crucible, and stir it well with a pipe, then take it of the fire, and let it cool: this is called regulus metallorum, because it is a composition of all imperfect metals, except lead, because only silver and gold are reckoned perfect, though according to the opinion of several authors gold is only perfect, because as they reckon men only to be perfect animals, so they reckon gold the only perfect metal, and as they reckon women to be imperfect animals, so they hold silver to be an imperfect

[57]

metal: the rest of metals are called imperfect, because nature cannot make them otherwise, as we observe that iron by having too much earth in it hinders nature in bringing it to greater perfection, too much sulphur in copper is the occasion of its imperfection, too much mercury in lead, too much arsenic in blocktin, of which pewter is made by mixing it with lead, without mixing it, it could not be made, because it is so brittle. The regulus of antimony in this composition is necessary for this reason, because its sulphur is necessary in this regulus, otherwise you could not destroy the metal of it, i.e.: you could not cause it to be no longer a metal; and that is the reason, why this regulus metallorum is so frangible.

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Tictura Metallorum

Take 1 part of this regulus well pulverised, and 4 parts of saltpetre very well powdered also, mix them together, and put them in a crucible ready hot upon a melting furnace by little and little, then let your matter melt, and keep it melting for an hour, or till your matter has a deep green colour, then pour your matter into a warm mortar and keep stirring it till it becomes a powder, put one part of this powder in a matrass, and six parts of alcohol vini, digest it till your menstruum be fully impregnated with the sulphur of the metals, which you will perceive by the deepness of the red tincture, 8 drops of which tincture taken in a proper vehicle is very good in restoring the natural ferment of the body.

Observation: as the regulus is necessary to demetallize the rest of the metals, so its

[59]

sulphur on the account of the tincture is of great moment; we added saltpetre afterwards, because we know that salts open the metals sooner than anything else, otherwise they would not afford us any tincture, and this is demonstrably true, as we see by its changing the colour of the metals. In this tincture it has been objected, that it is not the product of the sulphur of the metals, but of the salt nitre, because it is observed that salt being diluted in alcohol vini by long digestion produces a red tincture, as it is also observed that alcohol vini digested with saltpetre produces a red tincture, but we know by experience, that tinctures made of salts being put in water lose their colour, which this metallic tincture does not, because it has its colour from the sulphur. It is no great wonder that antimony demetallizes metals, because it is an effect of the great quantity

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of sulphur, wherewith the antimony does abound of which truth we have given several demonstrations. Besides we do observe that common sulphur produces the like effect.

Instance. A red hot piece of iron put in a mass of brimstone will become a powder, and this sulphur is the reason why in mines the metals are destroyed to prevent which inconvenience they who work in mines, that abound with too much brimstone, heat their mineral stone to separate the sulphur, before they melt their mineral; and this operation they call toasting.

Oil of Vegetables

Take rosemary or sage or any other plant or seeds of which you design to make oil, as much as you please, and put them in vesicâ cupreâ dry, or else they will produce no oil, fill half of your cucurbita with water, and add to it an handful of salt and distil it according to the common method, you will have a limpid

[61]

oil swimming upon the surface of the water, which you must separate, and keep for use.

Observation: we put common salt in this distillation, because as it is diluted in water it makes the water penetrate the plant more freely, and so facilitates the separation of the oil: we make use always of dry plants, because the plants being deprived of their natural moisture this menstruum penetrates the pores and so separates the oil more easily; this method is general in the extraction of all vegetable oils, and oils are nothing else but liquid resins of vegetables. All vegetable oils so distilled are liquid and transparent, and consequently they swim upon the surface of the water, except that of cinnamon, which always sinks, and is neither so transparent nor so light as others, because there

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are great many saline particles intermingled, that render it less volatile, as we observe that the taste of the cinnamon is much better than the smell, and as we observe in those bodies whose oil is very volatile, their smell is more grateful than their taste, as in white lilies, jasmines, violets, and the like. That the oil of cinnamon abounds with an acrimonious salt is manifest by the following experiment, if you distil it in a copper alembic, as we directed you to do the others before, the oil becomes green, because the acrimonious salt of the cinnamon acting upon the copper does impregnate it self with the sulphur of the copper, which not only gives it that colour, but from which also it receives its nauseous taste; therefore this oil we always make per retortum²⁵,

[63]

and not with the help of water, as we do the rest, but by this method, take half a pound of good cinnamon, and bruise it well, put it in your retort, add to it a gallon of sack²⁶,

²⁵ = by refining in a retort.

²⁶ A general name for a class of white wines formerly imported from Spain and the Canaries; OED 1989².

and half a pint of good rosewater, then distil away 3 pints, and so you will have the oil at the bottom of the aqua cinnamomi: we add to it rosewater in the distillation, because nothing is so agreeable as rosewater and cinnamon; this rosewater is not limpid, but of a wheyish colour, because it is not spirituous enough to support the oily particles which are mixed in it, as it happens when you make your distillation with brandy instead of sack and rosewater, but then you will find this great inconvenience, that when you taste this last, the oil of cinnamon is not so pleasant, as it was in the former method, and this error is not only

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observed in this case, but also in all distillations of this nature. From vegetables also oils are drawn per distillationem descensoriam, i.e. fill your capitellum caecum with wood, and then secure it from falling down with a small grate of iron, then make a fire of charcoal in the refrigeratory, and so the oil will fall down into the lower vessels, but these oils are empyreumatic and viscous and of very little use in physick; by this method in Norway they make tar out of firewood, and it has formerly been used by chemists also in making oil of boxwood, but this was when they understood no better, yet it is very serviceable in shipping. There is another method also of making oils of some parts of vegetables.

Instance. Oil of almonds and the like which is made by beating in a stone-mortar the fruits, and then squeezing them in a press; and this is called oleum per

[65]

expressionem; mechanics use the same method in oil of walnuts, and the like; but to press out a greater quantity of these oils, they powder their fruits, and heat them upon a slow fire, and keep stirring them for fear of an empyreuma, then they put them in a strong cloth, and press them whilst hot, and so they get a greater quantity of oil: it is observed that bitter almonds do not produce a bitter oil, though it does produce strong smell, because it carries bitter particles with it that ascend, but are not so fixed as to be perceived by the taste, though some authors have been pleased to affirm to the contrary; farther we observe that after the pressing of the oil, what remains is more bitter than the almonds themselves, and the smell stronger than the oil; if we heat again this matter after the oil is pressed, as before, and put a spoonful or two of water

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in the bottom of the copper-vessel, and keep stirring it with a spatula, then if we put 2 or 3 spoonfuls more of water in the bottom, and so press it again, we shall have more oil, which second oil does not keep so as the first, because the moisture causes it to become rancid: that which we call essence of jessamines²⁷ in reality is nothing else but oil of sweet almonds, which is made after this method, take almonds and scald them in hot water, and skin them, then dry your almonds thoroughly in a stove, so that they may rattle, and then make a stratum super stratum, change all your jasmines every 12th hour exactly for a week or longer if you have jasmines enough, then beat your almonds, and express the oil, which being so expressed is called essential jessamini, and this is the same with that of Genoa, and we must observe

[67]

that jasmines as well as lilies of the valley by distillation produce no sort of smell at all in any method whatsoever. Distillation per descensum is also used in some flowers by the help of glasses, exposing the upper parts, wherein the flowers are contained, to the heat of the sun, and placing the lower parts in a box full of salt, because that coolness condenses the vapours, which the sun has rarefied in the upper parts. Vegetables produce but a small quantity of oil, which makes it wonderful to see how cheap it is sold, but our modern chemists have another method of preparing it, by putting into the alembic oil of turpentine before distillations, which oil rises in the distillations and carries with it some of the smell and some of the virtue; but this last is to be rejected, and easy to be discovered by rubbing a little of it upon your hand, because what is aromatic

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will easily exhale, and the smell of the turpentine will remain.

Flores Salis Armoniaci Chalybeati

Take half an ounce of sal armoniack, 3 of filings of iron, beat them together, put them into a matrass with a short neck, and make your sublimation gradually, or after the same manner as above mentioned, the most volatile part of sal armoniack will sublime impregnated with the sulphur of the iron, which we perceive by the yellow colour and vitriolic taste which is in it; besides if you put some of these flowers in the tincture of tea of gall, they will change it into a black liquor, for this reason, if you beat your materia

²⁷ = essence of jasmine. "jessamin" is further on replaced with "jasmine", the modern spelling of the word.

sublimate with a caput mortuum, and resublime that, every time that you repeat your sublimation your flowers will be more impregnated with the metallick sulphur; these flowers are made use of in all obstructions, and are

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also stomachical. If when you melt silver you put some of these flores upon it, they will make it of the colour of gold, which is an effect of the sulphur martis: some instead of iron make this sublimation with the colcothar vitrioli, i.e. vitriolum ad rubidinem calcinatum²⁸, and these flowers are called by Mr Boyle ens veneris; its true that these flowers are impregnated with the metallic sulphur for the same reason as before, but we observe that these flowers put in spiritus salis armoniaci do not change the liquor to a blue colour, as all the preparations do that abound with copper mixed with any alkaline menstruum, as we observe in water made with quicklime and sal armoniack, that being put in a copper vessel it will become caerule²⁹; this liquor evaporated and

[70]

crystallized will produce a blue vitriol like that which is brought from Hungary, and will produce the very same effects, because if you dissolve the one as well as the other in water, and put iron into this water, which is not greasy, it will separate the copper from the salt magnetically, as we observe that all metals do attract one another magnetically, as copper does silver when diluted, quicksilver diluted gold, loadstone iron, so that their bodies are not inanimate, but have their motions and effluvias as other animals in their own sphere: if you can soil your blue vitriol, and with sal armoniack make your ens

veneris, your spirit of sal: armoniack will turn blue, as a certain sign, that the sal armoniack is impregnated with the sulphur veneris; but the effects are contrary if you make

[71]

this sublimation with the caput mortuum after your distillation of verdigrease³⁰, which is nothing else but the rust of copper, by the help of which you make your spiritus veneris, which spirit some authors call alkahest, i.e. a general dissolvent, though it does not really answer the true alkahest of Paracelsus, whereby he pretended to reduce all bodies in aqua elementata, this caput mortuum and sal armoniack making a

²⁸ = vitriol calcined to redness.

²⁹ A poetical equivalent of cerulean: Of the colour of the cloudless sky, pure deep blue, azure. OED 1989².

³⁰ = verdigris.

sublimation the flores will be much more impregnated with the sulphur veneris than by any other metal. If you put filings of copper in a small glass bottle and fill it up with spiritus salis

armoniaci, stopping it close, and 3 days after if you open your bottle though the liquor has received no alteration in its colour, yet so soon as you open it, it will turn

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blue at the top, and so by little and little till it be all of a blue colour, when it is so blue if you stop it again, it will begin to lose its colour upon the superficies, and so to the bottom, then if you unstop it again, it will again receive a blue colour beginning first at the top, and this we do observe, that when the liquor loses its colour, there appears in the bottom a small crystal, and when it recovers its colour, the crystal disappears, and the crystal which gives that precipitates to the bottom, and so vice versa.

Sal ad Calculum

Take 4 ounces of common salt, and 2 of quicklime, powder them both together, and put them in a crucible, and in a quick-furnace melt them together, then put the matter in a hot mortar, and let it cool, then powder it, and put it in

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a glass bottle well stopped, and keep it for use. This salt is the invention of Basil Valentine, and by him is recommended to be good for the stone and gravel, from whence it receives its denomination.

Regulus Antimonii Medicinalis

Take 5 parts of antimony powdered, 4 of common salt, and 1 of salt tartar all this well powdered and mixed together put in a red hot crucible, and continue your fire till the matter is thoroughly melted, then pour it out of the crucible into a hot mortar, and when the matter is cool separate the scoria from the regulus, then take your regulus and pulverize it into an alcohol, and put into a basin and pour warm water upon it, stirring it, in order to separate the saline particles that remain by lotions, and when by recantations and

[74]

repeated lotions you have dulcified this powder, dry it and preserve it close for use. This is the same powder that Dr Needham called panacea antimonii, it is used in

*tertians*³¹, or in all constitutions which are apt to be feverish, tending to *hectics*³² with good success.

Observation: in this experiment it is to be observed how common salt acts upon the sulphur of metals frigendo and attrahendo, whereas common salt is reckoned by all authors to be a neutrum, i.e. an equal proportion of acid and alkali, which is as much as to say, that the acid which is an active principle has thoroughly impregnated the passive alkali, which is the opinion of all authors. Objection. If it be really so, it is objected, how it comes to pass that common salt absorbs the acid metallic sulphur; it is true that in this experiment

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we added the alkaline salt tartar which will absorb the sulphur, and so intermingle with the common salt, and we may probably conjecture that the smell and taste of the scoria may be produced by the attraction of the salt tartar without any help of the common salt.

Answer. To which objection we may answer that common salt absorbs the metallic sulphur without any additional help. As for instance, if you melt common salt in an iron ladle, it will be strongly impregnated with it without the help of any alkaline body, and so it will answer in the ladle of any metal, wherein salt can be melted, except gold; this experiment must be narrowly considered, because it is not only for mere speculation, but also of great use.

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Spirit, oil, Volatile Salt of Vipers

Take as great a quantity, as you please, of vipers dried, cut them small, and put them in a retort, but let not the vipers fill above half of the retort, place it in a proper furnace luting a proper receiver to it, and put it in a proportionable calotte, heat them with a slow fire which you must gradually augment till the vapours ascend; then continue the same heat till your distillation is almost over, and when you perceive the vapours to come heavy in the receiver, i.e. when they rise thick and go to the bottom, then augment your fire to the extremity (which word extremity is to be considered in this as well as other experiments) that is as long as the body will bear it; for when the

³¹ Short for *tertian ague* or fever, characterized by the occurrence of a paroxysm every third (i.e. every alternate) day; OED 1989².

³² Applied to that kind of fever which accompanies consumption or other wasting diseases, and is attended with flushed cheeks and hot dry skin; OED 1989².

operation is ended, no more vapours will ascend. It is a certain rule in distillations to consider the nature of the bodies which you distil, without which rule it is impossible you should

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ever graduate your fire as it should be, notwithstanding all rules given by authors. All parts of animals when dried, by distillation will produce a volatile salt, oil and spirit: it is necessary your matter should be dried, otherwise the phlegma will produce a very fetid liquor, which is inseparable. there is no other distinction in the distilling of animals than by graduating the fire, as in this supposition, hartshorn will require a great deal more [spirit C:C: ol and Sal Volatile eadem modo parantur³³ note on the left margin] heat than blood. The volatile salts in this distillation will stick to the sides of the receiver, and the oil will swim upon the spirit, though some part of it will sink, because being the last that was distilled it is consequently the heavier, because it is more empyreumatic, being intermingled with some igneous particles. A separation of the oil from the spirit is to be made

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by filtration, and then with that spirit wash your volatile salt from the sides of the receiver, then put all into a clean new retort (excepting the oil) and place it upon a furnace luting to it a receiver, and with a very gentle heat first your volatile salt will ascend, then your spirit, and by so doing you will separate the phlegma and the ethereal oil which the spirit carried with it, when it was filtrated, which remains at the bottom; and this is called rectification and is to be observed in all volatile alkalis, and though the distillations require a strong fire to separate the volatile parts from the terrestrial, yet in the rectifications, when they are once entangled by the first distillations, they easily rise in the rectifications, and the phlegma

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which rises in the first distillations, in these rectifications, lies at the bottom of the retort, because it is heavier. The volatile spirit of all parts of animals is nothing else but a proportion of phlegma impregnated with the volatile salts, but fixed salts cannot be drawn from animals, it is true there is a way of fixing volatile salts, but it destroys rather than improves the body. The skins of animals as well as hair produce volatile salts as well as oil; but this last is more fetid than any other parts of animals. Some make no

³³ Spirit of harts horn (Cornu Cervi), oil and volatile salt are to be prepared in the same manner.

distinction in the nature of volatile alkalis of different sorts of animals: concerning which we shall have occasion to speak cursorily in other distillations.

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Oleum Terebinth.

Fill one third of a retort with Venice turpentine, and in a plain furnace place your calotte, and so place your retort luting a proportionable receiver to it, then by a slow fire distil 2 thirds of the quantity of spirit and oil, both which will ascend in confused vapours, then let all your matter cool, and take the receiver from the retort, and separate the spirit from the oil according to the method abovementioned, and when they are so separated, preserve them both for use.

Observation: the spirit of turpentine is nothing else but a phlegma impregnated with the volatile and subacid salt of turpentine, and so it is called a spirit to distinguish it from bare phlegma, the oil is nothing but the most volatile part

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of the turpentine attenuated by the fire in the distillation: the caput mortuum being deprived of its most volatile parts remains in a hard substance at the bottom, which is transparent; this resinous massa when it cools cracks in several little figures, as all resinous bodies will do in cooling after they have been liquefied, and this is the reason why some imagine that they see the figure of the leaves of the tree that produces the turpentine, as when they distil vipers, they would have us believe that they see the figure of the vipers in the sal volatile adhering to the sides of the receiver, so when they distil harts horn, they believe that it crystallizes in the form of a stag's horn; though this is not really true yet different volatile salts certainly differ in the position/configuration of parts

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as may be seen by a microscope, as the qualities also are different, and it is a great piece of ignorance to suppose as some do that all volatile salts are of the same nature, which opinion brings us into infinite errors; not only in this particular but also in infinite others, because we observe that the volatile salt of cantharides³⁴ is a great deal more acrimonious than that of ants, because it blisters more; but that of hartshorn not at all; so we consider the nature of bodies by their different effects, yet all these are volatile

³⁴ The pharmacopoeial name of the dried beetle *Cantharis vesicatoria* or Spanish Fly. It was used externally as a rubefacient and vesicant, internally as a diuretic and stimulant to the genito-urinary organs, etc. It was formerly considered an aphrodisiac. OED 1989².

salts, and all of an urinous smell. It is to be observed in the distillation of turpentine, honey, wax, butter and the like, that we ought to fill but one third of the

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retort, because these pingueous³⁵ bodies are apt to fume, and rise up to the top of the receiver without separation; to remedy this inconvenience of the ancients many make use of a squuma [?] ferri, which being light swims upon the top of the bituminous matter, and when the bubbles rise it breaks them, and so hinders them from overflowing into the receiver, others make use of sand; but all this is needless, because if you consider the nature of the body that you distil, and keep your fire accordingly, you may prevent all this inconvenience, which otherwise you will unavoidably meet with. Oil of turpentine is also made out of resin in a vesica cuprea with the help of water, as we did the oil of vegetables, which oil is very useful not only in physick, but also in mechanics; but this

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inconvenience we observe that what remains in the alembic is sold to the apothecary and passes for pix burgundiae, which they use in emplasters, unguents and the like, but it is to be considered that this resinous body, when deprived of its active spirit by the distillation, is of little or no virtue, and consequently you may suppose the compositions of which this is an ingredient to be less effectual than is to be expected.

Tartarū Vitriolatū

Take oleum tartari per deliquium, or salt tartar diluted in water, filtrate either of the two, to separate it from the terrestrious³⁶ parts, and then the liquor will be limpid, pour upon this liquor oleum vitrioli, and a fermentation

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will follow, because the acid particles of the vitriol acting upon the vacuous alkaline parts of the salt cause a violent ebullition, which is the reason of the calefaction of the liquor, you ought to pour your acid till your alkali be perfectly impregnated, which you may perceive after the cessation of the ebullition; then dry it by exhalations either to a crystal or a powder.

³⁵ From "pinguious": of the nature of fat; fatty, oily; OED 1989².

³⁶ Obsolete for having the nature of earth; earthy; OED 1989².

