

zennayen

zennayen

zennayen

Laliqueur Alu-
mine'ombe
desma Vaalke
ocla + sur les deuys.



arum naturarum

Drawn up by a learned physician from the mouths of artisans

The Mayerne manuscript revisited

Jenny Boulboullé

In the year 1666, on 23 May, members of the recently established Royal Society of London convened to discuss 'some papers about coloration' that had attracted their attention. The minutes of this meeting have survived in the archives of the Royal Society. They were published almost a century later by Thomas Birch, secretary of the society, with a note that these papers were '[d]rawn up by a very famous and curious physician from the mouths of the most knowing and experienced dyers of England and Holland in his time'.¹ The Royal Society's secretary was very likely referring to Sir Theodore de Mayerne (1573-1655), the same physician mentioned in the well-known *Miniatura, or The art of limning* by Edward Norgate (1581-1650).² Theodore de Mayerne, a Huguenot Protestant born in Geneva, had trained at universities in Germany and France before he immigrated to the British Isles while still in his thirties. He had also served the king of France before he left Paris for London to become first physician to the English kings James I (1566-1625) and Charles I (1625-1649). Throughout his long life, Mayerne enjoyed unequalled fame and wealth as Europe's most influential physician, with a vast European network that extended beyond court circles and medical matters.³ He died in exile in 1655.⁴

In this essay I focus on a manuscript compilation on diverse art and craft technologies that has survived together with Mayerne's medical papers in the special collections of the British Library.⁵ MS 2052, better known today as the *Mayerne manuscript*, comprises more than 300 recipes and technical descriptions, containing detailed handwritten records of artists' manual mastery and artisanal know-how.⁶ The codex opens with a note on a small paper fragment that gave the collection its current title: *Pictoria, sculptoria, tinctoria, et quae subalternarum artium spectantia in lingua Latina, Gallica, Italica, Germanica, conscripta a Petro Paulo Rubens, Van Dyke, Somers, Greenberry, Janson, etc. Fol: no XIX.*⁷ The title resonates with a shortened version that is calligraphed in Mayerne's majestic hand on fol. 2r, underneath which the royal physician added his flamboyant signature and a motto in Greek in a cryptic arrangement of calligraphed letters (fig. 1). The folio bears some resemblance to the calligraphed year-dated title pages that Mayerne added to his medical casebooks in the 1650s, towards the end of his life.⁸

Until now Mayerne's abundant medical note taking and this compilation of art-technological notes have rarely been studied in context. Instead, the historiography of Mayerne's written legacy has resulted in two apparently unconnected historiographies in the history of science