Observation: if you take oil of tartar per deliquium instead of salt tartar diluted in water, it will be better, because we observe the fermentation to be more violent, besides it does precipitate in fine transparent crystals, but the dissolution of salt tartar will never crystallize. Now the reason why oleum tartari per deliquium always crystallizes, is to

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be attributed to the nitrous aerial particles, which it attracts, and they are the cause of the dissolution, which being volatile crystallizes and so consequently aliquo modo volatilises this fixed alkali, which water cannot crystallize, and a crystallization of fixed salt is the beginning of volatilization. This mixture is more easily done than conceived, but the saturation of the alkali must be truly perfect, otherwise it will signify nothing, and though authors give no other rule than this, viz. to continue the dropping of oil of vitriol till the fermentation ceases, yet it is not to be understood mechanically, because the fermentation never ceases till the acid be predominant; if the acid predominates it cannot be

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tartarum vitriolatum, i.e. sal tartari oleo vitrioli imbut³⁷, if the alkali be imbutū, it will have a bitter taste, but if you pour never so little acid more than necessary, it will become sour, if too little, then the alkali will predominate; so that the intention is really to make a neutrum. When it is a true mixture, it is a very good stomachic, and experience tells us it is a true remedy in all convulsive vomits, and it is observed that when you mix it with any purgative though never so strong and violent it never gripes, as gum of gambouch³⁸, jalap³⁹, and the like. It is a wonder that Tachenius Suavius, Porcius &c. should tell us that oleum vitrioli poured upon alkaline salt will regenerate into vitriol, seeing it has

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no smell, taste, or any other vitriolic quality, or that spirit of common salt and salt tartar should make common salt, which is false; only they bring you this in their book upon the foundation of the regeneration of nitre, but this is the fault of all authors to bring all things to their hypotheses though never so false, as may be farther seen in the regeneration of nitre.

³⁷ Imbutus = soaked, wetted, dipped (from lat. imbuere).

³⁸ = gamboges.

³⁹ The Mexican climbing plant *Exogonium Purga*, with salver-shaped purplish flowers. The term is also applied to some allied plants yielding a similar drug. The purgative drug is obtained from the tuberous roots. The active principle is the resin contained in the tubers. OED 1989².

Spirit and volatile Salt of Sal Ammoniack

Take a pound of sal ammoniack and a pound of salt tartar, powder them very well singly and mix them, and then put them into a retort, put water to them about 6 or 8 ounces as you design to have more or less spirits, because (as we have said in the like cases) alkaline spirits are nothing

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but a phlegma impregnated with the volatile salt, so that if you add 6 ounces of water, you will have more spirit and less volatile salt, if 8 vice versa, if you put in no water you will have no spirit but all volatile salt. Make your distillation with a very slow fire, and it is a rule to be observed in all volatile bodies, because they by reason of their volatility do easily ascend, but if your fire be too violent, the vapours will come with violence into the receiver, and so hazard both your glasses. In making this spirit of sal ammoniack we intermingle cloves, nutmegs, mace, orange and lemon peel, dried marum syriacum, or some other aromack ad arbitrium⁴⁰, but in this case instead of water,

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we put in spiritus vini rectificati, because water cannot impregnate it self so well with the oil of aromatics as spiritus vini rectificati: this spirit is called sal volatile oleosum et aromaticum; because the alkaline [*>Sal volatile oleosum vel aromaticum<* note on the left margin] spirit is impregnated with the aromatic oil; this was 1st invented by Dr Sylvius. Dr Willis instead of this aromatic used to add in this distillation succinum⁴¹, then it is called spiritus ammoniaci succineati, when galbanum⁴² is put in, it is called spiritus ammoniaci galbanati; but the 1st invention of the basis salis ammoniaci is Glauber's for before him no author ever so much as dreamt of it. After your

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spirituous volatile salt ceases to ascend, take of the receiver, and when the matter is cool, lute a new receiver, and you will have flores salis ammoniaci distinct from the volatile salt without any urinous smell, yet very fine, and to the taste very pungent, which is used in obstructions; and is a very good uretic by opening all obstructions. Spirit of sal ammoniack is made another way, viz. by putting 4 parts of quicklime to one of sal ammoniack, so mixing them together in a retort either with or without water, and then distilling them till not any vapours will ascend; and this last spirit is much stronger

⁴⁰ = at your judgement.

⁴¹ = amber.

⁴² A gum resin obtained from certain Persian species of *Ferula*, esp. from *F. galbaniflua* and *F. rubricaulis*. OED 1989².

than the former; and it is generally liked though it is not to be admitted in physick, because it is impregnated with the acrimonious salt of the lime (and that is the reason why it is so strong) which being of a corrosive

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nature will produce very dangerous effects, rather than administer any profit to any patient. Now the reason why not so much as a grain of volatile salt ascends in this distillation is because the parts are divided by the acrimonious salt of the lime, notwithstanding Lemery says to the contrary. All vegetable fixed alkaline salts will produce the same effects with salt armoniack as sal tartari in these distillations, though not so well, because no vegetable fixed alkali is so fixed as salt tartar and consequently salt tartar is more porous, because we observe that it is more attractive of the acid which is contained in the sal ammoniack, for sal ammoniack is nothing else but

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a composition of camel's urine, if made in Asia, of man urine if made in Europe, which urine being mixed with common salt and woodsoot⁴³ first evaporates it to the consistence of an extract, and then sublimes this matter into a materia salina, as we have it: now this sublimata massa of sal ammoniack consists of the volatile alkali of the urine, which is bound by the acid of the common salt, and that is the reason why sal ammoniack has no sort of smell, but as soon as it is mingled with the salt tartar, especially if diluted the acid of the common salt contained in the sal ammoniack acting upon the fixed alkali of the salt tartar lets loose the volatile alkali of the urine, which is perceived by the smell either before

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but especially after the distillation, as it is in this spirit and volatile salt and that spirit which is made of sal kali; whence the derivation of alkali first came, which is a sort of samphire⁴⁴ dry and burnt to ashes, whose ashes being very alkaline produce the same effect with salt tartar; the plant is called kali and the Arabic word for salt is al, so you see the composition of the word. This salt though it be an excellent alkali, yet in this distillation of sal ammoniack it is much inferior to salt tartar, because being mechanically done its sulphur is not absolutely fixed into an alkaline substance

⁴³ The soot of burnt wood, formerly recognized in the British Pharmacop^{oe}ia as *fuligo ligni*, and used in dyeing. OED 1989².

⁴⁴ The plant *Crithmum maritimum* (growing on rocks by the sea), the aromatic saline fleshy leaves of which are used in pickles. Also called *rock samphire* and as a name for various other maritime plants, esp. the glasswort (*Salicornia*). OED 1989².

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for we do observe, that in this distillation the ashes give the spirit a nauseous and sulphurous smell; as may be plainly perceived by any curious observer, though it is true that with the ashes of kali by a new calcinations, filtration, and evaporation ad siccitatem⁴⁵ you may make an alkaline salt not unlike salt tartar, which if you use in this distillation you will not have the former inconvenience, viz. the nauseous and sulphurous smell. Now though we cannot perceive any difference in the acting of these two salts in this experiment, yet that cannot persuade us that all fixed salts are of the same nature; but this point we shall experimentally explain in the fixed salt of vegetables. If you

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dissolve the caput mortuum of this distillation in warm water, provided that you put not so much heat as to raise the flores, as we have said before, and then if you filtrate the dissolution and evaporate it ad cuticulam, i.e. till there is a thin skin upon the superficies of the liquor, and afterwards place it in a cool cellar or any other cool place, the salt will be crystallized; then decant the liquor that is not crystallized, and by new evaporations it will crystallize and so repeat it till all your liquor be crystallized; this is a general rule in all crystallizations of salts. And so when the liquor has a thin

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cuticula upon its surface, it is a sign that the menstruum has a great deal more salt than it can naturally support, because the superficies, which is exposed to the air more than any other part notwithstanding it is in balneo-arena, does by the incrustation denote that the liquor is fully impregnated, for if you proceed in your evaporations it is impossible to make any crystallizations for want of a sufficient proportion of humidity; as we observe in the least negligence in a crystallization the crystals will be lesser or greater according to the quantity of moisture, and yet the crystals never alter their proper colour

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because the crystals of different bodies always keep their different configuration/position of parts; and there is no salt but will crystallize except salt tartar. This salt is reckoned diuretic, and all diuretics are more or less diaphoretic. There is also another method of making volatile salt of sal ammoniack, [>sal volatile salis

⁴⁵ = to dryness.

ammoniack< note on the left margin] viz. by mingling one pound of sal ammoniack with 3 pound of chalk both well powdered, and then by putting it in a retort and luting it as the former with a little more heat than in other distillations. You may distil almost a pound of sal volatile; and this last is the most common method, because it is cheap but it is the worst of

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all, because though strong when first made, yet it loses its strength very quickly, and nothing remains but a chalky substance which has volatilized in the time of the distillation, by the volatile part of the sal ammoniack, which is easy to be gathered by the quantity of salt, because sal ammoniack could not produce above half the quantity. If you take an ounce of the spirit of sal ammoniack made by the salt tartar as before, and put it in a glass, adding to it an equal quantity of alcohol vini, by a little agitation both liquors will coagulate, and will remain in the glass though it be turned upside down, if you drop upon this coagulum

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some spirit of nitre, it will immediately dissolve the coagulum into a liquid. This experiment makes Helmont think, that this urinous spirit when joined with vinous spirit by congealing causes the gravel: spiritus nitri will dissolve this coagulum, and so the spirit nitri dulcis is a sovereign remedy in the stone. The dulcification of spiritus nitri as well as all other acid spirits is ordered for two reasons, the one is to dilute the acrimonious salts, and the other to attenuate and volatilize them, and so becomes useful when taken inwardly, and it is dulcified by this method, viz. by mingling four parts of alcohol vini, and one of the acid spirit together in a retort,

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and luting to it a proper receiver, and by a gentle heat the spirit will ascend dulcified; sometimes for the better performance of this dulcification we put the liquor distilled into the same retort again, and so distil 2 or 3 times more, and this proceeding is called cohobation.

Sal Volatile Oleosum extemperaneum⁴⁶

Take half an ounce of salt tartar and powder it very well, drop upon it a scruple of the oil of cloves, or any other aromatic oil either per se or mixed (this is according to the

⁴⁶ Extemporaneous = made for the occasion, hastily erected or prepared; of a medicine: needing to be prepared at the time of prescription as opposed to officinal. OED 1989².

pleasure of him that makes it) then stir it very well till the oil is thoroughly incorporated with the alkaline salt, then take 4 ounces of alcohol vini and incorporate it little by little with the salt, and keep it continually stirring it, by this means your menstruum

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will be impregnated with the aromatic oil, afterwards take 3 ounces of the spirit of sal ammoniack and mix it; this method answers all others of preparing this sal volatile oleosum, by distillation, and it is really believed in Holland that this was the true way that Dr. Sylvius used in preparing it. Sugar will divide per minimas the oleous body of salt tartar, and then you must dissolve your sugar in spiritus vini rectificati, and your oil will aromatize your menstruum, and this (I think) is a better way; because the alcohol with the spirit of sal ammoniack will coagulate, except the spirit of sal ammoniack be over diluted in phlegma, and so being rendered too weak, will not answer the intended effect,

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but if you add sugar you may put in your spirit of sal ammoniack as strong as you please without the fear of any inconvenience. This method of adding sugar is also used to communicate the aromatic oil to juleps⁴⁷.

Rosin⁴⁸ of Jalap

Take as much as you please of the powder of jalap root, put it in a matrass and with spiritus vini rectificati make your tincture per digestionem, decant your tincture when your matter is cool then filtrate it, afterwards with more spiritus vini rectificati make a second tincture upon the same body, and so a third, because as long as the root affords any tincture, it is a sign there is more resin, more or less according to the deepness of the tincture; put all the three tinctures together, and evaporate two thirds lento igne, so you take away a great part of

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the volatile spirits which supported the resin; pour the remainder after the evaporation into a basin of water, and the resin will precipitate, because after the evaporation there

⁴⁷ A sweet drink prepared in different ways; often, simply a liquid sweetened with syrup or sugar, and used as a vehicle for medicine; sometimes, a medicated drink used as a demulcent, 'comforting', or gently stimulating mixture. OED 1989².

⁴⁸ = resin, in the following replaced with 'resin'.

is not spirit enough to support the resin, and if there be any it is diluted in the water; so consequently all the resin precipitates.

Observation: the first tincture of jalap poured into water will become of a milky substance, which colour is produced from nothing else but the resinous particles of the jalap which being divided per minimas albescunt⁴⁹; an effect of all oleous bodies in aqueous liquors. Resin in reality is nothing else but solid oil of vegetables, as oil is really nothing but liquid resin rarefied by

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distillation, which rarefactions are made by the igneous particles that insinuated themselves into the pores of the resin and so separated its parts, as in the case of oil of camphor: these small accidents which happen by the fires working upon bodies have been a subject much talked of both by ancients and moderns, and whether these extracts such as common oil &c. were in the bodies before or after the operation of fire upon them; some argue and by experiments prove that they are really in the bodies before, others absolutely to the contrary, which 2 extremes of opinions proceed from want of due consideration of the nature of bodies and giving reasonable allowances, because we observe that nihil dat quod non habet⁵⁰; and we likewise observe that resins have

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the same qualities more or less as the root or that body which they came from, as purging, vomiting, &c. We say more or less, because resinous bodies in separating do lose a great deal of saline particles which remain diluted in the water, which being separated from the resin make it less efficacious in its operations, and this is the reason why the powder of jalap from which they extract the resin is much stronger than the resin extracted, because the powder does not only contain resinous but also saline particles, which saline particles affect the intestines more than the resinous, because nature brings the superfluous humours to the parts affected by the salts; so when it vellicates⁵¹ the stomach, it is vomitive, if the

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guts, it is purgative: this teaches us that purgatives and vomitives are praeternatural, and what good effects they produce in human bodies are merely accidental, just as if

⁴⁹ = turn white.

⁵⁰ = "He gives nothing who has nothing".

⁵¹ In old medical use with reference to the action of medicaments, sharp or acrid substances, etc. on the tissues of the body. OED 1989².

you put a grain of salt in the eye, it will water, and by this accident discharges the humours of the eye; and this is the reason of that celebrated question amongst the moderns (which the ancients did never question) whether a particular purge be requisite for such or such particular humour, it is true that the jalap root as well as resin is an excellent medicine in the dropsy, because it makes a great evacuation of the humour, but it is not supposed to proceed from any anti=hydropical⁵² quality of the jalap but from the acrimony of the salts which vellicando purge more or less: it is true also that rhubarb purges and purgando colours the

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excrements yellow, and this is the reason why ancients said that rhubarb purged the choler⁵³, and some went so far in this opinion as not only to endeavour to prove it from the colour of the excrements, but also from the colour of the rhubarb per similitudinem to the gall, as mechocan⁵⁴, and turpeth⁵⁵, which as well as jalap are good in the dropsy, and these the ancients did not only guess at by their effects, but by their colour also, because being white they purge the lymphatic humours: all these bodies abound with resin, which may be separated as we separate the resin of jalap. There is another method of separating resin from vegetables, as when they make labdanum Dioscorides by drying the plant jarra, and boiling it in a cauldron full of water, and so scumming of the resin which will

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swim upon the surface of the water, and then drying the resin, and this is that labdanum Dioscorides; but what is commonly sold by druggists and apothecaries is not that true labdanum Dioscorides which has a flavour like a rose, for it has none at all, but is full of impurity. We draw resinous gums also from vegetables after another method, from fennel by incision, either natural, that is when it swells and bursts of it self, or by a knife, this plant in hot countries in the months of July and August being full of succus swells the stock, and so breaks it, and produces a resin transparent like turpentine, which dries by the heat of the sun into a white gum, except on the superficies which is reddish, and this we observe that the hotter the countries are the

⁵² Hydropical = dropsical, which means pertaining to or of the nature of dropsy, but it also stands for being charged or swollen with water; OED 1989².

⁵³ = bile.

⁵⁴ The whitish tuberous root of a kind of morning glory, *Ipomoea macrorhiza* (*I. jalapa*), native to Mexico and the southern United States, which was formerly much used in medicine as a purgative; Also called *white jalap*. OED 1989².

⁵⁵ In this context it is more likely to stand for the root of East Indian jalap, *Ipomoea Turpethum*, an Indian and Australian plant (the drug of which has cathartic properties).

vegetables are more resinous; so the wine we have from the Canaries was produced from a plant which came

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from the Rhine, and the wine which comes from the Canaries is much more oleous than that which we have from the Rhine, and this difference is an effect of the heat.

Gas Sulphuris

Take a pound of roche-alum, i.e. crystallized alum, and one fourth of a pound of sulphur, powder them both together and mingle them, put all this matter in a retort, and place it in a calotte, and lute a receiver to it, and with a moderate heat you will draw of a spirit which is called gas sulphuris from it; continue the distillation till flowers arise and no vapours ascend, then let your matter cool, take out your spirit and preserve it very close in a glass bottle, because the gas is very volatile.

Observation: in this distillation you must observe that your retort must not be above

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one third full, because when the alum melts in the distillation it rises, and if it has not room enough it will break the retort; the phlegma of the alum is a proper vehicle to carry the gas into the receiver, otherwise the gas could not be gathered by reason of its volatility, as we observe that mechanics, when they make gas sulphuris to preserve their wine or vessels, burn brimstone matches in the vessels almost empty that only have a little quantity of water in them; after the matches are lighted within the vessels they stop up the buny[?]=holes, and the gas goes to the sides of the vessels, and after falls down into the water, they repeat this till the water is impregnated as much as can be, and then they mix this water with the wine (3 gallons to a hogshead) to preserve it from any

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alteration. there is another gas sulphuris made by the sulphur contained in the oil of vitriol (which is as strong as the former) by the addition of 3 parts of alcohol to 1 of the oil, so distil it, and by repeating the distillation you will raise the sulphur from the oil of vitriol, and this is a farther proof, that there is sulphur in the oil of vitriol. There are sulphurous vapours that naturally exhale in some part of the kingdom of Naples, particularly in that place, which is called the dogs=grotto that is so much talked of by all travellers, because if you put a dog in it, and it be kept there too long it will certainly expire, but if, when he begins to be convulsive, you take him out, and cast him into any

water, he will recover, after the same manner as may be seen in gas sulphuris: the reason

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why it offends dogs more than men proceeds from the smallness of the parts of the gas sulphuris, because we observe that when men go in this grotto as long as they stand they are not offended at all, because when these vapours rise up above a yard, they lose their effects, and because we observe that the nearer any animal is to the ground, the more this place is offensive to it, and therefore a low dog is sooner suffocated in it than a higher; these vapours will not only affect dogs but also all animals: it is called the dogs=cave, because travellers for want of other animals make experiments upon dogs: all this is effected by subterraneous heats, for we perceive this ground to be very hot, and the gas heats a man's legs whilst he

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stands in the grotto, which effect it does not produce in any other part of the body. What here in England is called damp in coal pits are nothing else but sulphurous gas, and the flames which appear on the moors in the night time are nothing else but sulphurous vapours, because gas signifies nothing else but a blast or vapour.

Distillation of Tobacco

Fill a retort half full of tobacco, and place it upon a calotte with a proportionable receiver luted to it, and distil it till no vapours ascend, and it will produce an oil and a spirit that is phlegmatic, which may be separated according to the common method, and so kept for use.

Observation: this method of making fetid oil of vegetables is not only peculiar in tobacco but in all sorts of vegetables. In this distillation of tobacco we do observe that sometimes

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there is produced a great quantity of volatile salt; but because this seldom happens it is supposed to proceed from the urine which is mixed sometimes with tobacco to moisten it, and not from the tobacco it self, otherwise if it was the nature of tobacco, it would succeed always; it is true that volatile salt may be drawn from all plants, but it is such a small quantity in proportion of the great quantity of the phlegma, which the plant produces though dry, that it is diluted in the phlegma which is almost inseparable from it by rectification. This only method is left us of gathering the volatile salt of plants, first

by keeping your fire so gentle that only the pure alcohol may ascend, and then increasing it gradually the volatile salt and oil will follow; the phlegma rises sooner because the volatile salt and oil are more fixed than the phlegma, but as soon as they are

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separated, they become more volatile, for we observe that in the rectification of all spirits the volatile salts ascend first, and the phlegma remains at the bottom, and so consequently it is more heavy. We observe farther in this distillation, that one sort of tobacco produces more or less oil than another, and that tobacco which produces the most oil, its oil is most efficacious, as we observe that that tobacco which is brought from the Isle of St. Anne does give a cat convulsions, but not kill her, some other tobacco you may give her and recover her with spirit of sal ammoniack, but there is some sort of tobacco that will irrecoverably kill her: in this experiment you must consider that the 3 different distillations be perfectly done, otherwise you may deceive yourself; this is an error daily to be seen in chemistry for want of due caution

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not only in this but also in all other experiments. It is no great wonder that this oil has such violent effects upon animals, which effects do not happen when we smoke because when smoked the oil is more rarefied, but in the distillation it is more dense, and so consequently it must cause different effects; as we observe that a drop of the oil of vegetables is abundantly stronger than the vegetables themselves.

De Magisterio

Powder in a mortar coral, pearls, Crabs eyes, or oyster shells, or anything of the same nature of which you intend to make magisterium, put it in a matrass, and cover it 3 fingers with the spirit of vinegar, digest it in balneoarenae, and shake it now and then to hasten the dissolution, and when the matter is cool, filtrate it, then pour upon this dissolution oil of tartar per deliquium; mix all this matter well together

[118]

and it will become turbid, which is a sign of a separation of the magistery from the acid menstruum, and so continue to pour on more of the oil of tartar per deliquium gradually till all the coral precipitates, but this must be done with due consideration and time; it is impossible to know when the coral is perfectly separated but by these following signs, the 1st is by the thickness of the mud and quantity of the settlements, the second is by

the limpidness of the liquor after the settlement of your coral, then you must decant your liquor, and pour upon it more oil of tartar per deliquium, and if you see it no more muddy, it is a certain sign that your coral is perfectly separated from the acid menstruum. Upon this precipitated powder you must pour warmwater, and by repeated lotions separate all that is salinum from the magisterium, then dry your powder either

[119]

upon sand or by the heat of the sun according to the season of the year.

Observation: magistery in reality is nothing else but an alcoholization of the coral, or other testaceous⁵⁶ alkalis, per menstrum, because that word alcohol is not only to be understood of fine spirit but also of impalpable powders, i.e. a body reduced into as small parts as it is capable of being divided into. This magistery has been very much applauded by the ancients, and more virtue has been attributed to it than the body really deserves, because as far as we can discover all testaceous alkalis act upon the acid humours in human bodies, but when the testaceous alkalis are turned into magistery having been once saturated with the acid menstruum wherein they have been dissolved they are rendered incapable of absorbing any more any

[120]

acid humours, as we may see by the following experiment, if you drop some acid upon this magistery, it does not cause any ebullition, which is a sufficient proof that it is saturated before: it is true that by lotions we separate both the alkaline and acid saline particles from the magistery, but this is only a superficial separation, and does not separate the salts enclosed in the pores of the magistery. This experiment of magistery is more instructive than useful in physick, notwithstanding the great harrangue that former authors have made in commendation of it; which is not to be wondered at seeing they were the first inventors of it; and were pleased with their own inventions. It is plain that all testaceous bodies are alkalis, because any acid will dissolve and support them invisibly,

[121]

and so oleum tartari per deliquium or any other alkaline fixed salts being acted upon by the acid menstruum, the menstruum must of necessity lose what it supported before. Those words testaceous alkalis are much misrepresented by modern authors, for they

⁵⁶ Having a shell, esp. a hard, calcareous, unarticulated shell, or being of the nature or substance of shells; shelly; consisting of a shell or shelly material. OED 1989².

suppose all testaceous bodies to be of the same nature, an error not only insufferable in this case, because it is notoriously false, but also because it will bring you into a thousand inconveniences. To make crabs eyes because testaceous to be of the same nature with pearls, and pearls with eggshells, and eggshell the same with coral, is very absurd, which proceeds from the want of the knowledge if the materia medica, and of the nature of bodies. Instance. Pearls calcine easily, and eggshells not in 44 hours time, and yet they are called equally testaceous. We observe in

[122]

oyster shells, though in the number of testaceous bodies, there is a noble salt distinct from the testaceous nature, which is a great corroborative to human bodies, as may be perceived by scraping gently with a knife the whitest part of the inside of an oyster shell which is pretty soft, and in time it will harden to that consistence, which is called an oyster pearl being solid and transparent; which salt is not to be found in eggshells, and so vice versa, eggshells have qualities that oyster shells have not.

[The note by E.S. Peck:]

FRIARSWOOD,
LONGROAD,
CAMBRIDGE.
TEL. TRUMPINGTON 294.

10.10.38

My dear President

I am enclosing a manuscript of notes taken by a student of Prof Vigani's lectures in 1707.

In order that it may have a safe, permanent & appropriate home I should be glad if Queens' College would accept it.

Yours sincerely

E. Saville Peck

MS Quns Vig. 1 – MS Quns Vig. 18

Transcriptions

MS Quns Vig. 1

31.2 cm x 19.4 cm, ink on paper, no watermark

Digital images: 2788, 2789

Proposalls

To all curious persons who are desirous to subscribe /for a Collection of English Insects. Viz:

That a Collection of English Insects containing 50 sorts of /Butterflyes, 150 sorts of moths, 150 sorts of Libellae, flyes /& bees, 150 sorts of Beetles, Hexapodes & grasse-hoppers /fairely taken & curiously preserved being all perfect. In /Number 500. Shall be delivered into the hands of Each subscriber /in time & manner following Viz:

Each subscriber paying down ten shillings at the time of sub /Scription. One half of the Collection shall be delivered /into his hands by the the [sic!] 1st of December next he paying /down 45 shillings at the time of the delivery there of. And /the other half shall be delivered by the 1st of December /in the year 1705 or sooner if possible Life & health /permitting the subscriber paying down at the delivery there /of 45 shillings more which in all will amount to five pounds /for a Collection which I dare venture to say will not be /obtained [ft] near so Easy a rate any other way.

Now If the collection fall short of it compleat Number /of 500 sorts (which I mention rather to shew the fairenesse /of my Intentions then from any distrust that it will.

I promise to discount 6 pence per Each Butterflye wanting to /Compleat their Numbers & 2 pence a peice for every one /of any other sorts wanting to Compleat their respective /Numbers which is as much as I account you for any in the whole Collection.

Now That you shall have all the sucurity you shall in reason /desire both for your mon-eyes deposited & for the perform= /ance of Articles

Now That an Essay having been made in this affaire will /be Exposed to the view of those who are desirous to sub= /scribe at Mr Edward Baker's an Apothecary at the /Signe of the Green Dragon in fore street near great /Moorgate att all times of the Day untill the 1st of Aprill /& Subscriptions taken in after which time there will /no attendance

be given nor subscription taken. By [reap] /the Greatnesse of the Undertaking will not allow the Author /longer time so to do

/Now Those who subscribe not will not obtain the Like /Collections at so low a price.

Nor doth the undertaker intend very many of them: the /Spring of his Undertaking being more his own satisfac= /tion then the Lucre of Money: designing no more then the making himself Easy under the Same

Received of Mr Vegany feb: the 23 1703/4 the sum /Of ten shillings as an Earnest to these proposals /& in part of payment which I have Engaged in /Wittnesse my hand

Edward Baker

MS Quns Vig. 2

31 cm x 38.5 cm, ink on paper, watermark

Digital images: 2786, 2787

[recto:]

M^r Vigani

London March 7th 1703

I have heare Sent you an account of the Goods Sent /to Cambridge. I am

Your Servant

Fran Porter

<i>fine Aloes 2oz</i>	00	00	08
<i>Stibium 2oz</i>	00	00	04
<i>Aq Aurantiarum 8oz</i>	00	00	06
<i>I[fewe]s Ears 2oz</i>	00	00	05
<i>Arsenicum Rub 2oz</i>	00	00	04
<i>Bals Capivi 2oz</i>	00	01	00
<i>Judaicum 2oz</i>	00	06	00
<i>Peru 2oz</i>	00	03	04
<i>Tolu 2oz</i>	00	03	00
<i>Borax 2oz</i>	00	00	08 ⁺
<i>fine bole 2oz</i>	00	00	02
<i>Sigill Lemnia 2oz</i>	00	00	04
<i>Cantharides 2oz</i>	00	02	00
<i>Lap Nephreticus 7dram</i>	00	03	06
<i>Natt: Cinnabor 2oz</i>	00	02	00
<i>A Rinoscerotos Horne</i>	01	10	00
<i>Cortix granatorum 2oz</i>	00	00	02
<i>A Load Stone</i>	01	10	00
<i>Cortix guaiaci 2oz</i>	00	00	02
<i>Cortix peru 2oz</i>	00	02	00
<i>Cortix Essulae 2oz</i>	00	00	06
<i>Cortix Winteranea 2oz</i>	00	00	02
<i>Coculus Indiae 2oz</i>	00	00	06
<i>Colloquintida 2oz</i>	00	00	10
<i>Dept Creet 1oz</i>	00	00	03
<i>Senna Alix 2oz</i>	00	00	07
<i>Grains 2oz</i>	00	00	02
<i>Amoniacum 1[lb]^[1]</i>	00	03	04 ⁺
<i>Benzonium opt 2oz</i>	00	00	08
<i>Liquid Labdanum 9oz½</i>	00	09	06
<i>Styrax Collat 4oz</i>	00	04	08

¹ The notation is unclear.

<i>Styrax 2oz</i>	00	00	08
<i>Opoponax 2oz</i>	00	02	00
<i>Sagapenum 2oz</i>	00	00	06
<i>Tacamahacca opt 5oz^{3/4}</i>	00	08	07½
<i>Bezoar Orientale 3dram½ 5grain</i>	00	17	11
<i>Lap Calliminarus 2oz</i>	00	00	02
<i>Lap Contyerva 1oz</i>	00	03	00
<i>Lap de Goa 1oz in 2 Stones</i>	00	15	00
<i>£ 07:15:07½</i>	07	15	07½

[verso:]

<i>per Contra</i>	07	15	07½
<i>Lap Iudaicus 2oz</i>	00	01	00
<i>Lap Hybernicae 2oz</i>	00	00	02
<i>Lap Tutiae 2oz</i>	00	00	08
<i>Lig Alloes opt 2oz</i>	00	05	00 ⁺
<i>Fine Orientall pearls 4dram</i>	00	10	00
<i>Ditto 2^{d[2]}½oz</i>	00	05	00
<i>Scotchpearls 1oz</i>	00	02	00
<i>La: Manna 2oz</i>	00	01	06 ⁺
<i>Musk ½oz</i>	00	14	00
<i>Civite ½oz</i>	01	03	00
<i>Crabs Eys 2oz</i>	00	00	08
<i>Ol Annysi 2oz 3shilling Mirab Eloms ad 2oz</i>	00	04	03
<i>Ol Laurini 2oz</i>	00	00	04
<i>Ol Macis per [pox]^[3] 2oz</i>	00	02	08
<i>Burg pitch 2oz</i>	00	00	01
<i>Rad Cass: Mumiae 2oz</i>	00	01	06
<i>Sperma Ceti 2oz</i>	00	02	00
<i>Scamony 2oz</i>	00	03	00
<i>Succus Kermis 2oz</i>	00	00	10
<i>Lig Collabrinum 2oz</i>	00	01	00
<i>Palme Oyl 2oz</i>	00	00	03
<i>Box 10 pence Small boxes 3 shilling</i>	00	03	10
<i>precipitate 2oz</i>	00	01	04
<i>160x^[4] by Math: Lancashire</i>			
<i>£ 11:19:08½</i>	11	19	08½
<i>Lap Lazulae 3oz</i>	00	03	00
<i>Balme gil 2oz</i>	00	06	00

² Probably oriental pearls of second, i.e. minor, quality.³ The abbreviation stands most likely for 'per expressionem'.⁴ The meaning of this notation is unknown.

<i>Ol Annysi 2oz</i>	00	03	00
<i>Aq Naphae 8oz</i>	00	00	06
<i>Balsam Peru 2oz</i>	00	03	04
<i>Ol Palmae 2oz</i>	00	00	03
<i>Balsam Capevae 2oz</i>	00	01	00
<i>Succ Kermes 2oz</i>	00	00	10
<i>St Storax 2oz</i>	00	02	04
<i>Musk 2dram</i>	00	07	00
<i>Civett 2dram</i>	00	11	06
<i>Ol Laurinum 2oz 4 pence box & glass 20 pence</i>	00	02	04
<i>£ 02 00 09</i>	02	00	09

[on the opposite side only stands:] *For*

MS Quns Vig. 3

6.5 cm x 15.8 cm, ink on paper, no watermark

Digital images: 2793, 2794

[recto:]

March. 14th. 1703/4. Sr

Pray pay upon sight hereof to Mr /Vigani or order the summ of twenty /pounds & place it to account.

Poley Clopton

To Mr Purvar or his /Cash-keeper at the black- /Bull in Bishop-gate Street.

[verso:]

J. Fran Vigani,^[5] of mr Ed: parver /Red:^[6] the 16 of nov 1704 the sum of twenty /poundes for mr vigain per mr Tho: Hiccox

⁵ Vigani's signature is in a light brown ink. This signature does not appear to be part of the message.

⁶ Abbreviation for 'received'.

MS Quns Vig. 4

38.5 cm x 31.3 cm, ink on paper, watermark

2 sheets of paper, folded in half to make a booklet of 8 pages

Digital images: 2801, 2802, 2803, 2804

The digital images show each one side of the 2 sheets

[folio 1, recto :]

S^r

*According to M^r Vigani's Order I here /Send you A Bill of Parcels of those /things he
Boght of me for you. my /most humble Service to yourself tho: /unknown concludes*

S^r

London Your very humble Servant

April the 11th: 1704 Hen: Colchester

[folio 1, verso:]

M^r: John: Franc: Viganni:

London Feb 18: 1703/4

*Bought of Hen: Colchester: Druggist at the /Maiden-head in Cheapside near Bow
Church /For the Honourable M^r Clapton Proctor of the University /and Fellow at
/Queens Colledge /in Cambridge*

<i>1oz Ol Garioph 3 shilling Glass 1 pence</i>	<i>0</i>	<i>3</i>	<i>1</i>
<i>1oz --- Cinamomi 6 shilling Glas 1 pence</i>	<i>0</i>	<i>6</i>	<i>1</i>
<i>1oz --- Annisi 16 pence Glas 1 pence</i>	<i>0</i>	<i>1</i>	<i>5</i>
<i>2oz --- Palme 2 pence per oz pott 1 pence</i>	<i>0</i>	<i>0</i>	<i>5</i>
<i>1oz --- Laurinum 2 pence pott 1 pence</i>	<i>0</i>	<i>0</i>	<i>3</i>
<i>2oz --- Petrol Alb 3 pence per oz Glass 1 pence</i>	<i>0</i>	<i>0</i>	<i>7</i>
<i>2oz ----- Nigri 3 pence per oz Glass 1 pence</i>	<i>0</i>	<i>0</i>	<i>7</i>
<i>2oz Tolum Mont 4 pence per oz</i>	<i>0</i>	<i>0</i>	<i>8</i>
<i>2oz Scammoneum opt 18 pence per oz</i>	<i>0</i>	<i>3</i>	<i>0</i>
<i>1oz Sperm Ceti 12 pence</i>	<i>0</i>	<i>1</i>	<i>0</i>
<i>2oz Com Tereb 2 pence pott 1 pence</i>	<i>0</i>	<i>0</i>	<i>3</i>
<i>2oz Coffe Raw 6 pence all</i>	<i>0</i>	<i>0</i>	<i>6</i>
<i>2oz Cocoa-nutts 6 pence</i>	<i>0</i>	<i>0</i>	<i>6</i>
<i>1oz Spickenard 18 pence</i>	<i>0</i>	<i>1</i>	<i>6</i>
<i>3oz½ Cetick nard 4 pence per oz</i>	<i>0</i>	<i>1</i>	<i>2</i>
<i>2oz Ceruss 2 pence</i>	<i>0</i>	<i>0</i>	<i>2</i>
<i>2oz Minium 1pence</i>	<i>0</i>	<i>0</i>	<i>1</i>

No 4 Mater Perlarum	0	1	0
3oz Cinabor offactic 2 shilling all	0	2	0
2oz Perle barley 2 pence	0	0	2
2oz Ichthycolla opt 1 shilling	0	1	0
2oz [pp] ^[7] Ras 3 pence box 2 pence	0	0	5
2oz Cetarck 4 pence	0	0	4
2oz Camypyths 2 pence	0	0	2
2oz Tereb venetiae 2 pence pott 1 pence	0	0	3
2oz Ditto 2 pence pott 1 pence	0	0	3
2oz ---- Strass 4 pence pott 1 pence	0	0	5
1oz ---- Cypria 6 pence pott 1 pence	0	0	7
1oz ---- E. Chio 12 pence pott 1 pence	0	1	1
2oz Lign Aloes 6 pence per oz	0	1	0
3oz ----- Asphalt 4 pence per oz	0	1	0
2oz ----- Guaicum 1 pence	0	0	1
2oz ----- Junip 6 pence	0	0	6
2oz ----- Lentis 6 pence	0	0	6
2oz ----- Rhodum 4 pence	0	0	4
2oz ----- Sant Alb 6 pence	0	0	6
2oz ----- Citri 4 pence	0	0	4
2oz ----- Rub 3 pence	0	0	3
9oz Sasaphras 6 pence	0	0	6
1dram Amber-greese 10 shilling	0	10	0
2oz Sagoe 2 pence	0	0	3
2oz Ol Tereb 2 pence Gl 1 pence	0	0	3
1oz Fol Ros R 9 pence	0	0	9
1 Fine Sponge 12 pence	0	1	0
2oz Epythem 6 pence	0	0	6
Carried over £	2	6	8

[folio 2, recto:]

2oz Sem Acet	0	0	4
1oz ----- Agn: Castor	0	0	3
2oz ----- Altheae	0	0	4
2oz ----- Ameos	0	0	6
1½oz --- Amomi	0	0	6
1oz ----- Anethi	0	0	2
1oz ----- Angell	0	0	2
1oz ----- Annisi	0	0	2
1oz ----- Apii	0	0	2
2oz ----- Alexand	0	0	6
1oz ----- Asparagi	0	0	3

⁷ The meaning of the symbol similar to two ,p's could not be identified.