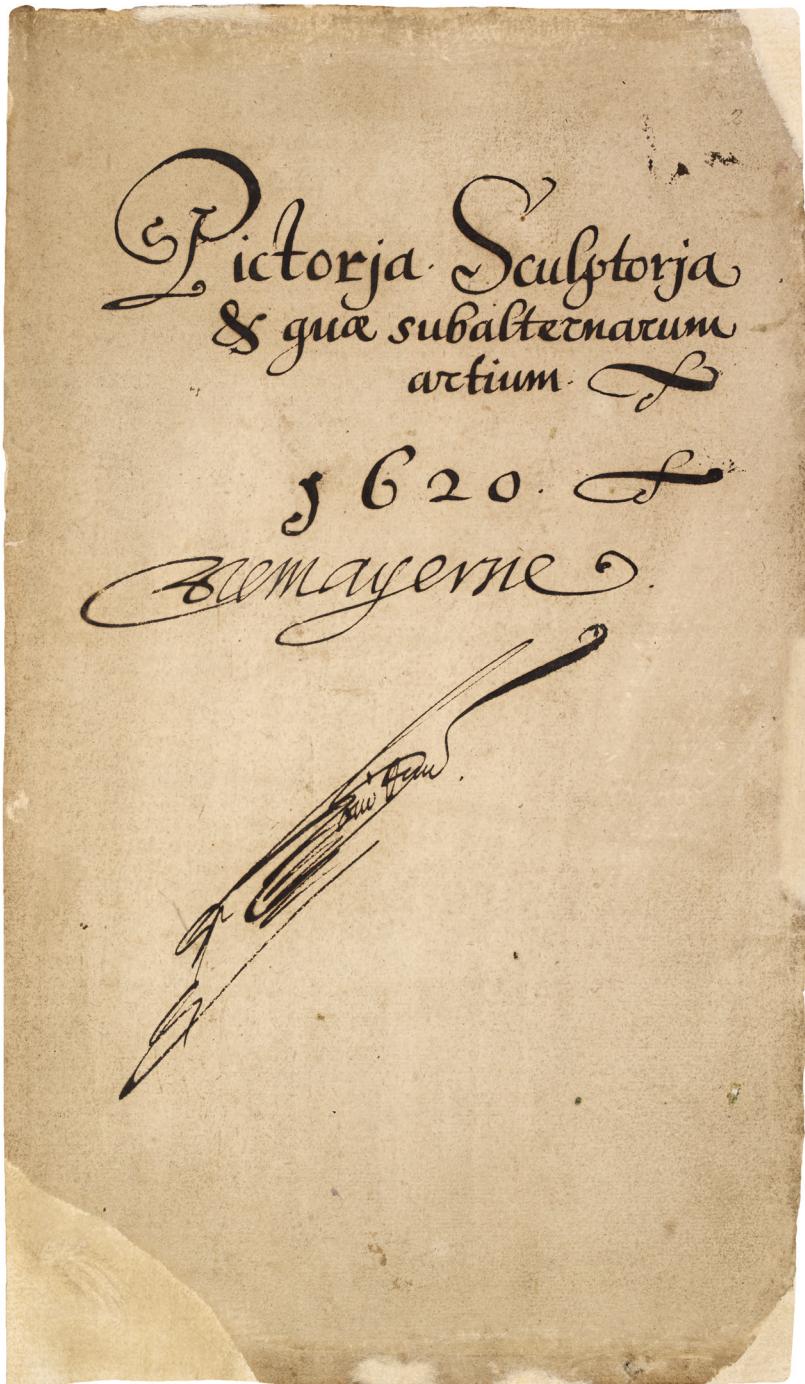
Detail fig. 15

Detail fig. 15

Mayerne's signature and a motto in Greek in a cryptic arrangement also recur on fol. 26r.



MS Sloane 2052, fol. 2r, title page (?) written in Mayerne's hand, London, British Library (photo: © British Library Board).



and medicine on the one hand and art history and conservation studies on the other. In particular, MS 2052 has almost exclusively been studied in isolation, focussing primarily on the art-technological information it contains.⁹ A study of this historical and epistemic artefact in its own right and in context of early modern scholarly manuscript culture is still lacking.

Today MS 2052 is considered one of the most important art-technological source texts, in particular with regard to seventeenth-century oil-painting techniques. Generations of conservators and art historians specialising in Netherlandish oil painting have studied Mayerne's manuscript -- in modern print editions -- to gain a better understanding of the much-admired masters of the 'Flemish hand': Paul van Somer (c. 1576-1622), Peter Paul Rubens (1577-1640), Daniel Mytens (c. 1590-1647), Anthony van Dyck (1599-1641), and Rembrandt van Rijn (1606-1669), many of whom were active at the English court in Mayerne's time.¹⁰

As a much-consulted source for the study of seventeenth-century artworks, MS 2052 seems to have answered as many questions about historical painting technologies as it raises about its own making and history. In the last century the *Mayerne manuscript* was closely studied by conservators and technical art historians, who garnered a wealth of information on historical art and craft technologies from its many records.¹¹ On the other hand, historians have found so far no direct internal or external historical evidence that would explain why and for what use this compilation was made, kept, and maintained. Many puzzling questions concerning its making have remained. This essay focusses on *how* the practical knowledge and artisanal know-how that this manuscript embodies was amassed. In what follows I attempt to reconstruct the methodological toolkit that Mayerne mobilised to learn *from and with* artists and craftsmen the tricks and secrets of their trade. The main questions that I address are the following: What does this manuscript tell us about how Mayerne studied colour technologies and craft practices? How did Mayerne collect, compile, organise, and engage with artisanal knowledge from living and textual sources? What kind of means and methods did this learned physician use to convey – in manuscript – the (unwritten) knowledge of skilled artisans?

In the first part I present an analysis of manuscript folios to show how Mayerne collaborated with artisans and conducted fieldwork to learn from artisans, including onsite observations, artist's interviews, and his own experimentations based on information he obtained from artists and craftsmen. I argue that it is misleading to associate this manuscript compilation with only one authoritative voice – as its popular name, the *Mayerne manuscript*, suggests – and instead discuss it as a polyphonic project.

In the second part I closely examine folios that document technical knowledge collected from master painters and that have been heavily annotated by Mayerne himself. I explore how the hand of the compiler and annotator contributes to the construction of a voice of authority on art and colour matters that is based on hands-on expertise, practical experience, and *in situ* observations. Moreover, my findings suggest that Mayerne drew on methodologies to organise, arrange, and transmit bodies of knowledge that have a long tradition in medical writing, extending back to Arabic manuscript transmission of ancient knowledge to the West. Based on a contextual and comparative analysis, I argue that Mayerne contributed to a textualisation of artisanal know-how and that his manuscript notes testify to his effort to integrate the voices of

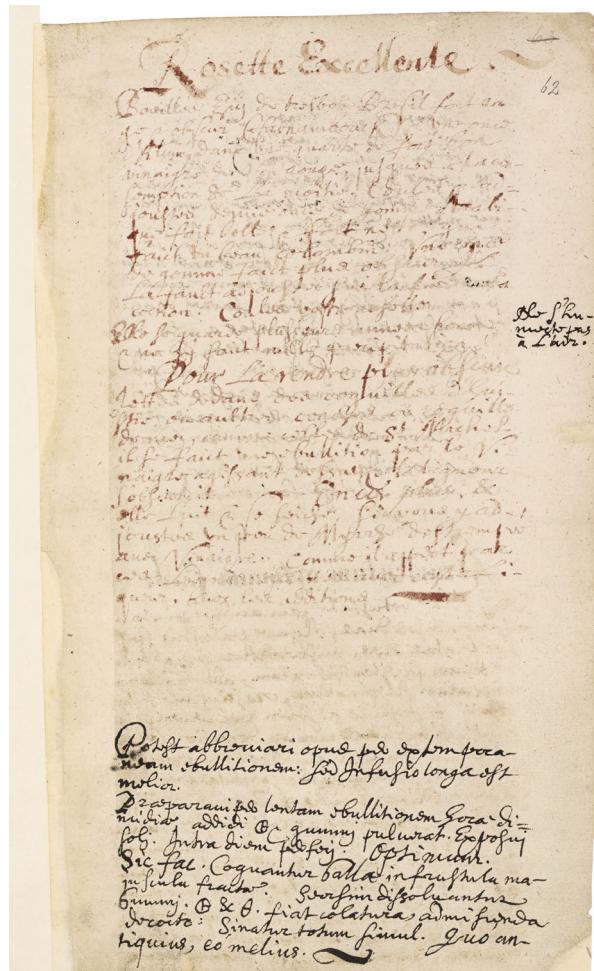
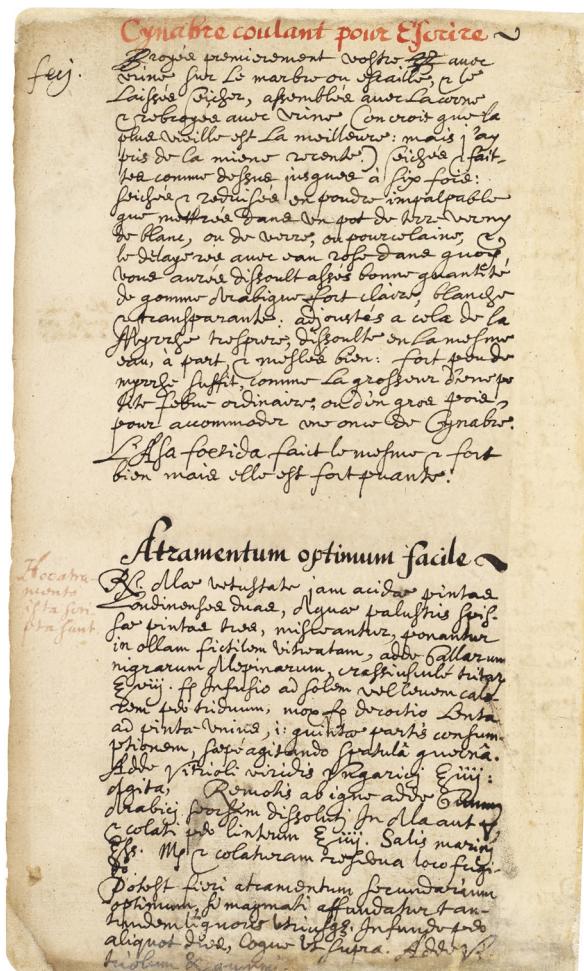
living sources into the text-based episteme – still dominated by ancient authorities – of his time. In the final part I address overlooked issues that demand further research: building on recent studies of his medical note-taking activities, I offer a *speculation*¹² on Mayerne's motivation for this art-technological project and, in particular, the historical function and aim of this manuscript compilation.