2oz ----- <i>Bardan</i>	0	0	4
1oz ----- <i>Basilici</i>	0	0	3
1½oz ---- <i>Bombacis</i>	0	0	4
2oz ----- <i>Cardam major</i>	0	1	0
1½oz ----- <i>minor</i>	0	0	3
1oz ----- <i>Cardui ben</i>	0	0	3
2oz ----- <i>Carthami</i>	0	0	6
2oz ----- <i>Carui</i>	0	0	2
2oz ----- <i>Catapucill</i>	0	2	0
2oz ----- <i>Cichorae</i>	0	0	4
1oz ----- <i>Citri</i>	0	0	6
1oz ----- <i>Citrulli</i>	0	0	3
2oz ----- <i>Cochleare</i>	0	0	4
2oz ----- <i>Collocynth</i>	0	0	4
1oz ----- <i>Coriand</i>	0	0	1
1oz ----- <i>Cucumer</i>	0	0	3
1oz ----- <i>Cucurb</i>	0	0	3
1oz ----- <i>Cydon</i>	0	1	6
1oz ----- <i>Cymin 2 pence</i>	0	0	2
1oz ----- <i>Dauci com</i>	0	0	2
½oz ----- <i>crett</i>	0	0	6
1oz ----- <i>Ebulae</i>	0	0	3
2oz ----- <i>Endiviae</i>	0	0	4
2oz ----- <i>Erucae</i>	0	0	4
1oz ----- <i>Faen Dulc</i>	0	0	3
2oz ----- <i>com</i>	0	0	2
2oz ----- <i>fenugr</i>	0	0	2
2oz ----- <i>Genisthae</i>	0	0	4
2oz ----- <i>Hiociami</i>	0	0	4
No4 <i>Vinellows</i>	0	2	0
<i>Summe brought over is</i>	2	6	8
<i>Carried over</i>	3	3	11
£			

[folio 2, verso:]

<i>Summe Brought over</i>	3	3	11
1oz <i>Sem: Lactusae</i>	0	0	3
1oz ----- <i>Levist</i>	0	0	3
2oz ----- <i>Limon</i>	0	0	6
2oz ----- <i>Linni</i>	0	0	3
2oz ----- <i>Lupini</i>	0	0	3
2oz ----- <i>Mosch</i>	0	0	6
2oz ----- <i>Macalep</i>	0	0	6
1oz ----- <i>Melon</i>	0	0	3

2oz ----- Milii folis	0	0	3
2oz ----- Napii Dulc	0	0	4
2oz ----- Nasturt	0	0	4
2oz ----- Nig: Rom	0	0	6
2oz ----- Pap: Alb	0	0	4
1oz ----- Nigr	0	0	4
2oz ----- Petros com	0	0	4
1½oz ----- Maced	0	1	6
2oz ----- Plantagm	0	0	4
2oz ----- Paeoniae	0	0	6
1oz ----- Paeponum	0	0	3
2oz ----- Portulac	0	0	6
2oz ----- Psillii	0	0	4
2oz ----- Rutae	0	0	6
1½oz ----- Santon	0	1	0
1oz ----- Saxifragi	0	0	6
1oz ----- Sesileos	0	0	4
2oz ----- Sinapies	0	0	3
1oz ----- Staves-ager	0	0	3
1oz ----- Sumach	0	0	4
2oz ----- Thlaspios	0	0	4
2oz ----- Urtice	0	0	4
2oz Sal Petre Refined	0	0	4
2oz ----- unrefined	0	0	3
1oz Sang Dracon opt	0	1	0
1oz ----- 2 ^d	0	0	6
1oz ----- Herci	0	1	0
No3 Scinci Marum: Box 2 pence	0	4	8
No4 Ven Vipers 3 English Ditto: Box 2 pence	0	7	2
1oz Serecuum Crud	0	1	0
1oz Succ Accatiae	0	0	6
1oz ----- Hyposistid	0	0	6
4oz ----- Sulph Vivum	0	0	4
4oz Talc Com	0	0	6
2oz ----- Venet	0	1	0
2oz ----- Tamarin: & pott	0	0	3
2oz Tart Alb:	0	0	2
	4	15	6
£			

Carried Over

[folio 3, recto:]

Brought: Over:	4	15	6
2oz Terra Sigill: Rub	0	0	4

2oz ----- Alb	0	0	4
4oz ----- Japon	0	1	0
1oz Visc : querc	0	0	4
1oz Vit Alb	0	0	1
2oz ---- Rom	0	0	6
1oz ---- Virid	0	0	2
2oz Rad Acori	0	0	4
2oz ----- Azari	0	0	4
2oz ----- Serp Virg	0	1	0
2oz ----- Scorzoner	0	0	6
2oz ----- Callam Arom	0	0	2
2oz ----- Mei Atham	0	0	8
2oz ----- Anchusae	0	0	8
2oz ----- China nod	0	0	6
2oz ----- Jallop	0	0	8
2oz ----- Gallangall	0	0	4
2oz ----- Turpethi	0	0	8
2oz ----- Chinae Meuley	0	0	6
2oz ----- Contrayerv	0	1	0
2oz ----- Zodoarie	0	0	6
2oz ----- Hormodaets	0	0	6
2oz ----- Costus Dulc	0	2	0
2oz ----- Rhaponnek	0	1	0
2oz ----- Arist Long	0	0	4
2oz ----- Rotund	0	0	4
2oz ----- Rhabarb	0	10	0
2oz ----- polipody	0	0	3
2oz ----- Torment	0	0	2
2oz ----- Bistort	0	0	2
2oz ----- Erulae camp	0	0	2
2oz ----- Pirethri	0	0	4
2oz ----- Cipri Rot	0	0	4
2oz ----- Mecoacan	0	0	6
2oz ----- Behen Alb	0	1	0
2oz ----- Rubr	0	1	0
2oz ----- Curcum	0	0	2
2oz ----- Rub Tintor	0	0	3
2oz ----- Ellebor alb	0	0	2
2oz ----- Irid flor	0	0	2
No1 ----- Scillae	0	1	0
2oz ----- Gentian	0	0	2
2oz ----- Angell Hysp	0	0	2
2oz ----- Hippocoanne	0	8	0
2oz ----- Casmunor	0	2	0
Carried over	6	16	3
£			

[folio 3, verso:]

<i>Brought Over</i>	6	16	3
<i>2oz Rad Eringi</i>	0	0	2
<i>2oz ----- Dict Alb</i>	0	0	8
<i>7oz ----- Elleb Nig</i>	0	0	7
<i>2oz ----- Sarsap</i>	0	1	0
<i>2oz ----- phu</i>	0	0	8
<i>8½oz --- Agarick</i>	0	4	3
<i>2oz ----- Cypr tong</i>	0	0	2
<i>4oz Antimony crud</i>	0	2	0
<i>2oz Squinanth</i>	0	2	0
<i>4oz Aloes Succotr</i>	0	2	0
<i>4oz Ars Alb</i>	0	0	3
<i>4oz ----- Citr</i>	0	0	3
<i>1¾oz Cass: Russiae at 5 shilling per oz</i>	0	8	9
<i>4oz Cin: Nativae</i>	0	6	0
<i>4oz Corall Rub</i>	0	2	0
<i>4 oz ----- Alb</i>	0	1	0
<i>2oz Ditto</i>	0	0	6
<i>2oz Gum Ammon</i>	0	0	8
<i>2oz ----- Arob</i>	0	0	3
<i>2oz ----- Annimi</i>	0	1	0
<i>2oz ----- Assafaetid</i>	0	1	0
<i>2oz ----- Carannae</i>	0	5	0
<i>2oz ----- Copall</i>	0	1	0
<i>2oz ----- Bdelium</i>	0	1	0
<i>4oz ----- Benzoin</i>	0	2	0
<i>2oz ----- Elemi</i>	0	1	0
<i>2oz ----- Guaici</i>	0	2	0
<i>2oz ----- Galban</i>	0	0	8
<i>2oz ----- Euphorb</i>	0	0	4
<i>2oz ----- Haedaerae</i>	0	2	0
<i>2oz ----- Juniper</i>	0	0	4
<i>2oz ----- Lacc</i>	0	0	6
<i>2oz ----- Labdanum</i>	0	0	4
<i>2oz ----- Shellack</i>	0	0	6
<i>2oz ----- Mastich</i>	0	1	0
<i>2oz ----- Myrrh</i>	0	0	9
<i>2oz ----- Olibanum</i>	0	0	6
<i>2oz ----- Oppoponax</i>	0	1	0
<i>2oz ----- Sagapenum</i>	0	1	0
<i>2oz ----- Sarcocoll</i>	0	2	0
<i>2oz ----- Storax Callam</i>	0	0	8
<i>2oz ----- Liq^d:</i>	0	0	7
<i>2oz ----- Senega</i>	0	0	2
<i>2oz ----- Taccemehac</i>	0	0	8
<i>2oz ----- Dragon</i>	0	0	6

2oz Lap Amethist		0	4	0
6dram Or Bezoar at 50 shilling per oz		1	17	6
4oz 3dram ----- Occid		2	0	0
5oz Callaminar Lap		0	0	4
Carried over	£	13	10	9

[folio 4, recto:]

Brought over		13	18	9
2oz Lap Gogat		0	2	0
2oz ----- Granats		0	3	0
2oz ----- Hematit		0	0	4
2oz ----- Hyacynths		0	5	0
4oz ----- Hybern		0	0	2
2oz ----- Judaicus		0	2	0
5oz ----- Lazuli at 2 shilling per oz		0	10	0
2oz ----- Lincis		0	1	0
2oz ----- Magnesis		0	2	0
2oz ----- Sapphire		0	3	0
2oz ----- Neph		0	3	0
2oz ----- Polished		0	10	0
2oz ----- Rubin		0	3	0
2oz ----- Smaragd		0	3	0
2oz ----- Tophas		0	3	0
2oz ----- Tutiae		0	1	0
2oz ----- Spongiae		0	2	0
No1 ----- Larg Aetitis		0	5	0
No2 Nutts perserved at 16 pence Each pott 1 pence		0	2	9
2oz Lap Dental		0	2	0
2oz ----- Ostiochla		0	1	0
2oz ----- Chrystiall		0	1	0
2oz Allum Plumos		0	1	0
2oz ----- Roach		0	0	2
1oz Succ: Alb		0	1	0
2oz ----- Citr		0	0	6
2oz Amygd Amar		0	0	2
2oz ----- Valent:		0	0	2
No2 Boxes		0	2	0
4oz Arg Vivum and glass		0	1	9
1oz Aur: Jud		0	0	3
4oz Ars Rubr.		0	0	3
1oz Bacc Alkengi		0	0	6
1oz ----- Lauri		0	0	1
1oz ----- Myrtill		0	0	3
1oz ----- Chermes		0	0	6
1oz Bals peru 18 pence glass 1 pence		0	1	7
1 oz ----- Capivae and glass		0	0	7
5¼oz ----- Tolu at 18 pence per oz		0	7	10½
1oz ----- Judaic at 4 shilling per oz glass 1 pence		0	4	1

1oz Bol Armen	0	0	2	
1oz Camphor	0	0	6	
1oz Catharides	0	1	0	
No1 Cass: fist Cane	0	0	3	
2oz 5dram Castor No[A]	0	2	0	
1oz Cochineale	0	2	4	
Carried over	£	18	12	11½

[folio 4, verso:]

<i>Brought over</i>	18	12	11½
<i>1oz Cort Capper</i>	0	0	3
<i>1oz Cassia Lignea</i>	0	0	4
<i>1oz [p]or^[8] Citri</i>	0	1	0
<i>1oz ----- Erulae</i>	0	0	6
<i>1oz ----- Granot</i>	0	0	1
<i>1oz ----- Guaici</i>	0	0	1
<i>2oz ----- Peru opt</i>	0	3	0
<i>2oz ----- Tamarind</i>	0	0	1
<i>2oz ----- Winter</i>	0	0	2
<i>1oz Cucebs</i>	0	0	3
<i>1oz Cuscutae</i>	0	0	2
<i>1oz Chel Cancror</i>	0	0	1
<i>1oz Cicer Rubr</i>	0	0	2
<i>1oz ----- Alb</i>	0	0	1
<i>1oz Collocynth</i>	0	0	6
<i>1oz Coccul Indie</i>	0	0	6
<i>2oz Dates</i>	0	0	4
<i>1oz Balaustins</i>	0	0	4
<i>1oz Flor Cham</i>	0	0	2
<i>1oz ----- Origani</i>	0	0	3
<i>1oz ----- Stechados</i>	0	0	3
<i>1oz Fol Dict Cret</i>	0	0	6
<i>½oz ----- Malab</i>	0	0	6
<i>1oz ----- Senna Alex</i>	0	0	4
<i>1oz ----- Sal Donell</i>	0	0	2
<i>1oz ----- Gaules</i>	0	0	1
<i>1oz ----- Gutta Gambae</i>	0	0	4
<i>1oz Jujubes</i>	0	0	2
<i>½oz perles orient</i>	0	8	0
<i>1oz ----- Raggs</i>	0	2	6
<i>1oz Mirab beller</i>	0	0	3
<i>1oz ----- Chaebulae</i>	0	0	3
<i>1oz ----- Citri</i>	0	0	3

⁸ The symbol similar to a ,p' could not be identified.

1oz ----- <i>Embolae</i>	0	0	3
1oz ----- <i>Indiae</i>	0	0	3
1oz <i>Mummiae</i>	0	0	4
1oz <i>Nux Vomica</i>	0	0	3
1oz ----- <i>Cypress</i>	0	0	2
1oz <i>Occul Cancror</i>	0	0	4
1oz <i>Ol Mace per Exp^r</i>	0	2	0
1oz ----- <i>Liq^d and glas 1 pence</i>	0	2	1
1oz <i>Long Pepper</i>	0	0	3
2oz <i>Guinea Ditto</i>	0	0	4
2oz <i>Sal Ammon</i>	0	0	6
2oz <i>Sal Gem</i>	0	0	4
1oz <i>Succ in Flau 2 pence</i>	0	0	2
$\frac{1}{2}$ lb <i>Cotten 6 pence</i>	0	0	6
2oz <i>Sem Bombaci with Cotten 4 pence</i>	0	0	4
£	20	2	11½

MS Quns Vig. 5

19.5 cm x 16 cm, ink on paper, no watermark

Digital images: 2790, 2791

[recto:]

To

The Hon.^{ble} Poll Clapton

At Queens Colledge

Cambrige

[verso:]

Sr

*I was ordered by Mr Vegany to desire you to pay /me for those Glasses ec which I Sent
you down /per his Order who I suppose gave you account particularly /You may please
to order your Carrier or who you think /fitt to pay me giving me aline of Advice & /in so
Doing you'll oblige*

Your humble Servant

From the hour Glass in Cha: Clutterbuck

Newgatestreet 6 May 1704

A parcell Del At ----- £ 2:12:6

MS Quns Vig. 6

8.8 cm x 15.4 cm, ink on paper, watermark

Digital images: 2795, 2796

[recto:]

*Aug^t. 8th. 1704. Rec^d. there of Mr Clopton /Tenn pounds for a Cabinet for the use /of
Queen's College in Cambridge*

By mr John Austin

/

10.

[verso:]

July. 6th.^[9]

⁹ Ink smeared.

MS Quns Vig. 7

29.5 cm x 37 cm, ink on paper, watermark

Digital images: 2799, 2800

[recto, on the left:]

For m^r Francis Vigani

At Katharine Hall

In

Scriptha [written sideways]

Cambridge

[recto, on the right:]

M^r: Vigani

London xber^[10] 12th 1704

I have heare under written an account of the Goods Sent /by your Order to Cambridge.

I did formerly Send an /accoumpt of them thither which I perceive by /yours Miscarried.

I am

Your Oblidged Servant

Fran Porter

March 7th 1703

<i>fine Alloes 2oz</i>	<i>00</i>	<i>00</i>	<i>08</i>
<i>Stibium 2oz</i>	<i>00</i>	<i>00</i>	<i>04</i>
<i>Aq Aurantiarum 8oz</i>	<i>00</i>	<i>00</i>	<i>06</i>
<i>Iewes Eares 2oz</i>	<i>00</i>	<i>00</i>	<i>05</i>
<i>Red Arsenick 2oz</i>	<i>00</i>	<i>00</i>	<i>04</i>
<i>Balsam Capevae 2oz</i>	<i>00</i>	<i>01</i>	<i>00</i>
<i>Judaicum 2oz</i>	<i>00</i>	<i>06</i>	<i>00</i>
<i>Peru 2oz</i>	<i>00</i>	<i>03</i>	<i>04⁺</i>
<i>tolu 2oz</i>	<i>00</i>	<i>03</i>	<i>00</i>
<i>borax 2oz</i>	<i>00</i>	<i>00</i>	<i>08⁺</i>
<i>fine bole 2oz</i>	<i>00</i>	<i>00</i>	<i>02</i>
<i>terra Sigill Lem 2oz</i>	<i>00</i>	<i>00</i>	<i>04</i>
<i>Cantharides 2oz</i>	<i>00</i>	<i>02</i>	<i>00</i>
<i>Lap Nephret 7dram</i>	<i>00</i>	<i>03</i>	<i>06</i>
<i>Natt Cinober 2oz</i>	<i>00</i>	<i>02</i>	<i>00</i>

¹⁰ Probably a notation for 'December'.

<i>A rinossarus horn</i>	01	10	00
<i>Cort Granatorum 2oz</i>	00	00	02
<i>A Load Stone</i>	01	10	00
<i>Cort guaici 2oz</i>	00	00	02
<i>Peru 2oz</i>	00	02	00
<i>Essulae 2oz</i>	00	00	06
<i>Winter 2oz</i>	00	00	02
<i>Cocc India 2oz</i>	00	00	06
<i>Collocinth 2oz</i>	00	00	10
<i>Dep Cret 1oz</i>	00	00	03
<i>Senna Alix 2oz</i>	00	00	07
<i>Graynes 2oz</i>	00	00	02
<i>Amoniacum 1lb</i>	00	03	04 ⁺
<i>Fine benzamin 2oz</i>	00	00	08
<i>Liquid Labdanum 9oz½</i>	00	09	06
<i>St Storax 4oz in 2 potts</i>	00	04 ⁺²	08
<i>Storax 2oz</i>	00	00	08
<i>Opoponax 2oz</i>	00	02	00
<i>Sagapenum 2oz</i>	00	00	06
<i>taccamahacca a shell 5oz¾ at 18 pence per oz</i>	00	08	07½
<i>bezor Orient 3dram½ 5gr at 40 shilling per oz</i>	00	17	11
<i>Lap Callaminaris 2oz</i>	00	00	02
<i>Lap Contyer 1oz</i>	00	03	00
<i>Lap de Goa 1oz</i>	00	15	00
<i>Lap Iudaicus 2oz</i>	00	01	00
	07	16	07½

[verso, on the left:]

<i>per Contra</i>	07	16	07½
<i>Lap hibernia 2oz</i>	00	00	02
<i>Lap tutiae 2oz</i>	00	00	08
<i>Lig Alloes opt 2oz opt</i>	00	05 ⁺²	00
<i>fine Orient Pearles 4dram</i>	00	10	00
<i>ditto 2nd ½oz</i>	00	05	00
<i>Scotch Pearles 1oz</i>	00	02	00
<i>fine Large Manna 2oz</i>	00	01	06 ⁺
<i>precipitat 2oz</i>	00	01	04
<i>Mirabilons [om] [on] 2oz</i>	00	01	03
<i>Musk ½oz</i>	00	14	00
<i>Civett ½oz</i>	01	03	00
<i>Crabs Eyes 2oz</i>	00	00	08
<i>ol Annyse 2oz</i>	00	03	00
<i>ol bayes 2oz</i>	00	00	04

<i>ol Mace pexp^[11] 2oz</i>	00	02	08
<i>Burg Pitch 2oz</i>	00	00	01
<i>Rad Cassia Mumia 2oz</i>	00	01	06
<i>Sper Ceti 2oz</i>	00	02	00
<i>Scamony 2oz</i>	00	03	00
<i>Succus kermes 2oz</i>	00	00	10
<i>Lig Colubrinum 2oz</i>	00	01	00
<i>Palme Oyl 2oz</i>	00	00	03
<i>Box 10 pence Small boxes 3 shilling</i>	00	03	10
<i>£ 11 19 08½</i>	11	19	08½

March 10th 1703

<i>Lap Lazulae 2oz</i>	00	03	00
<i>Balme gil 2oz</i>	00	06	00
<i>Ol Annyse 2oz</i>	00	03	00
<i>Aq Napha 8oz</i>	00	00	06
<i>Balsam Peru 2oz</i>	00	03	04
<i>Ol Palme 2oz</i>	00	00	03
<i>Balsam Capevae 2oz</i>	00	01	00
<i>Succ Kermes 2oz</i>	00	00	10
<i>Storax Coll 2oz</i>	00	02	04
<i>Musk 2dram</i>	00	07	00
<i>Civett 2dram</i>	00	11	06
<i>ol Laurinum 2oz</i>	00	00	04
<i>Box and glasses 20 pence</i>	00	01	08
<i>£ 02 00 09</i>	02	00	09

11 19 08½

02 00 09

14:00:05½

[verso, on the right:]

M^r Vigani *London xber^[12] 12th 1704*

*To prevent any Mistake I have under written an account /Of what goods was Sent to
Newarke. Iam*

Your Oblidged Servend

Fran Porter.

¹¹ Most likely short for 'per expressionem'.

¹² Probably a notation for 'December'.

1703 *for Newarke*

<i>March</i>	<i>1 Aparcell</i>	<i>11</i>	<i>02</i>	<i>08</i>
	<i>8 crabs eyes pp^[13] 4oz</i>	<i>00</i>	<i>02</i>	<i>00</i>
	<i>10 Aparcell</i>	<i>01</i>	<i>05</i>	<i>06</i>
	<i>15 Jallop 4lb½ and box</i>	<i>01</i>	<i>00</i>	<i>07</i>
		<i>13</i>	<i>10</i>	<i>09</i>

14 00 05½

13 10 09

27:11:02½

¹³ The symbol similar to a ,pp' could not be identified.