MS 2052 and the genesis of the *Mayerne manuscript*

The manuscript MS 2052 is a heterogeneous composite of paper sheets in various sizes. The total of its 170 folios was bound into book format after Mayerne's death.¹³ It contains notes written in different hands in European vernaculars and Latin. The recipe entries are often richly annotated in black and red inks. The sheets occasionally contain drawings of painter's tools and a series of eye-catching colour samples with captions in a German hand, as well as samplings of a variety of coloured inks for writing and drawing (figs. 2a, 2b, 2c). The manuscript contains no preface, dedication, table of

2a-b

MS Sloane 2052, fols. 61v-62r, ink recipes
apparently written in Mayerne's hand with
self-made red and black inks, London, British
Library (photos: © British Library Board).



contents, or index. Its current shelf number, MS 2052 on fol. 1r, might have been added in the eighteenth century by Sir Hans Sloane (1660-1753), who purchased it probably together with the bulk of Mayerne's papers in 1712.¹⁴

The double pagination in pencil on the top right of the recto is of a later date; the original chronology is unknown.¹⁵ Mayerne's hand has been identified on both the first and the last dated entries, which provide the internal evidence that the note collection was compiled by and for Theodore de Mayerne over a period of more than 20 years between c. 1620 and 1646.¹⁶ However, the collection also contains many undated sheets, like the aforementioned iconic colour samples, that could have been added earlier or later by Mayerne himself, by his amanuenses, or by other hands before the compilation was bound into its current codex format. Mayerne's



2c

MS Sloane 2052, fol. 81v, undated folio with colour sample and captions in an anonymous German hand, London, British Library
(photo: © British Library Board).

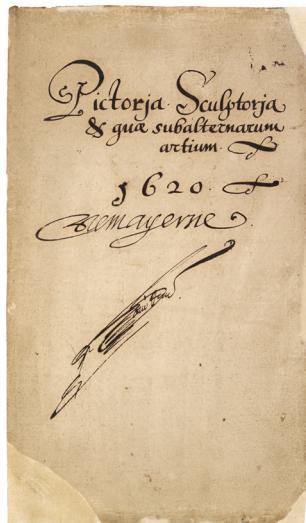


fig. 1 its current title page



fig. 15 one of the last dated sheets



Detail of fig. 15 one of the last dated sheets

calligraphed signature and motto on its current title page display striking similarities to one of the last dated sheets, on which Mayerne recorded on 5 November 1646 colour experiments with an ink made from bilberries and expressed his intention to make further trials.¹⁷ Mayerne left no other records in which he claims owner- or authorship of this manuscript collection, nor do we have any other external historical documentation that links the compilation to his name.¹⁸

The manuscript MS 2052 was fused to Mayerne's name only after its 'rediscovery' in the nineteenth century when Sir Charles Eastlake (1793-1865) and the German painter Ernst Berger (1847-1919) published the first translations and transcripts from it.¹⁹ Eastlake is the first who refers to this source as the *Mayerne manuscript*, in his *Materials for a history of oil painting*, published in London in 1847. But it was the German editor and translator Berger who provided in 1901 a full transcript of the *Mayerne manuscript*, for the first time translated in its entirety.²⁰ With these editorial gestures, authorship was construed and tied to one name: in the hands of Eastlake and Berger the *Mayerne manuscript* became an art-technological factum.

Charles Eastlake describes the unearthing of MS 2052 from the archival bowels of the British Museum and provides evidence for attributing this exceptional find to the hand of Sir Theodore de Mayerne. He portrays the author of the manuscript as a modern chemist *avant la lettre*, whose name 'appears with honour in the history of chemistry' and who 'combined a love of art with a scientific knowledge applicable to its mechanical operations'.²¹ Eastlake's retrospective 'scientification' of Mayerne, the Paracelsian 'chymist' and physician, provides a strategic role for the *Mayerne manuscript* in the 'scientification' of art-technological research in the nineteenth century. In Eastlake's account primacy is given to the analytic gaze of the chemist above the skilled hands and practical expertise of Baroque master painters. Eastlake's 'rediscovery' of MS 2052 involves a reassessment of Mayerne's legacy: it is now the physician who enlightens the artisans. In Eastlake's reading, 'His [Mayerne's] knowledge of painting, and remarkable predilection for investigating its technical processes and materials, were of great service to the artists with whom he was in conversation'. It is, therefore, not surprising 'that, in return for the useful hints which he was sometimes able to give them, they should freely open to him the results of their practical knowledge'.²² Knowledge transfer and claims of art-technological expertise are basically reversed in Eastlake's reception. A reductionist and anachronistic reading à la Eastlake pays little attention to the conspicuous heterogeneity and art-technological diversity of this collection. And more importantly, it obscures the wealth of means and methods that the compiler of this fascinating collection mobilised to learn from artisans.