MS Quns Vig. 8

28.8 cm x 36.5 cm, ink on paper, watermark

Digital images: 2784, 2785

[recto, on the right:]

*M^r The: Sherman
 aganst the 2 swans
 without olgate*

*For
 M^r Francis Vigani
 at Catherine Hall
 Cambridge*

[verso, on the right:]

M^r: Vigani

London January 16 1704

I sent you yesterday by M^r Martin Cambridge /Carrier as under written. I could not gett /Severall of the things viz black lead Spongia /C[?]nosb [Gum] fennell + Portingall Jar. I was /asked tenn shillings for a ball thats found in /a bullocks stomach. I do not know what Sort /of Raw Sack yarne you would have of & noe /good Span Saffron to be had. Soe sent none /but if you plese to send me a Sample of what Sort /of Silk you would have will procure it for you. /I had sent those things Sooner but could not gett /many of them. I Returned your bill back /by the Gentleman that brought it the hazzard & /& charges would be ~~difficult~~ considerable. /Your best was^[14] is to order your Correspon- dener /to Send it by a Safe hand & soe the party that /brings it to have a receite. Your freind /came in a Morneing & not a drinking time. /If he would have beene plesed to have come /at an evening should have beene glad to have /presented him with a glass of Wine. I am

Your obliged Servant

Fran Porter

¹⁴ Could also be read as 'way' instead of 'was'.

<i>China Ink 3 pieces</i>	00	01	06
<i>Opium 1oz</i>	00	00	08
<i>Mecoacan 1oz</i>	00	00	03
<i>W^t Myrrh 1oz</i>	00	00	04
<i>Red Myrrh 1oz</i>	00	00	04
<i>Pistaties 1lb</i>	00	02	04
<i>Tamerinds 2oz</i>	00	00	02
<i>Dantz Vitrioll picht 1oz</i>	00	00	01
<i>Stones found in bullocks galls n^o1</i>	00	03	00
<i>Manna Large 2oz</i>	00	01	06
<i>Barbados Alloes 2oz</i>	00	00	04
<i>Cattechaw perxp^[15] 1oz</i>	00	04	06
		4	
	00	14	06

[recto, on the left:]

<i>per Contra</i>	00	14	06
<i>Yall Alloes 2oz</i>	00	00	06
<i>Sang draconis 1oz</i>	00	00	09
<i>Red Tartor 1oz</i>	00	00	01
<i>Cr: Tartor 1oz</i>	00	00	01
<i>Muscovid glass 1 peice 3 pence</i>	00	00	03
<i>Bolognian Tartor 1oz</i>	00	00	01
<i>Tripolo Earth a peice</i>	00	00	02
<i>W^t Sanders 1oz</i>	00	00	03
<i>Yall Sanders 1oz</i>	00	00	02
<i>Red Sanders 1oz</i>	00	00	01
<i>Lig Rhodii 1 peice</i>	00	00	01
<i>Lig Nephriticum a peice</i>	00	01	00
<i>Lig Juniper a peice</i>	00	00	03
<i>Sericum Alb 1oz</i>	00	00	06
<i>Oss: de Corde: Cer 2oz</i>	00	03	00
<i>Succus Liquorit 2oz hi[s] 2oz</i>	00	00	04
<i>Succus Liquorit Angl 2oz</i>	00	00	02
<i>box</i>	00	00	06
£ 01 :02 :09	01	02	09

160x

¹⁵ Probably stands for ‚per expressionem‘.

MS Quns Vig. 9

16 cm x 19.5 cm, ink on paper, watermark

Digital image: 2783

6 Feb. 1704/5 y upon a rewiw of the bills it

appears dow to me for the materia Lib. sh. p.

medica, ~~to be dow~~ from Queens Coll. 51=07=4½

J. Fran: Vigani,

Poley Clopton

it his sewerall tings in the repositori /that it is nat in the bills besead mey /Charge to
London wick come to twenty /tow pound 3 shell receved bifer naw

Poley Clopton

MS Quns Vig. 10

21.5 cm x 18.2 cm, ink on paper, watermark

Digital images: 2797, 2798

[recto:]

For mr Fran: Vigani

In

Cambridge

[verso:]

Mr Vigani

London february 8th 1704

*I have received of your Carrier thirty one pounds /fourteene shallings & payed the Car-
ridge of it /he hath a Receite in full but the last parcell /Sent you the second of January
you have not taken /Notice of it which comes to twenty two shillings /9 pence. I desire
you to order it being you have sent /up the other Money I thought convenient to ~~have~~
/Receive it Not questioning but you forgot /the other parcell & that you will Order the
Money*

I am Your Oblidged Servand

Fran Porter

MS Quns Vig. 11

9 cm x 13.4 cm, ink on paper, no watermark

Digital image: 2792

<i>To Seignior Vigani.</i>	2.	3.	0
<i>Paid Purvar for the</i>			
<i>returne of £ 20</i>	0.	2.	0
<i>for the carriage of</i>			
<i>six boxes & a</i>			
<i>Basket of Glasses.</i>	0.	10.	6
<i>for 2 quires of gilt-</i>			
<i>paper & 05 of other</i>	<u>0.</u>	<u>7:</u>	<u>0</u>
<i>Paper.</i>	3.	2.	6.

*Feb. 9th. 1704. Received this three pounds two shillings /& six pence of the Master
Poley Clopton.*

MS Quns Vig. 12

Envelope: 10.7 cm x 13.7 cm, ink on paper, no watermark

Digital image: 2811 with key to the right of the envelope

L. T. Polts Esq.

Queens' College

Key of Prof. Vigani's

Materia Medica Chest

in Library

E.S.P.^[16]

¹⁶ E.S.P stands for E. Saville Peck.

MS Quns Vig. 13

Envelope: 9 cm x 15.2 cm, ink on paper, no watermark

Digital image: 2809

The envelope contains a newspaper cutting from Cambridge Daily News, 15. Feb 1933, '*Old-Time Cures. First Professor of Chemistry*'

[note on the envelope:]

Report of an address given by Mr. E. Saville /Peck on John Francis Vigani, the first Professor /of Chemistry in the University of Cambridge, & /on this, Prof. Vigani's cabinet of medical materials.

MS Quns Vig. 14

22.8 cm x 17.8 cm, ink on paper, watermark

Digital images: 2805, 2806

[recto:]

TEL: 2435.

25, BENTLEY ROAD,
CAMBRIDGE

3/6/37

Dear Mr Peck,

Thank you very much /indeed for your very interesting /account of Vigani. I return it with this letter. I have enjoyed /it thoroughly.

There is one little point. On /page 37 you mention "star slough" /as being "nostoc jelly". When I was /in Devon there was often a substance /found in Moors & waste places /called "star jelly" locally – I /think there were some letters once in /Nature about it. This stuff /was in fact the oviducts of /frogs which were carefully /set apart by birds (Heron) /before eating the animals. /The oviducts swell up because

[verso:]

of the jelly they secrete which normally coats /the eggs before laying. /I was wondering if "star slough" /were the same thing.

With many thanks

Yours very sincerely

Carl Pauten[?]

MS Quns Vig. 15

Ink on paper, no watermark

Digital image: 2583

*FRIARSWOOD,
LONG ROAD,
CAMBRIDGE.
TEL. TRUMPINGTON 294.*

10.10.38

My dear President

I am enclosing a manuscript of notes taken by a student of Prof Vigani's lectures in 1707.

In order that it may have a safe, permanent & appropriate home I should be glad if Queens' College would accept it.

Yours sincerely

E. Saville Peck

MS Quns Vig. 16

15.2 cm x 9.2 cm, ink on paper, no watermark

Digital image: 2810

This manuscript /was found at Stockton-on- /Tees on Dec. 31st. 1935 /by Dr. Salt of King's College.

It was later acquired /by Mr. E. Saville Peck /and presented to /Queens' College by /him on Oct. 15th. 1938

¹⁷ The name 'Seltman' was added in handwriting. The letter was probably forwarded to the Librarian of Queens' College at the time, Dr Seltman.

MS Quns Vig. 18

19.5 cm x 16 cm, printed address, ink on paper, watermark

Digital image: 2808

Tel.

SHELFORD 2233

LYNDHURST,

GREAT SHELFORD,

CAMBRIDGE.

20. vi. 52

Dear Dr Seltman,

I have pleasure in enclosing a copy of my paper on "Vigani". /You may perhaps recall giving me /permission to study the MS "Lectures", /for which I am most grateful.

Yours sincerely

LJM Coleby

√ 23. vi. 52

Bibliography

Manuscripts

British Museum

MS Sloane 2052

British Library

MS Add.22910

MS Add. 22911

MS Add.4276 (previously Birch MS 4276)

Cambridge, Queens' College Old Library

LECTURE-NOTES (undated). *Cours De Chymie. Joan : Francis : Vigani Veronens.*

Cambridge University Library

LECTURE-NOTES (1707). *Course of Chemistry under Signior Vigani Professor of Chemistry in the University of Cambridge at the Laboratory of Trin. Coll. November & December 1707.* Classmark Dd.12.53

Cambridge University Grace Book 0

Glasgow University Library

LECTURE-NOTES (1705). *Seignior Vigani's Course of Chymistry at CAMBRIDGE, Coll. Regin. die Novembr 19 1705.* Classmark MS Ferguson 62

Printed Sources

A.Z. (1760). *Remarks on Mr. Robert Dossie's Institutes of Experimental Chemistry in a Letter Addressed to the Authors of the Review, &c.* London, printed for S. Hooper.

ABRAHAM, LYNDY (2001). *A Dictionary of Alchemical Imagery.* Cambridge, Cambridge University Press.

AGLIONBY, WILLIAM (1719). *Choice Observations upon the Art of Painting. Together with Vasari's Lives Of the Most Eminent Painters from Cimabue to the Time of Raphael and Michael Angelo. With an Explanation of the Difficult Terms.* London, printed for R. King, at the Prince's-Arms in St. Paul's Church-Yard.

ALGAROTTI, FRANCESCO (1764a). *An Essay on Painting written in Italian by Count Algarotti F. R. S F.S.A.* London, printed for L. Davis and C. Reymers.

ALGAROTTI, FRANCESCO (1764b). *Saggio sopra la pittura. Essay on painting by Count Algarotti.* Glasgow.

ANONYMOUS (1652). *A Book of drawing, limning, washing or colouring of maps and prints, and the art of painting, with the names and mixtures of colours used by the picture-drawers, or, The young-mans time well spent.* London, Printed by M. Simmons for Thomas Jenner, and are to be sold at his shop.

ANONYMOUS (1668). *The excellency of the pen and pencil: exemplifying the uses of them in the most exquisite and mysterious arts of drawing, etching, engraving, limning, painting in oyl, washing of maps & pictures : also the way to cleanse any old painting, and to preserve the colours : collected from the writings of the ablest masters both ancient and modern, as Albert Durer, P. Lomantius, and divers others ; furnished with divers cuts in copper, being copied from the best masters, and are here inserted for examples to the learner to practice by : a work very useful for all gentlemen, and other ingenious spirits, either artificers or others.* London, Printed by Thomas Ratcliff and Thomas Daniel, for Dorman Newman and Richard Jones ...

ANONYMOUS (1684). *Acta Eruditorum.* Lipsiae (Leipzig).

- ANONYMOUS (1685). 'An Account of a Book Frederici Hoffmanni fred. Fil. M, D, : Exercitatio Medico Chymica de Cinnabari Antimonii.' *Philosophical Transactions* **16**(176): 1208-1210.
- ANONYMOUS (1700). 'Modus colorandi marmora.' *Philosophical Transactions* **22**(268): 735-736.
- ANONYMOUS (1701a). *Bellum Medicinale, or the present state of doctors and apothecaries in London. Being remarks upon a Letter [entitled, "The present state of Physick and Surgery in London," etc.] from a merchant-dispensary-physician to himself, and his answer. In a letter from a Chymist in the City to a Country Physician, with the Physician's answer.* London.
- ANONYMOUS (1701b). *The Present State of Physick and Surgery in London. With an estimate of the prizes of all the medicines now in use. In a letter from a Merchant in London, to a Dispensary Physician, with the Physician's answer.* London.
- ANONYMOUS (1702). *A Pill to purge the Dispensary Doctors, or, a cure for the present state of physick.* London.
- ANONYMOUS (1707). *Die geöffnete Raritäten- und Naturalien-Kammer (...) Wobey eine Anleitung, wie ein vollständiges Raritätenhaus anzuordnen und einzurichten sey (...).* Hamburg.
- ANONYMOUS (1718). *An Inventory of the Goods belonging to the Publick Laboratory.* Cambridge.
- ANONYMOUS (1724). *Pharmacopodae justificati: or, Apothecaries vindicated from the imputation of ignorance.* London.
- ANONYMOUS (1729). *The art of painting in miniature : teaching the speedy and perfect acquisition of that art without a master / done from the original french.* London.
- ANONYMOUS (1731). *The art of drawing and painting in water-colours : whereby a stranger to those arts may be immediately render'd capable of delineating any view or prospect... / with instructions for making transparent colours of every sort; partly from some curious personages in Holland, France and Italy; but chiefly from a manuscript of... Mr. Boyle...* London, printed for J. Peele.

ANONYMOUS (1749). *Arts companion; or a new assistant for the ingenious*. London; and Dublin reprinted, I. Jackson.

ANONYMOUS (1764). 'Gentleman's Magazine.' (34): 273

ANONYMOUS (1870). *The Diary of Abraham de la Pryme*. Durham, Surtees Society Publications.

ANONYMOUS (1882). *The Family Memoirs of the Rev. William Stukeley*. Durham, Surtees Society Publications.

ANONYMOUS (1933). *Old-Time Cures. First Professor of Chemistry*. Cambridge Daily News. Cambridge.

ANONYMOUS (1964). 'Pomum ambrae: Amber and Ambergris in Plague Remedies.' *Sudhoffs Archiv für Geschichte der Medizin und der Naturwissenschaften* **48**: 111-122.

ANONYMOUS (1764,7). *Annual Register, 'Characters'*. Cambridge.

ARTLOVE, MRS. (1730). *The Art of Japanning, Varnishing, Polishing, and Gilding: Being a Collection of very Plain Directions and Receipts*. London, printed for T. Warner, at the Black-Boy in Pater-Noster-Row.

BALSINGER, B. J. (1970). *The Kunst- und Wunderkammer: a catalogue raisonné of collections in Germany, France and England. 1556-1750*. Pittsburgh (Pa).

BARDWELL, THOMAS (1756). *The practice of painting and perspective made easy: in which is contained, the art of painting in oil, with the Method of Colouring... and a new, short, and familiar account of the art of perspective, illustrated with copper-plates, engraved by Mr. Vivares*. London, Thomas Bardwell, A. Millar, J. Dodsley, J. and J. Rivington.

BARROW, JOHN (1735). *Dictionarium polygraphicum: or, The whole body of arts regularly digested ... adorned with proper sculptures, curiously engraven on more than fifty copper plates ...* London, C. Hitch and C. Davis [etc.].

BATE, JOHN (1635). *The mysteries of nature and art : in foure severall parts. The first of water works. The second of fire works. The third of drawing ... The fourth of sundry experiments*. London, printed by T. Harper for R. Mabb.

- BATESON, MARY, Ed. (1903-). *Cambridge University Grace Book B, Part i-*. Cambridge, Cambridge Antiquarian Society.
- BAUMER, JOHANN W. (1782). *Bibliotheca Chemica*. Giessae (Giessen).
- BENT, THOMAS (1698). 'The way of making pitch, tarr, rosin and turpentine near Marseilles; communicated in a letter from Nimes, by Mr. Thomas Bent, to Dr. Welsted.' *Philosophical Transactions* **20**(243): 291.
- BERGER, KATHLEEN (2002). *Glasflitter in historischen Architekturfassungen. Die besondere Fasstechnik in der Stucknische des Dresdner Schlosses. Quellenlage, Vergleichsbeispiele, Fragen der Herstellungstechnik*. Studiengang Restaurierung, Fachklasse fuer Historische Wandmalerei und Architekturfarbigkeit. Dresden, Hochschule für Bildende Künste.
- BERGVELT, ELLINOR and KISTEMAKER, RENÉE, Eds. (1992). *De wereld binnen handbereik. Nederlandse kunst- en rariteitenverzamelingen, 1585-1735*. Zwolle/Amsterdam, Waanders Uitgevers/Amsterdams Historisch Museum.
- BERRIE, BARBARA H. and MATTHEW, LOUISA C. (2005). *Invention: New Materials and New Colors in Renaissance Venetian Paintings*. (Sackler NAS Colloquium) Scientific Examination of Art: Modern Techniques in Conservation and Analysis. Washington D.C., The National Academies Press.
- BIRCH, THOMAS (1999). *The works of the Honourable Robert Boyle / with a new introduction by Peter Alexander*. Bristol, Thoemmes.
- BISCHOFF, GUDRUN (2002). *Das De Mayerne-Manuskript. Die Rezepte der Werkstoffe, Maltechniken und Gemälderestaurierung*. Studiengang Restaurierung und Technologie von Gemälden und gefaßten Skulpturen. Stuttgart, Staatliche Akademie der Bildenden Künste Stuttgart. Institut für Technologie der Malerei: 327.
- BLOME, RICHARD (1670). *A geographical description of the four parts of the world, taken from the notes & workes of the famous Monsieur Sanson, geographer to the French King, and other eminent travellers and authors [microform] : to which are added the commodities, coyns, weights, and measures of the chief places of traffick in the world, compared with those of England, (or London) as to the trade thereof : also, a treatise of travel, and another of traffick, wherein, the matter of trade is briefly handled : the whole illustrated with variety of useful and*

delightful mapps and figures. London, Printed by T.N. for R. Blome ... and for convenience are also sold by Nath. Brooks ... Edw. Brewster ... and Tho Basset

BLOME, RICHARD, Ed. (1672). *A Description of the Island of Jamaica with the other Isles and Territories in America to which the English are related. Taken from the Notes of Sr Thomas Linch Knight, Governor of Jamaica, and other Experienced Persons in the said Places*. London, T. Milbourn.

BOAS HALL, MARIE (1958). *Newton (Sir Isaac): Papers and letters on Natural Philosophy, and related documents. Edited, with a general introduction, by I. B. Cohen, assisted by R. E. Schofield...with explanatory prefaces by M. Boas etc.* Cambridge (USA).

BOAS HALL, MARIE (1962). *Unpublished Scientific Papers of Isaac Newton; A Selection from the Portsmouth Collection in the University Library, Cambridge*. Cambridge.

BOAS HALL, MARIE and HALL, ALFRED RUPERT (1964). *A brief history of science*. New York.

BOAS, MARIE (1958). *Robert Boyle and seventeenth-Century Chemistry*. Cambridge, University Press.

BOERHAAVE, HERMAN (1727). *A new Method of Chemistry. trans Shaw and Chambers*. London.

BOERHAAVE, HERMAN (1734). *Dr. Boerhaave's Elements of Chymistry faithfully abridgd from the Genuine Edition, by a Physician*. London.

BOERHAAVE, HERMAN (1751). *Methodus Studii Medici*. Amstelodami (Amsterdam).

BOON, JAAP J., VAN DER WEERD, JAAP, et al. (2001). *Chemical changes in old master paintings: dissolution, metal soap formation and remineralisation processes in lead pigmented paint layers of 17th C paintings*. Deterioration of Artists' Paints: Effects and Analysis. A joint meeting of ICOM-CC Working Groups Paintings 1 & 2 and the Paintings Section, UKIC. British Museum, London.

BOUTET, CLAUDE (1739). *Traité de la peinture en miniature. The art of painting in miniature : teaching the speedy and perfect acquisition of that art without a master / translated from the original French*. London, printed for J. Hodges, J. James, and T. Cooper.

- BOWETT, ADAM (1994). 'The Vigani Specimen Cabinet by John Austin, a Cambridge Joiner.' *Regional Furniture* 8.
- BOYLE, ROBERT (1670). *Experiments and considerations touching colours : first occasionally written... to a friend; and now suffer'd to come abroad as the beginning of an experimental history of colours*. London, printed for H. Herringman.
- BRACHERT, FELICITAS and BRACHERT, THOMAS (1980). 'Zinnober.' *Maltechnik Restauro*: 145-158.
- BRADLEY, PETER R. (1992). *British herbal compendium: a handbook of scientific information on widely used plant drugs*. Bournemouth, British Herbal Medicine Association.
- BRADLEY, RICHARD (1728). *Dictionarium botanicum*. London.
- BRADLEY, RICHARD (1730). *Course of Lectures upon the Materia Medica, Antient and modern. Read in the Physick Schools at Cambridge, upon the Collections of Doctor Attenbrook and Signor Vigani, deposited in Catherine-Hall, and Queen's-College*. London, Printed for Cha. Davis in Pater-Noster-Row.
- BREWSTER, D. (1855). *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton*. London.
- BROOKES, RICHARD (1753). *The general dispensatory: containing a translation of the pharmacopoeias of the Royal Colleges of Physicians of London and Edinburgh*. London, J. Newbery, W. Owen.
- BROWNE, ALEXANDER (1660). *The whole art of drawing, painting, limning, and etching : collected out of the choicest Italian and German authors : to which is added exact rules of proportion for drawing the heads of men, women and children , of what bigness soever / originally invented and written by the famous Italian painter Odoardo Fialetti, painter of Boloign ; published for the benefit of all ingenuous gentlemen and artists by Alexander Brown*. London, Printed for Peter Stint ... and Simon Miller
- BROWNE, ALEXANDER (1669). *Ars pictoria, or, An academy treating of drawing, painting, limning, and etching: to which are added thirty copper plates expressing the choicest, nearest and most exact grounds and rules of symetry / collected out of*

the most eminent Italian, German, and Netherland authors by Alexander Browne. London, Printed by J. Redmayne for the author, and are to be sold by him ... and Richard Tompson ... and Arthur Tooker

BROWNE, ALEXANDER (1675). *Ars pictoria, or, An academy treating of drawing, painting, limning, etching; to which are added XXXI copper plates expressing the choicest, nearest and most exact grounds and rules of symmetry / collected out of the most eminent Italian, German, and Netherland authors by Alexander Browne.* London, Printed for Arthur Tooker and William Battersby.

BROWNE, ALEXANDER (1677). *A compendious drawing-book / composed by Alexander Browne, limner, collected from the drawings of ye most celebrated painters in Europe ; engraven (with additions) on forty copper-plates, by Arnold de Jode and others, the best artists ; published for ye use of the ingenious practitioners in the art of symmetry.* London, Printed for Austin Oldisworth

BUCKLOW, SPIKE (2000). 'Paradigms and Pigment Recipes: Natural Ultramarine.' *Zeitschrift für Kunsttechnologie und Konservierung* **1**(14): 5-14.

BURMESTER, ANDREAS and RESENBERG, LAURA (2003). 'Von Berggrün, Schiefergrün und Steingrün aus Ungarn.' *Restauro* **109**(3): 180-187.

CALDWELL, MELANIE (2001). *Some developments in british paint manufacture over the last two hundred years, and the occurrence of white surface deposits on paintings.* Deterioration of Artists' Paints: Effects and Analysis. A joint meeting of ICOM-CC Working Groups Paintings 1 & 2 and the Paintings Section, UKIC. British Mseum, London.

CAMBRIDGE PHILOSOPHICAL SOCIETY, Ed. (1936). *Catalogue of a loan exhibition of historic scientific apparatus in Cambridge. Arranged under the auspices of the Cambridge Philosophical Society in the East Room of the Old Schools 8-23 June 1936.* Oxford, Oxford University Press.

CAMPBELL, R. (1747). *The London Tradesman. Being a Compendious View of All the Trades, Professions, Arts, both Liberal and Mechanic, now practised in the Cities of London and Westminster. Calculated For the Information of Parents, and Instruction of Youth in their Choice of Business.* London, T. Gardner, at Cowley's-Head in the Strand.

- CARDON, DOMINIQUE and ANDARY, C. (2000). 'The Names of Madder in Historical Literature in Relationship with Root Contents.' *Dyes in History and Archaeology* **20**.
- CARDON, DOMINIQUE (1988). 'Meditarranean kermes and kermes-dyeing.' *Dyes in History and Archaeology* **7**: 5-8.
- CARLYLE, LESLIE (2001a). *The Artist's Assistant. Oil Painting Instruction Manuals and Handbooks in Britain 1800-1900 With Reference to Selected Eighteenth-century Sources*. London, Archetype Publications Ltd.
- CARLYLE, LESLIE (2001b). *Historical reconstructions of artists' oil paint: an investigation of oil processing methods and the use of selected artists' mediums*. Deterioration of Artists' Paints: Effects and Analysis. A joint meeting of ICOM-CC Working Groups Paintings 1 & 2 and the Paintings Section, UKIC. British Museum, London.
- CHAMBERS, EPHRAIM (1738). *Cyclopedia; or an universal dictionary of arts and sciences*. London.
- CHAMBERS, EPHRAIM and BOERHAAVE, HERMAN (1727). *A new method of chemistry...to which is prefix'd a critical history of chemistry and chemists...translated by P. Shaw and E. Chambers*. London.
- CHENCINER, ROBERT (2000). *Madder Red: A history of luxury and trade*. Richmond, Surrey, Curzon.
- COLE, WILLIAM (1685). 'A Letter from Mr William Cole of Bristol, to the Phil. Society of Oxford; Containing His Observations on the Purple Fish.' *Philosophical Transactions* **15**: 1278-1286.
- COLEBY, L. J. M. (1952). 'John Francis Vigani, First Professor of Chemistry in the University of Cambridge.' *Annals of Science* **8**(1): 46-60.
- CROSLAND, MAURICE P. (1962). *Historical Studies in the Language of Chemistry*. London, Melbourne, Toronto, Heinemann.
- CULPEPER, NICHOLAS (1649). *A physicall directory or a translation of the London Dispensatory made by the College of Physicians in London ... with many hundred additions, etc*. London.

- CULPEPER, NICHOLAS (1651). *London Pharmacopoeia, and following editions up to 1675, see below.*
- CULPEPER, NICHOLAS (1789). *Culpeper's English Physician; and complete herbal etc....* London.
- DAGRON, BENOIT (1998). 'Inventaire du matériel de l'atelier du peintre Vassily Kandinsky tel qu'il est conservé au Musée national d'art moderne - CCI Centre Georges Pompidou dans le fonds Kandinsky.' *Techne. La science au service de l'histoire de l'art et des civilisations* **8**: 64-76.
- DANIELS, VINCENT (1987). 'The Blackening of Vermilion by Light'. in *Recent Advances in the Conservation and Analysis of Artifacts. Jubilee Conservation Conference*. Ed. BLACK, JAMES. London, University of London, Institute of Archaeology: 280-282.
- DE LA HYRE, P. (1730). 'Traité de la pratique de peinture.' *Mémoires de l'Académie Royale des Sciences depuis 1666 jusqu'à 1699* **IX**: 678.
- DEEKS, JULIAN (1993). *Chemistry not mysterious: Vigani, Bentley and chemistry teaching at Cambridge University*. Department of History and Philosophy of Science. Cambridge, University of Cambridge.
- DOBBS, BETTY JO TEETER (1975). *The Foundations of Newton's Alchemy or "The Hunting of the Greene Lyon"*. Cambridge, London, New York, Cambridge University Press.
- DONKIN, R. A. (1977). 'Spanish Red. An ethnogeographical study of cochineal and the opuntia cactus.' *Transactions of the American Philosophical Society* **67**(part 5): 5-84.
- DOSSIE, ROBERT (1758a). *The Handmaid To The Arts. Vol. the First. Teaching, I. A perfect knowledge of the materia pictoria: ...II. The several devices employed for the more easily and accurately making designs from nature, ... III. The various manners of gilding, silvering, and bronzing, ...* London, printed for J. Nourse.
- DOSSIE, ROBERT (1758b). *The Elaboratory laid open, or, the Secrets of Modern Chemistry and Pharmacy revealed: Containing many Particulars extremely*

necessary to be known to all Practitioners in Medicine. London, printed for J. Nourse.

DOSSIE, ROBERT (1758c). *The Handmaid to the Arts. Volume the Second. Teaching, I. The preparations of inks, cements, and sealing-wax, ... II. The art of engraving, etching, and scraping mezzotintoes; ... III. The nature, composition, and preparation of glass of every sort. ... IV. The nature and composition of porcelain; ... V. The manner of preparing and molding the papier maché, ... To whic is added, an Appendix containing several supplemental articles ...* London, printed for J. Nourse.

DOSSIE, ROBERT (1761). *Theory and Practice of Chirurgical Pharmacy: Comprehending a complete Dispensatory For the use of Surgeons; With explanatory and critical notes on each composition; and an introductory inquiry concerning the particular intentions of cure, in which remedies are applied, or administered; and the nature, and medicinal efficacy, of the several simples subservient to them.* London, printed for J. Nourse.

DRAZIL, JAROMIR VACLAV (1983). *Quantities and units of measurement : a dictionary and handbook.* London, Wiesbaden, Mansell, Brandstetter.

DUBOS, JEAN BAPTISTE (1748). *Critical reflections on poetry, painting and music...* London.

DUBREUIL, JEAN (1739). *The practice of perspective: : or, an easy method of representing natural objects according to the rules of art. ... illustrated with one hundred and fifty copper-plates. Written in French by a Jesuit of Paris ; since translated into German, ... English, ... And now, a second time, into the same language, by E. Chambers, F.R.S. The third edition. To which is prefixed The theory of perspective, ...* London, printed for Tho. Bowles; and John Bowles.

DUFRESNOY, CHARLES-ALPHONSE (1716). *The art of painting: by C. A. du Fresnoy: with remarks: translated into English, with an original preface, containing a parallel between painting and poetry: by Mr. Dryden. As also a short account of the most eminent painters, both ancient and modern: by R. G. Esq; The second edition, corrected, and enlarg'd.* London, printed for B. L. [i.e. Bernard Lintott] and sold by William Taylor.

DUVERGER, E. (1997). *Antwerpse kunstinventarissen uit de zeventiende eeuw. 1666-1674.* Brussels.

- EASTAUGH, NICHOLAS. (1999). 'What's in a Name? Problems with Pigment Nomenclature.' *The Picture Restorer* **16**: 12-13.
- ERXLEBEN, J. C. P. (1784). *Anfangsgründe der Chemie*. Göttingen.
- EVERS, NORMAN (1933). 'Some 200 Year-old Specimens of Drugs.' *The Pharmaceutical Journal and Pharmacist*: 219.
- EYLES, V. A. (1973). *J. Woodward: Brief instructions for making observations...Reprint with an Introduction*. London.
- FAIDUTTI, MARCEL and VERSINI, CAMILLE (post 1967). *Le Manuscrit de Turquet de Mayerne 1620 - 1646?: Pictoria Sculptoria & quae subalternarum artium. 1620*. Lyon, Audin Imprimeurs.
- FARRINGTON, ANTHONY (2002). *Trading Places. The East India Company and Asia 1600-1834. An Exhibition at the British Library 24 May - 15 September 2002*. London, The British Library.
- FELLER, ROBERT L., Ed. (1994 reprint). *Artists' Pigments - A Handbook of their Histories and Characteristics. Volume 1*. Washington D.C., National Gallery of Art.
- FERGUSON, JOHN (1894). *John Francis Vigany: First Professor of Chemistry in the University of Cambridge. Read to the Cambridge Antiquarian Society, Wednesday, May 16, 1894*. Cambridge, unpublished.
- FERGUSON, JOHN (1899). 'Vigani, John Francis (1650?-1712)'. in *Dictionary of National Biography*. Ed. LEE, SIDNEY. London, Smith, Elder & Co. **18**: 305-306.
- FLOYER, JOHN (1702). 'Observations on the class of sweet tastes, made by comparing the tastes of sweet plants with Monsieur L'Emery's chymical analysis of them, in his treatise of drugs, by Sir John Floyer.' *Philosophical Transactions* **23**(279): 1160-1172.
- FRENCH, C. J. (2000). "'Crowded with Traders and a Great Commerce": London's Domination of English Overseas Trade, 1700-1775'. in *The Development of London as a Financial Centre*. Ed. MICHIE, R. C. London, New York, I. B. Tauris. **1**: 27-37.

- FUCHS, ROBERT (2004). *Barocke Sinneslust: Das Trierer Schablonenbuch von 1752. Papier, Glassplitter und farbige Tuschen*. Mehr als Papier - beyond Paper. Dresden.
- GAGE, JOHN (1995, 2001 reprint). *Colour and culture. Practice and meaning from antiquity to abstraction*. London, Thames & Hudson.
- GAGE, JOHN (2000, 2003 reprint). *Colour and meaning. Art, science and symbolism*. London, Thames & Hudson.
- GEOFFROY, ÉTIENNE FRANCOIS OR STEPHEN FRANCIS (1736). *A Treatise of the Fossil, Vegetable, and Animal Substances, That are made Use of in Physick. Containing the History and Description of them; with an Account of their several Virtues and Preparations. [...] Translated from a Manuscript Copy of the Author's Lectures, read at Paris*. London, printed for W. Innys and R. Manby, T. Woodward, and C. Davis.
- GEORGI, THEOPHIL (1739) *Allgemeines europäisches Bücher-Lexicon in welchem nach Ordnung des dictionarii die allermeisten Autores oder Gattungen von Büchern zu finden (...) noch von dem Anfange des XVI. seculi bis 1739 inclusive*. Leipzig, In Verlegung Gotthilft Theoph. Georgii.
- GETTENS, RUTHERFORD J. and WEST FITZHUGH, ELIZABETH (1966). 'Azurite and Blue Verditer.' *Studies in Conservation* **11**: 54-61.
- GETTENS, RUTHERFORD J., KÜHN, H., et al. (1967). 'Lead White.' *Studies in Conservation* **12**: 125-139.
- GETTENS, RUTHERFORD J., FELLER, R. L., et al. (1972). 'Vermilion and Cinnabar.' *Studies in Conservation* **17**: 45-69.
- GETTENS, RUTHERFORD J. and WEST FITZHUGH, ELIZABETH (1974). 'Malachite and Green Verditer.' *Studies in Conservation* **19**: 2-23.
- GETTENS, RUTHERFORD J., FELLER, ROBERT L., et al. (1993a). 'Vermilion and Cinnabar'. in *Artists' Pigments. A Handbook of Their History and Characteristics. Volume 2*. Ed. ROY, ASHOK. Washington D.C., National Gallery of Art: 159-182.
- GETTENS, RUTHERFORD J. and WEST FITZHUGH, ELIZABETH (1993b). 'Malachite and Green Verditer'. in *Artists' Pigments. A Handbook of Their History and*

- Characteristics. Volume 2.* Ed. ROY, ASHOK. Washington D.C., National Gallery of Art: 183-202.
- GETTENS, RUTHERFORD J. and WEST FITZHUGH, ELIZABETH (1993c). 'Azurite and Blue Verditer'. in *Artists' Pigments. A Handbook of Their History and Characteristics. Volume 2.* Ed. ROY, ASHOK. Washington D.C., National Gallery of Art: 23-35.
- GIBSON-WOOD, CAROL (1997). 'Classification and value in a seventeenth-century museum. William Courten's Collection.' *Journal of the History of Collections* **9**(1): 61-77.
- GIOVANOLI, RUDOLF and MÜHLETHALER, BRUNO (1970). 'Investigation of Discoloured Smalt.' *Studies in Conservation* **15**(1): 37-44.
- GORDON, JAMES, Ed. (1906). *Peacham's Compleat Gentleman. 1634. With an Introduction by James Gordon.* Oxford, London, Edinburgh, New York, Clarendon Press.
- GRAMATKE, CORINNA (forthcoming). *Beitrag zur europäischen kunsttechnologischen Quellenforschung. Spanische Traktate zur Malerei und Skulpture des siglo de oro. Kritische Übersetzung der Kapitel zur Mal- und Fastechnik von Carducho, Pacheco und Palomino.* Studiengang Kunsttechnologie, Konservierung und Restaurierung von Kunst und Kulturgut. Dresden, Hochschule für Bildende Künste.
- GRIERSON, SU (1988). 'Possible contaminants in indigo dyeing.' *Dyes in History and Archaeology* **7**: 21-24.
- GRISSOM, CAROL A. (1986). 'Green Earth'. in *Artists' Pigments. A Handbook of their History and Characteristics. Volume 1.* Ed. FELLER, ROBERT L. Washington D.C., National Gallery of Art: 141-168.
- GROUT, RACHEL and BURNSTOCK, AVIVA (2000). 'A Study of the Blackening of Vermilion.' *Zeitschrift für Kunsttechnologie und Konservierung* **1**(14): 15-22.
- GUNTHER, R. T. (1937). *Early Science in Cambridge.* Oxford, Oxford University Press.
- GUTFLEISCH, BARBARA and MENZHAUSEN, JOACHIM (1989). 'How a Kunstkammer should be formed'. Gabriel Kaltemarckt's advice to Christian I of Saxony on the formation of an art collection, 1587.' *Journal of the History of Collections* **1**(1): 3-32.

- HALEY, CHRISTOPHER (2002). *'Boltheads and Crucibles'. A Brief History of the 1702 Chair of Chemistry at Cambridge*. Cambridge, University of Cambridge, Department of Chemistry.
- HALLER, URSULA (2005). *Das Einnahmen- und Ausgabenbuch des Wolfgang Pronner. Die Aufzeichnungen des "Verwalters der Malerei" Herzog Wilhelms V. von Bayern als Quelle zu Herkunft, Handel und Verwendung von Künstlermaterialien im ausgehenden 16. Jahrhundert*. München, Anton Siegl.
- HARLEY, ROSAMUND D. (1969). 'Literature on technical aspects of the Arts. Manuscripts in the British Museum.' *Studies in Conservation* **14**: 1-8.
- HARLEY, ROSAMUND D. (1975). 'A nineteenth-century book of colour samples.' *bulletin of the American Institute for Conservation of Historic and Artistic Works, Washington D.C.* **15**: 49-53.
- HARLEY, ROSAMUND D. (1979). 'Field's manuscripts: early nineteenth-century colour samples and fading tests.' *Studies in Conservation* **24**: 75-84.
- HARLEY, ROSAMUND D. (2001). *Artist's Pigments c. 1600-1835. A Study in English Documentary Sources. Second Revised Edition*. London, Archetype Publications Ltd.
- HARRIS, JOHN (1704). *Lexicon technicum: or Universal English Dictionary of Arts and Sciences: Explaining not only the Terms of Art, but the Arts themselves*. London, Printed for Dan. Brown, Tim. Goodwin, John Walthoe, Tho. Newborough, John Nicholson, Tho. Benskin, benj. Tooke, Dan. Midwinter, Tho. Leigh, and Francis Coggan.
- HARRISON, JOHN (1978). *The library of Isaac Newton*. Cambridge, Cambridge University Press.
- HARTMANNUS, PHILIPPUS JACOBUS (1699). 'Succincta Succini Prussici Historia & Demonstratio.' *Philosophical Transactions* **21**(248): 5-7.
- HAUDICQUER DE BLANCOURT, FRANCOIS (1699). *The Art of Glass... now first translated into Ennglish*. London, Richard Wilkin.
- HELTZEL, VIRGIL BARNEY, Ed. (1962). *Peacham, Henry: The complete Gentleman, The truth of our times, and The art of living in London. London 1643*. Folger

documents of Tudor and Stuart civilization. Ithaca, N.Y., Published for the Folger Shakespeare Library by Cornell University Press.

HERING, M. H. BERND (2000). *Weißes Farbmittel*. Fürth, Eigenverlag.

HERMENS, ERMA, Ed. (1998). *Looking through paintings. The study of painting materials in support of art historical research*. Baarn, London, de Prom and Archetype.

HICKS, EDWARD (1962). *Shellac. Its origin and applications*. London, MacDonald.

HIGGIT, CATHERINE, SPRING, MARIKA, et al. (2001). *Pigment-medium interactions in oil paint films containing red lead or lead-tin yellow*. Deterioration of Artists' Paints: Effects and Analysis. A joint meeting of ICOM-CC Working Groups Paintings 1 & 2 and the Paintings Section, UKIC. British Museum, London.