Recent scholarship has emphasised the importance of colours in every realm of early modern Europe's societies, be it cultural, political, economic, or natural philosophical.²³ It is against this background of colour's pervasiveness in early modern worlds and artisans' skilled expertise in colour matters that I try to make sense of this important art-technological compilation that has traditionally mainly been studied in context of oil-paint medium debates.²⁴

An acute concern for colour technologies was not uncommon among members of the English court. Edward Norgate's detailed treatment of colour techniques for use on paper and parchment, which he wrote upon Mayerne's request in the 1620s, was, for example, avidly read and copied by a close-knit community of English nobility and gentry.²⁵ Norgate, who – like Mayerne – worked for English kings and aristocracy, portrays his foreign 'friend' in his *Minatura* as an 'ingenious Gentleman' and 'learned Phisitian' whose desire was 'to know the names nature and Property of the severall colours of Limning commonly used by excellent Artists of our Nation' and who was eager to learn from the hand of an accomplished limner and English virtuosi 'the Order to be observed in preparing, and manner of working those Colours soe prepared'.²⁶

An art-technological polyphony

The collected notes comprised in MS 2052 relate to diverse artisanal practices and techniques, including instructions for the preparation of pigments, inks, dyes, and oils with particular handling properties and the creation of visual effects with paint applications, varnishes, and gilding techniques.²⁷ Among these we find, for example, a painter's trick for painterly imitations of gemstones (*doublets*) 'with tears of dragon's blood' - a red resin that, Mayerne notes, 'can be easily purchased at the druggist',²⁸ and a description of different technologies to attain *l'esclat d'or*, roughly translatable as the visual effect and luminous shine of golden surfaces.²⁹ Also found are numerous instructions for making and preparing pigments and colourants from raw materials, such as plants, stones, and metals – compiled from written and living sources. It also contains many recipes for diverse writing, drawing, and paper/parchment technologies,³⁰ instructions related to engravings and prints,³¹ and a miscellany of observational records and recipes for manipulating, amending, or improving properties of materials – for example, varnishes for making textiles water-resistant,³² and treatments for cleaning and restoring damaged or stained papers and canvases.³³ Last but not least, we can discern in the many hands that contributed to this collection a shared and active interest in hands-on experimentation geared towards modification, manipulation, alteration, and/or transformation of material properties or applications for courtly or genteel as well as profitable uses.

With its distinct features and in its material richness, this historical artefact and manual product testifies to a laborious and time-consuming process of collecting, recording, organising, annotating, assessing, and augmenting information related to artisanal practices and products. Moreover, art and colour technologies are not only described in it but also experimented with, demonstrated, and displayed on its folios. The compiler's voice is abundantly present in the manuscript: palaeographic analyses have identified Mayerne's hand on many of its folios – often conspicuously visible in annotations and commentaries added in scarlet-red ink.³⁴

MS 2052 comprises correspondence and notes written in different hands, among which is a long letter by Mayerne's fellow countryman the painter and enamellist Jean Petitot (1602-1665), dated 14 January

1644 and addressed to 'Monsieur le Chevalier de Mayerne, Baron d'Aubonne et premier Medicin du Roy & demeu[ran]t en St. Martin Lane A Londre'.³⁵

From the surviving correspondence we get the impression that Mayerne actively took part in an economy of artisanal secrets. In this letter, Petitot responds, for example, to Theodore de Mayerne's request to inform him about his experiences with a varnish used by painters and for making water-resistant textiles and leathers – of special interest to militaries and soldiers. The letter contains a detailed description of Petitot's working experiences from making and using this varnish, and recommendations to improve the process: he advises to make greater amounts at once for bigger patches of canvas cloth and highlights the importance of 'l'experience' to bring the amber varnish production to perfection. Furthermore, he intimates an idea for a much-needed invention, a soft glue (*colle bien souple*) to impregnate the canvas prior to applying the (coloured) varnish. Petitot points out that this could keep the canvas light and might prevent it from taking up too much colour. Finally, he encourages Mayerne to further explore this issue in his own varnish experimentations.