HILL, JOHN, GENT. (1688). *The exact dealer [microform] : being an useful companion for all traders : in two parts : I. Containing the growth, manufacture, and trade of all the counties of England and Wales ... a description of weights, measures and coins, with their value ... II. Containing directions for measuring carpenters, joiners, painters, plasterers, glaziers, bricklayers work, &c / by J.H., author of The secretary's guide*. London, H. Rhodes.

HILLIARD, NICHOLAS (1981). *A treatise concerning the arte of limning / by Nicholas Hilliard. together with A more compendious discourse concerning ye art of liming / by Edward Norgate ; with a parallel modernized text edited by R.K.R. Thornton and T.G.S. Cain*. Ashington, Manchester, Mid Northumberland Arts Group in association with Carcanet New Press.

HOEFER, FERDINAND (1843). *Histoire de la Chymie*. Paris

HOFFMANNUS, FREDERICUS (1685). *Exercitatio Medico Chymica de Cinnabari Antimonii*. Lugdunum Batavorum.

HOOFNAIL, JOHN (1738). *New practical improvements, and observations, on some of the experiments and considerations touching colours, : of the honourable and judicious Robert Boyle, Esq; so far as they relate to tinctures and pigments; ...* London, printed for R. Gosling.

HOUGHTON, JOHN (1727-28). *A collection for the improvement of husbandry and trade. Consisting of many valuable materials relating to corn, cattle, coals, hops, wool,*

&c. With a compleat catalogue of the several sorts of earths, ... With many other useful particulars, communicated by several eminent members of the Royal Society, to the collector, John Houghton, F.R.S. Now revised, corrected, and published, with a preface and useful indexes, by Richard Bradley, ... In three volumes. London, printed for Woodman and Lyon.

HUNTER, MICHAEL (1985). 'The cabinet institutionalized: the Royal Society's 'repository' and its background'. in *The origins of museums. The cabinet of curiosities in the sixteenth- and seventeenth-century Europe*. Eds. IMPEY, OLIVER and ARTHUR MACGREGOR. Oxford, Clarendon Press: 159-168.

IMPEY, OLIVER (2000). 'Ein kurzer Bericht über japanische Exportlacke des 17. Jahrhunderts und ihre Verwendung in Europa'. in *Japanische und europäische Lackarbeiten. Rezeption, Adaption, Restaurierung*. Ed. KÜHLENTAL, MICHAEL. München.

IMPEY, OLIVER and MACGREGOR, ARTHUR, Eds. (1985). *The origins of museums. The cabinet of curiosities in the sixteenth- and seventeenth-century Europe*. Oxford.

JACKSON, BETTY (1965). 'From Papyri to Pharmacopoeia. The Development of Standards for Crude Drugs'. in *The Evolution of Pharmacy in Britain*. Ed. POYNTER, F. N. L. London, Pitman Medical Publishing Ltd: 151-164.

JUEL-JENSEN, BENT (1992). 'Musaeum Clausum, or Bibliotheca Abscondita. Some thoughts on curiosity cabinets and imaginary books.' *Journal of the History of Collections* 4(1): 127-140.

K., C. *Art's Master-Piece: or, A Companion for the Ingenious of either Sex. In two Parts. 1. The Art of Limning and Painting in oil, &c. II. The Art of making Glass of Chrystal of all Sorts and Colours, and to prepare the Materials. And other matters worthy of Note. To which are added Many Curiosities, and rare Secrets, known to few, but very profitable and pleasant.* London, G. Conyers, at the Ring and F. and B. Sprint, in Little-Britain.

KEMPFER, ENGELBERTUS (after 1730). *The History of Japan with account on Metals, Minerals, Trees, Plants, Customs and Manufactures of the Natives, their Trade and Commerce with the Dutch Chinese, written in High Dutch by Engelbertus Kempfer, M. D. Physician to the Dutch Embassy to the Emperor's Court, and translated from this original Manuscript, never before printed, by J. G. Scheuchzer, F. R. S. and Member of the College of Physicians, London, added*

- is a Part of a Voyage to Japan, made by the English in 1673*. London, C. Davis in Pater Noster Row.
- KIRBY, JO (1999). 'The Painter's Trade in the Seventeenth Century: Theory and Practice.' *National Gallery Technical Bulletin* **20**: 5-49.
- KIRBY, JO and SAUNDERS, DAVID (1998). *Sixteenth- to Eighteenth-Century Green Colours in Landscape and Flower Paintings: Composition and Deterioration*. IIC Conference. Dublin.
- KIRBY, JO and WHITE, RAYMOND (1996). 'The Identification of Red Lake Pigment Dyestuffs and a Discussion of their Use.' *National Gallery Technical Bulletin* **17**: 56-80.
- KNORR, GEORG WOLFGANG (1754). *Deliciae naturae selectae: oder, Auserlesenes Natüralien-Cabinet welches aus den drey Reichen der Natur zeigt, was von curiosen Liebhabern aufbehalten und gesammelt zu werden verdienet*. Nürnberg.
- KÖNIG, EMANUEL (1693). *Κεραζ Αμαλθειαζ seu Thesaurus remediorum e triplici Regno, sistens: I. Jo. Jac. Waldschmied descriptionum virium medicamentorum. II. Jo. Franc. Vigani sucessum processum chymicorum. III. Remedia anglica, monspeliensia aliaque miscellanea. IV. Generalia operationum pharmaceutico-chymicarum. V. Joelis Langelotti et Emanuelis Koenig chymiam physicam*. Basel, Koenig.
- KREKEL, CHRISTOPH and BURMESTER, ANDREAS (2001). 'Das Münchner Taxenprojekt. Apothekentaxen als neuer Quellentyp für die Erforschung historischer Künstlermaterialien.' *Restauro* **107**(6): 450-455.
- KREKEL, CHRISTOPH and BURMESTER, ANDREAS (2003). 'Pharmacy Price-Lists as a New Type of Documentary Source for Research into Historical Artists' Materials: The Münchner Taxenprojekt.' *Dyes in History and Archaeology* **19**.
- KREKEL, CHRISTOPH, BURMESTER, ANDREAS, et al. (2005). 'Vitriol. Kurzmitteilungen aus dem Münchner Taxenprojekt.' *Restauro* **111**(8): 562-565.
- KREMERS, EDWARD (1923). 'History of the Apothecary Shop: A Bibliography. No. 4. The Apothecary Shop of Castlee Issogue.'".' *Journal of the American Pharmaceutical Association* **12**(252).

- KREMERS, EDWARD and URDANG, GEORGE (1951). *History of Pharmacy. A Guide and a Survey*. Philadelphia, London, Montreal, J. B. Lippincott Company.
- KRIEG, DAVID (1704). 'Part of a letter from Dr David Krieg, F.R.S. to the Publisher, concerning cobalt, and the preparations of smalt and arsenic.' *Philosophical Transactions* **24**(293): 1753-1756.
- KÜHN, HERMANN (1968). 'Lead-tin yellow.' *Studies in Conservation* **13**: 7-33.
- KÜHN, HERMANN (1970). 'Verdigris and copper resinate.' *Studies in Conservation* **15**: 12-36.
- KÜHN, HERMANN (1993). 'Verdigris and Copper Resinate'. in *Artists' Pigments. A Handbook of Their History and Characteristics. Volume 2*. Ed. ROY, ASHOK. Washington D.C., National Gallery of Art: 131-158.
- KUNCKEL, JOHANNES (1689). *Johannis Kunckelii ... Ars vitraria experimentalis, oder, Vollkommene Glasmacher-Kunst [microform] : lehrende als in einem aus unbetrüglicher Erfahrung herfliessendem Commentario über die von dergleichen Arbeit / beschriebenen sieben Bücher P. Anthonii Neri ... und denen darüber gethanen gelehrten Anmerckungen Christophori Merretti ... (so aus den Ital. und Latein. beyde mit Fleiss ins Hochteutsche übersetzt)*.
- KUNDMANN, JOHANN-CHRISTIAN (1737). *Rariora naturae & artis item in re medica, oder Seltenheiten der Natur und Kunst des Kundmannischen Naturalien-Cabinets, wie auch in der Artzneywissenschaft*. Breslau, M. Hubert.
- LANGURI, G. M. and BOON, JAAP J. (2002). 'Mass Spectrometry as a Micro-analytical Method to study Kassel Earth (VanDyke Brown) Pigments in Oil Paint.' *Proceedings of Art2002-Conference: Non-destructive Testing and Microanalysis for the diagnostics and Conservation of the Cultural and Environmental Heritage, 2-6 June 2002, Antwerp, Belgium*.
- LEAKE, CHAUNCEY D. (1975). *A historical account of Pharmacology to the twentieth Century*. Springfield (Illionois), Charles C. Thomas.
- LEATHES, STANLEY M., Ed. (1887). *Cambridge University Grace Book A*. Cambridge, Cambridge Antiquarian Society.
- LEE, SIDNEY, Ed. (1897). *Dictionary of National Biography, Vol L*. London, Smith, Elder & Co.

- LEMERY, NICOLAS (1698). *Traité universel des drogues simples, mises en ordre alphabetique. Où l'on trouve leurs differens noms, leur origine, leur choix, les principes qu'elles renferment, leur qualitez, leur ethymologie, & tout ce qu'il y a de particulier dans les animaux, dans les vegetaux et dans les mineraux* Ouvrage dépendant de la *Pharmacopée Universelle*, Paris chez Laurent D'Houry, à l'entrée de la rue S. Jacques, devant la fontaine S. Severin, au Saint Esprit 1698. Paris, Laurent D'Houry.
- LINTON, ARTHUR W. (1916). 'East Indian Voyages of the Sixteenth and Seventeenth Centuries in their Relation to Drugs, Spices and Dyestuffs.' *Journal of the American Pharmaceutical Association* **5**(471): 574.
- MACGREGOR, ARTHUR (1985a). 'The cabinet of curiosities in seventeenth-century Britain'. in *The origins of museums. The cabinet of curiosities in the sixteenth- and seventeenth-century Europe*. Eds. IMPEY, OLIVER and ARTHUR MACGREGOR. Oxford, Clarendon Press: 147-158.
- MACGREGOR, ARTHUR (2001). 'The Ashmolean as a museum of natural history, 1683-1860.' *Journal of the History of Collections* **13**(2): 125-144.
- MACTAGGART, PETER and MACTAGGART, ANN (1980). 'Refiners' Verditors.' *Studies in Conservation* **25**: 37-45.
- MAJOR, D. B. (1674). *Unvorgreiffliches Bedencken von Kunst und Naturalien Kammern*. Kiel.
- MARTINDALE (1999). *The complete drug reference*. London, Pharmaceutical Press.
- MASSING, ANN (1990). 'Painting Materials and Techniques: Towards a Bibliography of the French Literature before 1800'. in *Die Kunst und ihre Erhaltung. Rolf E. Straub zum 70. Geburtstag gewidmet*. Worms, Wernersche Verlagsgesellschaft.
- MASSING, ANN (1995). 'From Books of Secrets to Encyclopedias: Painting Techniques in France between 1600 and 1800'. in *Historical Painting Techniques, Materials and Studio Practice. Preprints of a Symposium (held at) University of Leyden, the Netherlands. 26 - 29 June 1995*. Eds. WALLERT, ARIE, ERMA HERMENS and MARJA PEEK. Leyden, The Getty Conservation Institute: 20-29.

- MATTHEWS, LESLIE G. (1962). *History of Pharmacy in Britain*. Edinburgh, London, E. & S. Livingstone LTD.
- MAURIÈS, PATRICK (2002). *Cabinets of Curiosities*, Thames & Hudson.
- MERRET, CHRISTOPHER and NERI, ANTONIO (1662). *The art of glass, wherein are shown the wayes to make and colour glass, pastes, enamels, lakes, and other curiosities / Written in Italian by Antonio Neri, and translated into English, with some observations on the author [by C.M., i.e. Christopher Merret] Whereunto is added an account of the glass drops made by the Royal Society meeting at Gresham College*. London, Printed by A.W. for O. Pulleyn.
- MÖLLER, ROLAND (1999). 'Ein Malkasten mit Farben, Gerätschaften und Malanweisungen aus dem 19. Jahrhundert.' *Beiträge zur Erhaltung von Kunstwerken* **8**: 31-41.
- MOLLERUS, D. (1704). *Von Kunst- und Naturalienkammern*. Altorf.
- MONK, J. H. (1830). *The Life of Richard Bentley*. London.
- MÜHLETHALER, BRUNO and THISSEN, J. (1969). 'Smalt.' *Studies in Conservation* **14**: 47-61.
- MULLER, JEFFREY M. and MURRELL, JIM, Eds. (1997). *Edward Norgate. Miniatura or the Art of Limning. Edited, Introduced, and Annotated by Jeffrey M. Muller & Jim Murrell*. New Haven, London, Yale University Press.
- PARKINSON, JOHN (1640). *Theatrum botanicum: The theater of plants : Or, An herball of a large extent ; containing therein a more ample and exact history and declaration of the physicall herbs and plants that are in other authours, encreased by the accesse of many hundreds of new, rare, and strange plants from all the parts of the world, with sundry gummes, and other physicall materials, than hath beene hitherto published by any before; and a most large demonstration of their natures and vertues ; shewing withall the many errors, differences, and oversights of sundry authors that have formerly written of them; and a certaine confidence, or most probable conjecture of the true and genuine herbes and plants. Distributed into sundry classes or tribes, for the more easie knowledge of the many herbes of one nature and property, with the chiefe notes of Dr. Lobel, Dr. Bonham, and others inserted therein...* London, Printed by Tho. Cotes.

PEACHAM, HENRY (1606). *The Art of Drawing with the Pen, and Limming in Water Colours, more exactlie then heretofore taught and enlarged with the true manner of Painting upon glasse, the order of making your furnace, Annealing, &c.* London, Printed by Richard Braddock, for William Jones.

PEACHAM, HENRY (1612). *The Gentlemans Exercise.* London.

PEACHAM, HENRY (1634). *The Compleat Gentleman. Fashioning him absolut, in the most necessary and commendable Qualities concerning Minde or Body, that may be required in a Noble Gentleman. Whereunto is annexed a description of the order of a Maine Battaile or Pitched Field, eight severall wayes: with the Art of Limming and other Additions newly enlarged. By Henry Peacham Master of Arts: Sometimes of Trinitie College in Cambridge.* London, Francis Constable.

PEACHAM, HENRY (1968). *The Compleat Gentleman.* Amsterdam.

PECK, E. SAVILLE (1934). 'John Francis Vigani, First Professor of Chemistry in the University of Cambridge (1703-12), and his Materia Medica Cabinet in the Library of Queens' College (Read 13 February, 1933).' *Proceedings and Communications of the Cambridge Antiquarian Society* **XXXIV**: 34-49.

PETIVER, JACOBUS (1705). 'Catalogus concharum fossilium, metallorum, mineralium, &c. quae a Cl. D. Johanne Jacobo Scheuchzero, M.D. Tiguri, & Societat. Reg. Angl. Soc. nuper accepit D. Jacobus Petiver, S.R.S.' *Philosophical Transactions* **24**(301): 2042-2044.

PETIVER, JAMES (1700). 'An account of Mr Sam. Brown His Second Book of East India Plants, with their names, vertues, description, &c. By James Petiver, Apothecary, and Fellow of the Royal Soc.' *Philosophical Transactions* **22**(267): 699-721.

PETIVER, JAMES (1702). 'An account of Mr Sam. Brown his sixth book of East India plants, with their names, vertues, description, &c. By James Petiver, Apothecary, and Fellow of the Royal Society. To these are added some animals, Rc which the Reverend Father George Joseph Camel, very lately sent him from the Philippine Isles.' *Philosophical Transactions* **23**(277): 1055-1068.

PEY, E. B. F. (1987). 'The Hafkenscheid Collection. A collection of pigment and painting materials dating from the first half of the 19th century.' *Maltechnik Restauro* **2**(93): 23-33.

- PEY, E. B. F. (1989). 'The Organic Pigments of the Hafkenscheid Collection.' *Maltechnik Restauro* **2**: 146-150.
- PEY, INEKE (1998). 'The Hafkenscheid Collection'. in *Looking through paintings. The study of painting techniques and materials in support of art historical research*. Ed. HERMENS, ERMA. Baarn, London, de Prom and Archetype: 465-500.
- PILES, ROGER DE (1706). *The art of painting, and the lives of the painters: containing, a compleat treatise of painting, designing, and the use of prints: with reflections on the works of the most celebrated painters, and of the several schools of Europe, as well ancient as modern. Done from the French of Monsieur de Piles. To which is added, an essay towards an English-school, with the Lives and Characters of above 100 painters*. London, printed for J. Nutt.
- PLESTERS, JOYCE (1966). 'Ultramarine Blue, Natural and Artificial.' *Studies in Conservation* **11**: 62-81.
- PLESTERS, JOYCE (1969). 'A Preliminary Note on the Incidence of Discolouration of Smalt in oil Media.' *Studies in Conservation* **14**: 62-74.
- PLESTERS, JOYCE (1993). 'Ultramarine Blue, Natural and Artificial'. in *Artists' Pigments. A Handbook of their History and Characteristics. Volume 2*. Ed. ROY, ASHOK. Washington D.C., National Gallery of Art: 37-66.
- POMET, LE SIEUR PIERRE (1694). *Histoire générale des drogues, traitant des plantes, des animaux, et des minéraux; ouvrage enrichy de plus de quatre cent figures en taille-douce tirées d'après nature:: avec un discours qui explique leurs differens noms, les pays d'où elle s viennent, la maniere de connoître les veritables d'avec les falsifiées, et leurs proprietéz, où l'on découvre l'erreur des anciens & des modernes; le tout tres utile au public*. Paris, chez Jean-Babtiste Loyson, & Augustin Pilon, sur le Pont au Change, à la Prudence et au Palais chez Estienne du Castin, dans la Galerie des Prisonniers, au bon Pasteur.
- POMET, LE SIEUR PIERRE (1712). *A Compleat History of Drug. Written in French by Monsieur Pomet ; to which is added what is further observable on the same subject, from Messrs. Lemery, and Tournefort*. London, for R. Bonwicke [et al.].
- POMIAN, KRZYSZTOF (1990). *Collectors and curiosities. Paris and Venice, 1500-1800*. Cambridge, Polity Press.

- POYNTER, F. N. L., Ed. (1965). *The Evolution of Pharmacy in Britain*. London, Pitman Medical Publishing Co Ltd.
- PRICE, DAVID (1989). 'John Woodward and a surviving British geological collection from the early eighteenth century.' *Journal of the History of Collections* **1**(1): 79-95.
- PRICE, FRANCIS (1738). *The carpenter's plain and exact rule : Shewing, how to measure carpenters, joyners, sawyers, bricklayers, plaisterers, masons, glaziers and painters work. How to undertake each work, and at what price; the rates of each commodity, and the common wages of journeymen ... With the extraction and uses of the square and cube roots. Likewise the practical gauger made easy, the art of dialling, and how to erect and fix any dial*. Dublin, James Hoey.
- PRITCHARD, FRANCES (1991). 'Dyes on some 16th- and 17th-century textiles excavated in London.' *Dyes in History and Archaeology* **10**: 38-41.
- RAMAZZINI, BERNARDINI (1713). *De Morbis Artificum Diatriba*. Patav. (Padoa?).
- RAY, JOHN (1691). *A collection of words not generally used, with their significations and original [microform] : in two alphabetical catalogues, the one of such as are proper to the northern, the other to the southern countries : with an account of the preparing and refining such metals and minerals as are gotten in England / by John Ray. The second edition, augmented with many hundreds of words, observations, letters, &c*. London, Printed for Christopher Wilkinson ...
- RAY, JOHN (1738). *A collection of curious travels and voyages : In two parts. Part I. Containing Dr Leonhart Rauwolf's journey into the eastern countries. ... Translated. ... by Nicholas Staphorst. Part II. Containing travels into Greece, ... To which are added, three catalogues of such trees, ... as grow in the Levant. By J. Ray, F.R.S*. London, printed for Olive Payne, and Thomas Woodman, and William Shropshire.
- RESENBERG, LAURA (2005). *Zinnober - Zurück zu den Quellen*. München, Anton Siegl.
- RICHTER, ERNST LUDWIG and HÄRLIN, HEIDE (1974a). 'A Nineteenth-Century Collection of Pigments and Painting Materials.' *Studies in Conservation*(19): 76-82.
- RICHTER, ERNST LUDWIG and HÄRLIN, HEIDE (1974b). 'The Pigments of the Swiss Nineteenth-Century Painter Arnold Böcklin.' *Studies in Conservation*(19): 83-87.