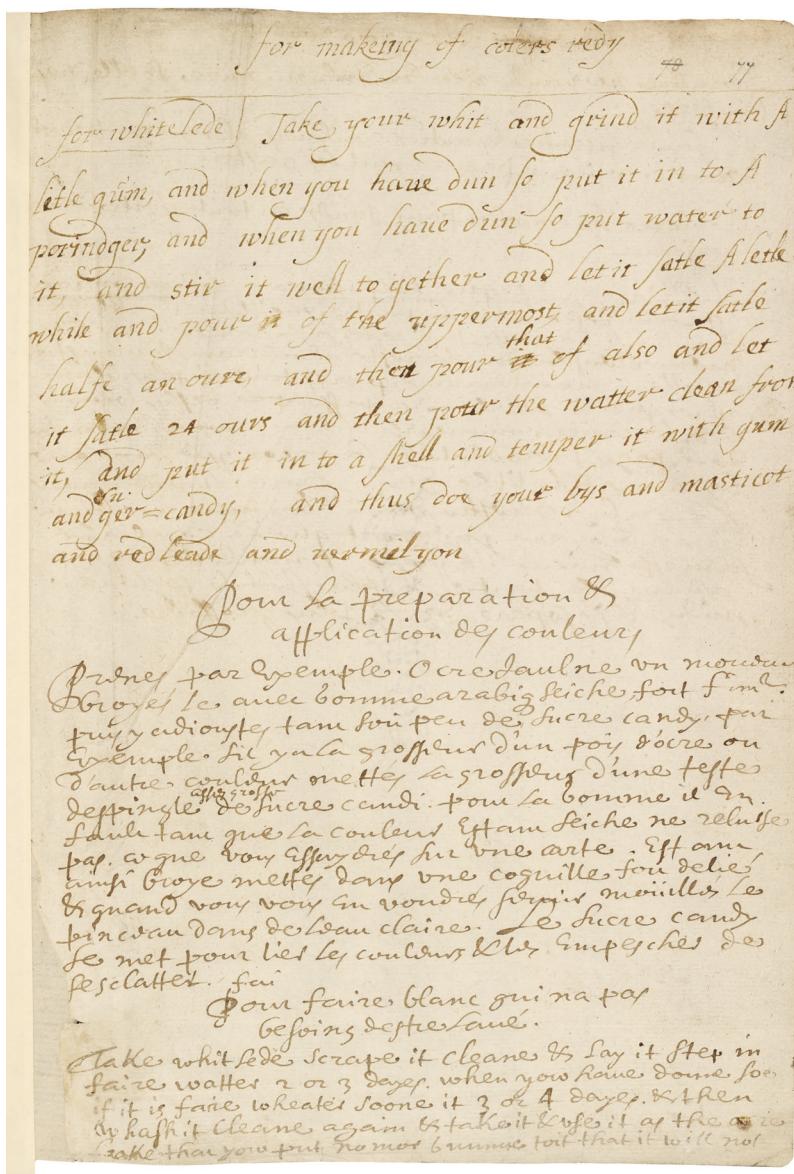
Other entries collected from practitioners, in their own hands, include a recipe 'For making of colors redy' by the English miniaturist Samuel Cooper (fig. 3). More complex instructions for time-consuming and laborious procedures to transform a precious stone into an even more precious blue pigment were meticulously put into writing by the Netherlandish portrait painter Cornelius Jansen, active at the English court under the reign of James I. These recipes for 'drawing azure ultramarine out of Lapis Lazuli' and diverse manners for making 'very faire' artificial azure that 'when set in hot horse dung for a month provet excellent (...)' span several folios.³⁶

Not all recipes are written in the hands of painters and craftsmen. Mayerne added many entries himself, and scholars have also identified the handwriting of his son-in-law and medical apprentice John Colladon (1608-1675) on numerous leaves.³⁷ For example, on folio 42 the 'Procedure of the painter to draw on parchment, & to work [on] it with a quill and with a lead [pen]' is recorded in Colladon's hand.³⁸ On the top right we find a note in red supplying the personal and geographical information that identifies a living source in the Netherlands, apparently added later by Mayerne (fig. 4).

Many of the manuscript notes are collected from the mouths of a variety of experts, among which are the multi-skilled serviceman 'Capitain Salle'³⁹; a German apothecary⁴⁰; an excellent instrument maker, from whom Mayerne obtains the recipe for an amber varnish for lutes⁴¹; and the tinsmith who makes his profession and trade from gilding varnish.⁴² Mayerne's polyphony of skilful practitioners is remarkably oblivious to societal hierarchies and linguistic borders and includes many notes in artisans' native tongues.⁴³ The manuscript also gives voice to "subaltern" workers' active in the artisanal trades that flourished under Caroline reign.⁴⁴ For example, on another folio we find instructions 'for correcting the smell of oil used to treat leathers and textiles' with a prompt in Mayerne's hand – 'Have a look at the goat leather [industry]⁴⁵ – to explore these 'secrets' at artisanal production sites. The detailed documentation of craft practices through first-hand observations by Mayerne and his collaborators provides

textual records of practitioners' expertise that was not commonly shared in writing. Many of the entries offer insights on how Mayerne went to work to amass all sorts of artisanal know-how. We can discern a variety of recordings, including observational reports, extracts from conservations with master makers, and detailed descriptions of experimentations with collected recipes.

It is unlikely, though, that Mayerne had visited all sites of artisanal production himself, especially towards the end of his life when corpulence and old age kept him at his desk (fig. 5). The manuscript also contains descriptions of experiments in other hands, suggesting that others were involved in recipe trials and record keeping of further experimentations, most importantly his right-hand man, John Colladon. Perhaps we can best

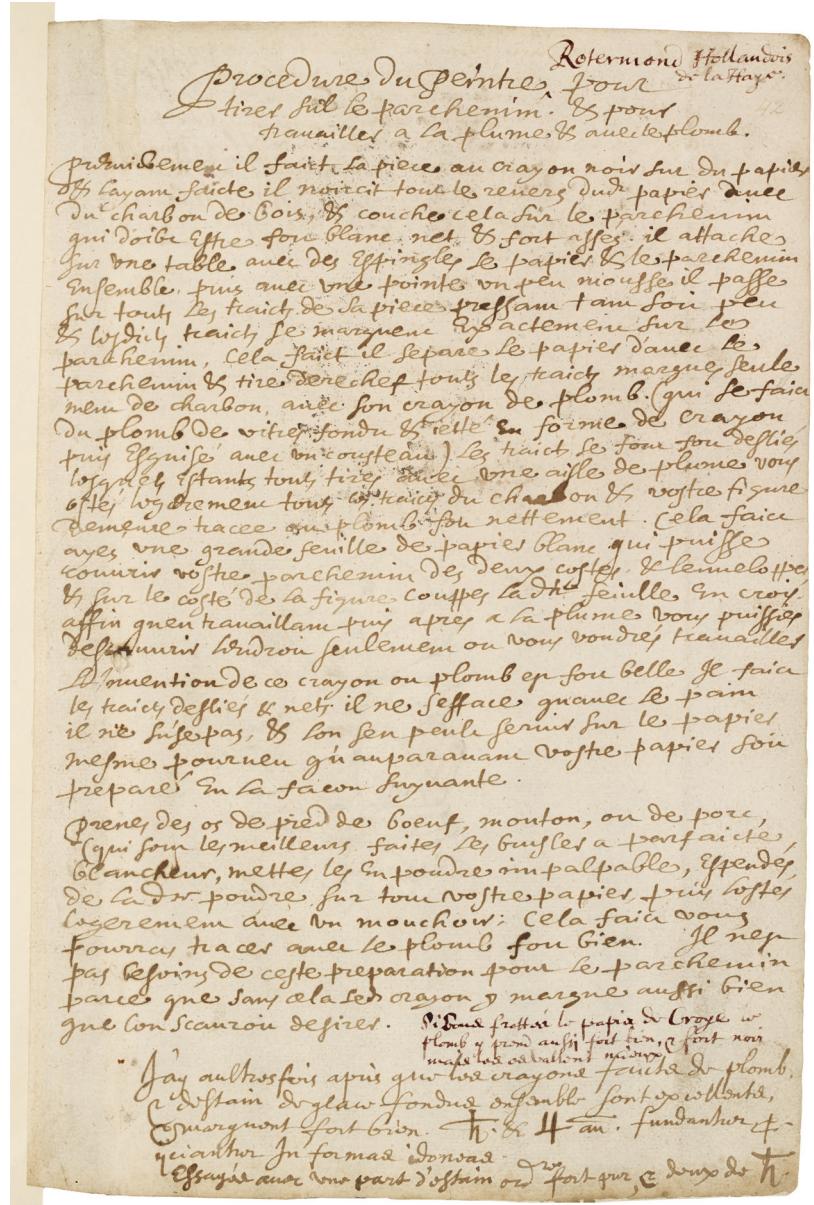


3

MS Sloane 2052, fol. 77r, *For making of colors redy*, entry at top of the folio identified as Samuel Cooper's hand; the following French and English entries are written in a different hand, most likely by Mayerne's assistant John Colladon, London, British Library (photo: © British Library Board).