- RIDDLE, JOHN M, Ed. (1992). *Quid pro quo: Studies in the history of drugs*. Hampshire (GB), Brookfield (Vermont), Variorum.
- ROBERTS, R. S. (1965). 'The Early History of the Import of Drugs into Britain'. in *The Evolution of Pharmacy in Britain*. Ed. POYNTER, F. N. L. London, Piman Medical Publishing Company Ltd: 165-185.
- RÖNNERSTAM, CECILIA and HÄLLDAHL, LARS (2006). *Nomenclatura et species colorum miniatae picturae: Researching seventeenth-century pigments in Sweden*. The Object in Context: Crossing Conservation Boundaries. Contributions to the Munich Congress 28 August – 1 September 2006. Munich.
- RÖTTER, CAROLIN (2003). 'Auripigment. Genauere Betrachtung eines historischen Farbmittels.' *Restauro* **109**(6): 408-413.
- ROWSON, J. M. (1950). 'An apothecaries' chemistry cabinet.' *Reprinted from The Pharmaceutical Journal and Pharmacist*.
- ROY, ASHOK, Ed. (1993). *Artists' Pigments. A Handbook of Their History and Characteristics. Volume 2*. Washington D.C., National Gallery of Art.
- ROYAL COLLEGE OF PHYSICIANS, Ed. (1618). *Pharmacopoeia Londinensis in qua medicamenta antiqua et nova usitatissima, sedulo collecta, accuratissime examinata ... describuntur. Opera Medicorum Collegii Londinensis*. London, J. Marriott.
- SALMON, WILLIAM (1683). *Doron medicum, or, A supplement to the new London dispensatory [microform] : in III books : containing a supplement I. to the materia medica, II. to the internal compound medicaments, III. to the external compound medicaments : compleated with the art of compounding medicines*. London, Printed for T. Dawks, T. Bassett, J. Wright and R Chiswell : Sold by T. Passinger and T. Sawbridge.
- SALMON, WILLIAM (1691). *Pharmacopoeia Londinensis*. London.
- SALMON, WILLIAM (1693). *Seplasmus : the compleat English physician, or, the druggist's shop opened : explicating all the particulars of which medicines at this day are composed and made, shewing their various names and natures ... in x books*. London, Printed for Matthew Gilliflower ... and George Sawbridge ...

- SALMON, WILLIAM (1701). *Polygraphice: or, The Arts of Drawing, Engraving, Etching, Limning, Painting, Vernishing, Japaning, Gilding, &c. In Two Volumns*. London, A. and J. Churchill, J. Nicholson.
- SAVARY DES BRUSLONS, JACQUES (1759-1762). *Dictionnaire universel de commerce : d'histoire naturelle, & des arts & metiers, contenant tout ce qui concerne le commerce qui se fait dans les quatre parties du monde ... / ouvrage posthume du sieur Jaques Savary des Bruslons ... ; continué sur les mémoires de l'auteur ... par Philemon-Louis Savary ...* Copenhagen, les frères Cl. & Ant. Philibert.
- SCHIEBL, ULRICH (1998). *Techniken der Faßmalerei in Barock und Rokoko: ...daß alles von Bronze gemacht zu sein schiene*. Stuttgart, Enke.
- SCHNEIDER, WOLFGANG (1962). *Lexikon alchemistisch-pharmazeutischer Symbole*. Weinheim/Bergstr., Verlag Chemie.
- SCHRAMM, MARIA and SCHRAMM, HANS-PETER (1999). 'Zum substantiellen Inhalt des Malkastens.' *Beiträge zur Erhaltung von Kunstwerken* 8: 42-43.
- SCHREIBER, CHRISTIANUS ULRICUS (1702). *Resp. Quid pro Quo, seu de substitutis therapeuticis dissertatio. Præs. W. H. Waldschmiedt*. Kiliæ Holsatorum.
- SCHULZ, EVA (1990). 'Notes on the history of collecting and of museums in the light of selected literature of the sixteenth to the eighteenth century.' *Journal of the History of Collections* 2(2): 205-218.
- SCHUPBACH, WILLIAM (1985). 'Some cabinets of curiosities in European academic institutions'. in *The origins of museums. The cabinet of curiosities in the sixteenth- and seventeenth-century Europe*. Eds. IMPEY, OLIVER and ARTHUR MACGREGOR. Oxford, Clarendon Press: 169-178.
- SCHÜTTE, RUDOLF-ALEXANDER (1997). 'The Kunst- und Naturalienkammer of Duke Anton Ulrich of Brunswick-Lüneburg at Schloß Salzdahlum. Cabinet collections, literature and science int he first half of the eighteenth century.' *Journal of the History of Collections* 9(1): 79-115.
- SCHWEPPE, HELMUT (1992). *Handbuch der Naturfarbstoffe: Vorkommen, Verwendung, Nachweis*. Landsberg/Lech, ecomed.
- SHAW, PETER (1747). *A philosophical and chymical analysis of antimony : giving a rational account of the nature, principles, and properties of that celebrated drug,*

its various chymical preparations, and particularly, one that is not only an effectual cure for the present distemper among the cattle, but a preservative from their being infected ... / by an eminent physician. London, Printed for Joseph Davidson.

SHAW, PETER (1755). *Chemical lectures, publickly read at London, : in the years 1731, and 1732; and at Scarborough, in 1733; for the improvement of arts, trades, and natural philosophy.* London, printed for T. and T. Longman; J. Shuckburgh; and A. Millar.

SHAW, PETER and HAUKSBEE, FRANCIS (1731). *An essay for introducing a portable laboratory: by means whereof all the chemical operations are commodiously perform'd, ...* London, printed for J. Osborn and T. Longman.

SHERARD, WILLIAM (1700). 'The way of making several China varnishes. Sent from the Jesuits in China, to the Great Duke of Tuscany, communicated by William Sherard.' *Philosophical Transactions* **22**(262): 525-526.

SHIPTON, JACOB (1699). *Pharmacopoeia Londinensis. Collegii Regalis Londini remedia...cura J. Shipton Pharmacopoei.* London.

SINGER, CHARLES (1948). *The Earliest Chemical Industry: the Alum Trade.* London.

SLOANE, HANS (1700). 'An account of part of a collection of curious plants and drugs, lately given to the Royal Society by the East India Company. A preface to the following account by the Publisher of these Transactions.' *Philosophical Transactions* **22**(204): 579-594.

SLOANE, HANS (1707). *The natural history of Jamaica.* London.

SMITH, GODFREY (1740). *The laboratory, or school of arts: in which are faithfully exhibited and fully explain'd, I. A variety of curious and valuable experiments in refining, calcining, melting, assaying, ...of gold; ... II. Choice secrets for jewellers in the management of gold; in enamelling, ... III. Several uncommon experiments for casting silver,... IV. The art of making glass: ... V. A collection of very valuable secrets, ... VI. A dissertation on the nature and growth of saltpetre; ... The second edition. To which is added, and appendix: teaching, I. The art and management of dying silks, ... II. The art of preparing rockets, ... Translated from the High Dutch.* London, printed for James Hodges, J. James and T. Cooper.

- SMITH, JOHN (1705). *The art of painting in oyl: Wherein is included each particular circumstance relating to the best and most approved rules for preparing, mixing, and working of oyl colours. ... The fourth impression with some alterations and many matters added, which cannot be found in the three former editions. To which is added, the whole art and mystery of colouring maps, and other prints, with water colours.* London, printed for Samuel Crouch.
- SPRING, MARIKA and GROUT, RACHEL (2001). *The blackening of vermilion: a study of the process through the detailed analysis of paint samples.* Deterioration of Artists' Paints: Effects and Analysis. A joint meeting of ICOM-CC Working Groups Paintings 1 & 2 and the Paintings Section, UKIC. British Museum, London.
- STAHL, GEORG ERNST (1723). *Ausführliche Betrachtung und zulänglicher Beweis von den Saltzen daß dieselebe aus einer zarten Erde, mit Wasser innig verbunden, bestehen.* Halle.
- STALKER, JOHN and PARKER, GEORGE (1960). *A treatise of japanning and varnishing, 1688, by John Stalker and George Parker. With an introduction by H. D. Molesworth.* London, A. Tiranti.
- STAPPEL, MATTHIAS (2001). 'Schellack. Eigenschaften, Verwendung, Untersuchungsmethoden.' *Restauro* **107**(8): 596-603.
- STIEB, ERNST W. (1966). *Drug Adulteration, Detection and Control in Nineteenth - Century Britain.* Madison, Milwaukee, London, The University of Wisconsin Press.
- STUKELEY, WILLIAM (1880-5). *Family memoirs of the Rev. William Stukeley.* Durham, Surtees Society.
- STUKELEY, WILLIAM and WHITE, A. H. (ED.) (1935). *Memoirs of Sir Isaac Newton's Life.* London.
- TALLEY, MANSFIELD KIRBY (1981). *Portrait Painting in England: Studies in the Technical Literature before 1700.* New Haven, London, Paul Mellon Centre for Studies in British Art.

- TALLEY, MANSFIELD KIRBY and GROEN, KARIN (1975). 'Thomas Bardwell and his Practice of Painting: a comparative investigation between described and actual painting technique.' *Studies in Conservation* **20**: 44-108.
- TAYLOR, BROOK (1719). 'A new theory for mixing colours taken from Sir Isaac Newton's Opticks'. in *New Principles of linear perspective*. Ed. TAYLOR, BROOK. London: 76-70.
- TAYLOR, JOHN (1637). *The Carriers' Cosmography: or A Brief Relation of The Inns, Ordinaries, Hostelries and other lodgings in and near London; where the Carriers, Waggon, Footposts and Higglers do usually come from [...]With Nomination of what days of the week they do come to London [...]*. London, printed by A.G.
- TOMSKI, HEINZ W. (1976). *A Textbook of Pharmacy Management for Students and Practising Pharmacists*. London, Kogan Page Ltd.
- TORRENS, HUGH (1985). 'Early collecting in the field of geology'. in *The origins of museums. The cabinet of curiosities in the sixteenth- and seventeenth-century Europe*. Eds. IMPEY, OLIVER and ARTHUR MACGREGOR. Oxford, Clarendon Press: 204-213.
- TRAPP, WOLFGANG (1996). *Kleines Handbuch der Maße, Zahlen, Gewichte und der Zeitrechnung*. Augsburg, Bechtermünz.
- TREASE, G. E. (1965). 'Introduction. (Presidential Address)'. in *The Evolution of Pharmacy in Britain*. Ed. POYNTER, F. N. L. London, Pitman Medical Publishing Company Ltd.: 11-16.
- UDWADIA, FAROKH ERACH (2000). *Man and Medicine. A History*. Oxford, Oxford University Press.
- VALENTINI, MICHAEL BERNHARD (1704-1714). *Museum museorum, oder vollständige Schaubühne aller Materialien und Specereyen: nebst deren natürlichen Beschreibung, Election, Nutzen und Gebrauch*. Frankfurt/Main.
- VAN DE GRAAF, J. A. (1958). *Het de Mayerne Manuscript als Bron voor de Schildertechniek van de Barok*. Utrecht.
- VAN DER VEEN, JAAP (1992b). 'Met grote moeite en kosten. De totstandkoming van zeventiende-eeuwse verzamelingen'. in *De wereld binnen handbereik*.

- Nederlandse kunst- en rariteitenverzamelingen, 1585-1735*. Eds. BERGVELT, ELLINOR and RENÉE KISTEMAKER. Zwolle/Amsterdam, Waanders Uitgevers/Amsterdams Historisch Museum: 51-69.
- VAN EIKEMA HOMMES, M. (1998). 'Painters' methods to prevent colour changes described in sixteenth century to early eighteenth century sources on oil painting techniques'. in *Looking through paintings. Leids Kunsthistorisch Jaarboek XI*. Ed. HERMENS, ERMA.
- VAN EIKEMA HOMMES, M. (2001). 'Verdigris glazes in historical oil paintings: recipes and techniques.' *Zeitschrift für Kunsttechnologie und Konservierung* **15**(1): 163-195.
- VAN EIKEMA HOMMES, MARGRIET (2004). *Changing Pictures: Discolouration in 15th to 17th Century Oil Paintings*. London, Archetype.
- VAN GELDER, ROELOF (1992a). 'De wereld binnen handbereik. Nederlands kunst- en rariteitenverzamelingen, 1585-1735'. in *De wereld binnen handbereik. Nederlandse kunst- en rariteitenverzamelingen, 1585-1735*. Eds. BERGVELT, ELLINOR and RENÉE KISTEMAKER. Zwolle/Amsterdam, Waanders Uitgevers/Amsterdams Historisch Museum: 15-38.
- VAN GELDER, ROELOF (1992b). 'Liefhebbers en geleerde luiden. Nederlandse kabinetten en hun bezoekers'. in *De wereld binnen handbereik. Nederlandse kunst- en rariteitenverzamelingen, 1585-1735*. Eds. BERGVELT, ELLINOR and RENÉE KISTEMAKER. Zwolle/Amsterdam, Waanders Uitgevers/Amsterdams Historisch Museum.
- VAN LEEWENHOEK, ANTHONY (1693). 'Observations about the making of cochineel, according to the account of an old Spaniard of Jamaica, that had lived a great many years in those parts.' *Philosophical Transactions* **17**: 502-503.
- VAN LEEWENHOEK, ANTHONY (1704a). 'A Letter from Mr Anthony van Leewenhoek, F.R.S. concerning cochineel.' *Philosophical Transactions* **24**(292): 1614-1628.
- VAN LEEWENHOEK, ANTHONY (1704b). 'A letter from Mr Anthony van Leewenhoek, concerning the tubes or canals that convey the yellow sap in the herb called chelidonium majus, or Calendine, &c.' *Philosophical Transactions* **24**(293): 1730-1740.

- VAN SCHENDEL, A.F.E. (1972). 'Manufacture of Vermilion in 17th-century Amsterdam. The Pekstok Papers.' *Studies in Conservation* **17**: 70-82.
- VENN, JOHN and VENN, J. A. (1922). *Alumni Cantabrigienses. A biographical List of all known Students, Graduates and Holders of Office at the University of Cambridge, from the earliest times to 1900. Part 1: From the earliest times to 1751*. Cambridge, Cambridge University Press.
- VEST, M. and WOUTERS, J. (1999). *Dyestuffs and pigments in 12th to 18th century alum tawed bookbinding leather in European collections*. ICOM-CC Preprints. Lyon, International Council of Museums, Conservation Committee.
- VIGANI, JOHN FRANCIS (1682). *Medulla chemiae*. Gedani (Gdansk).
- VIGANI, JOHN FRANCIS (1683). *Medulla Chymiae, Variis Experimentis aucta, multisq; Figuris illustrata*. London.
- VIGANI, JOHN FRANCIS (1685). *Medulla chymiae*. London.
- VIGANI, JOHN FRANCIS (1687). *Medulla Chymiae jam variis experimentis aucta multisque figuris illustrata*. London.
- VIGANI, JOHN FRANCIS (1693). *Medulla Chymiae, Authore Johanne Francisco Vigani Veronensi. Notis experientia nixis illustrata observationibusque Practicis aucta a Davide Stam, Medic. Doctor. Leidens. Lugduni Batavorum (Leyden), Apud Felicem Lopez*.
- VIGANI, JOHN FRANCIS (1709). *Mr. Vigani, [...], promises to sell unto his Old Customers the Medicines following, at the Prices annexed, from the First of August 1709*. Cambridge, Cambridge University Press.
- VIGANI, JOHN FRANCIS (1718). *Medulla chymiae*. Nürnberg.
- WALLER, RICHARD (1686). 'A Catalogue of Simple and Mixt Colours, with a Specimen of each Colour prefixt to its proper Name: By R. Waller, Fellow of the Royal Society.' *Philosophical Transactions* **16**: 24-27.
- WALLERT, ARIE (1987). 'Natural organic Yellows: Analysis and documentary Evidence'. in *Recent Advances in the Conservation and Analysis of Artifacts. Jubilee Conservation Conference*. Ed. BLACK, JAMES. London, University of London, Institute of Archaeology: 297-302.

- WALLERT, ARIE, HERMENS, ERMA, et al., Eds. (1995). *Historical painting techniques, materials, and studio practice : preprints of a symposium held at the University of Leiden, the Netherlands, 26-29 June, 1995*. Marina Del Rey, CA, Getty Conservation Institute.
- WALRAVE, K. 'Het Hafkenscheidkastje. 320 Verfstoffen uit 1800.' *Teylers Magazijn*: 1-7.
- WATSON, G. M. (1965). 'Some Eighteenth-Century Trading Accounts'. in *The Evolution of Pharmacy in Britain*. Ed. POYNTER, F. N. L. London, Pitman Medical Publishing Ltd: 45-77.
- WEST FITZHUGH, ELIZABETH, Ed. (1997). *Artists' Pigments. A Handbook of Their History and Characteristics. Volume 3*. Washington D.C., National Gallery of Art.
- WHITEBREAD, CHARLES (1936). 'An interesting old Medicine Chest.' *Journal of the American Pharmaceutical Association* **25**(1005).
- WHITING, MARK C. (1988). 'The analysis of madder and related dyes.' *Dyes in History and Archaeology* **7**: 9-12.
- WILLEMIJN FOCK, C. (1992). 'Kunst en rariteiten in het Hollandse interieur'. in *De wereld binnen handbereik. Nederlandse kunst- en rariteitenverzamelingen, 1585-1735*. Eds. BERGVELT, ELLINOR and RENÉE KISTEMAKER. Zwolle/Amsterdam, Waanders Uitgevers/Amsterdams Historisch Museum: 70-91.
- WILLIS, R. and CLARK, J. W. (1886). *The Architectural History of the University of Cambridge*. Cambridge.
- WILSON, GEORGE (1700). *A Compleat Course of Chymistry. Containing near Three Hundred Operations...* London.
- WOOD, GEORG BACON and BACHE, FRANKLIN (1918). *The Dispensatory of the United States of America*. Philadelphia, London, J. B. Lippincott Co.
- WOODCOCK, SALLY (1995). 'The Roberson Archive: Content and Significance'. in *Historical Painting Techniques, Materials and Studio Practice. Preprints of a Symposium (held at) University of Leyden, the Netherlands. 26 - 29 June 1995*. Eds. WALLERT, ARIE, ERMA HERMENS and MARJA PEEK. Leyden, The Getty Conservation Institute: 30-37.

- WOODCOCK, SALLY (1997). 'The Roberson Archive: a colourful past.' *The picture restorer* **12**: 14-17.
- WOODWARD, JOHN M. D. (1695). *An essay toward a Natural History of the Earth, and Terrestrial Bodies, Especially Minerals: As also of the Sea, Rivers and Springs. With an Account of the Universal Deluge: And of the Effects that it had upon the Earth*. London.
- WOODWARD, JOHN M. D. (1696). *Brief Instructions For Making Observations in all Parts of the World: as also For Collecting, Preserving, and Sending over Natural Things Being An Attempt to settle an Universal Correspondence for the Advancement of Knowledg [sic!] both Natural and Civil. Drawn up at the Request of a Person of Honour and presented to the Royal Society*. London, Richard Wilkin.
- WOODWARD, JOHN M. D. (1728-29). *An attempt towards a natural history of the fossils of England; in a catalogue of the English fossils in the collection of J. Woodward, ...* London, printed for F. Fayram; J. Senex; and J. Osborn and T. Longman.
- WOUDHUYSEN-KELLER, RENATE and WOUDHUYSEN, PAUL (1998). 'Thoughts on the use of the green glaze called 'copper resinate' and its colour-changes'. in *Looking through paintings. The study of painting materials in support of art historical research*. Ed. HERMENS, ERMA. Baarn, London, de Prom and Archetype: 133-146.
- WREN, RICHARD CRANFIELD (1975). *Potter's new cyclopedia of botanical drugs and preparations*. Bradford, The Health Science Press.

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