4

MS 2052, fol. 42r, 'Procédure du Peintre pour tirer sur le parchemin, & pour travailler à la plume & avec le plomb', hand ascribed to John Colladon; addition in the top right corner in red ink probably in Mayerne's hand, 'Rotermond Hollandois de la Hayes' (photo: © British Library Board).



envision Mayerne's engagement with the arts and crafts of his time as a necessarily collaborative project, similar to the explorations and descriptions of foreign artisanal cultures and craft practices that we encounter in early modern travel accounts and humanists' scholarly projects.⁴⁶

A keen interest in artisanal cultures and their processes of making was not exceptional among Renaissance scholars and the learned virtuosi of the early modern period. We can situate the thirst for information and abundant note taking to which Mayerne's compilation testifies within the flourishing cultures of humanism and antiquarianism. From recent studies of surviving paper archives, compiled between the sixteenth and mid-seventeenth century, we know that the interest of humanists and virtuosi

and their scholarly efforts were by no means restricted to the textual and material remains of ancient Graeco-Roman cultures.⁴⁷

The manuscript notes bundled in MS 2052 testify to a keen interest of its compiler in particular technologies and materials. Conspicuous, for example, is the painstaking scrutiny Mayerne devoted to his research into 'vernix', a notion that was used in the early modern period for a variety of resinous and resin-like materials, many of which were used to make varnishes for diverse applications. In what follows I discuss examples of Mayerne's zealous study of *vernix d'ambre* (amber-varnish technologies) that extended over a period of more than 10 years, starting at the beginning of 1631 or earlier and holding his attention at least until 1644.⁴⁸ Amber was certainly well known to the royal physician as a drug (component) and ingredient in cosmetics, listed e.g. in the catalogue of simples in the Latin edition of the *Pharmacopea Londinensis* (1618) and in Nicholas Culpeper's (1616-1654) *A physicall directory* (1649).⁴⁹ Most likely, Mayerne was also familiar with the natural historical work on amber by his predecessor William Gilbert (c. 1544-1603) who, like Mayerne later, built a profitable medical practice as royal physician (in Gilbert's case, to Elizabeth I and James I) and from his services to London's genteel elite. Gilbert discusses in his book *De magnet* ([1600] 1901) the static electricity that can be observed by rubbing amber, the same fossilised resin that was so intensively explored for its artisanal properties by Mayerne.⁵⁰

In what follows I focus on 'para-technical' information that Mayerne added to a series of recipes concerned with artisanal amber technologies – for example, dates, locations, names, and/or professions of interviewees and observed practitioners. I also analyse the *mise-en-page* of collected recipe entries, marginal notes, and annotations, as well as the use of linguistic constructions and literary strategies. The complex question of why Mayerne was particularly interested in amber technologies certainly demands further research, especially the economic context, but is not the topic this essay.⁵¹

The folios on amber-varnish making and varnish applications reveal much about Mayerne's learned methodologies for obtaining, accumulating, managing, layering, and digesting artisanal know-how. On fol. 43 we find a recipe for the 'The True Amber Varnish' and on its verso for 'The True Varnish for Lutes & Viols'.⁵² Mayerne notes that the latter derives 'nota bene from an excellent lute maker', who is identified in a marginal note on the top left as 'Mr. De la Garde'. Mayerne meticulously noted the instrument maker's advice in the margin: 'To make it good don't add more than 3-4 pieces of amber at once' on a fire of medium heat 'to smelt it without burning'.⁵³ Mayerne included more oral accounts drawn up from the mouths of artists, such as the 'True description of *Vernix d'Ambre* & from China as Jehan Haitier dictated it to me' on a folio dated 9 March 1633.⁵⁴ Haitier's name recurs on fol. 49, where Mayerne echoes the authoritative voice of the master: 'To make it good, one has to melt the gomme Lacque with the melted Ambre, in the manner of Haitier & make the rest well and truly'.⁵⁵ On the verso of the previous folio (fol. 48v), Mayerne reports on his own trials in an entry dated 8 February 1631 and marked with Mayerne's initial M (fig. 6).⁵⁶



5

Attributed to Jean Petitot, *Portrait of Sir Theodore de Mayerne*, 1640(?), enamel on copper, 41 x 35 mm oval, London, National Portrait Gallery (photo: National Portrait Gallery).

Vernix d'Ambre 8 febr. 1631

M. J'ay pris du Carabi tressubtillement puluise, et l'ay broyé sur le marbre premièrement avec de l'huile d'Afrique, et un peu d'huile blanche de Charente. Deuxièmement par disoudre, j'ay ajouté un peu d'huile de selle ou huile de Carabi qui incontinent a perdu le corps. J'ay ramassé le tout avec une cuve, et dans une cuvette l'ay porté sur le feu fort petit, et adjoustant un peu de vernis commun des menuisiers, seulement pour faire corps, et tenir l'evaporation de l'huile de selle distillée suffisante. Apres avoir bouilli tant fort que le Carabi soit entièrement dissous, en remuant touzjours, j'ay adjousté force de feu de l'huile de Charente, et ay en un vernis assez liquide, un peu trouble, et maigre qui estoit fort bon.

Pour le bien faire je pourrois faire infuse **#**
Il fault ou **l**'ambre quelquejoure dans du tresson **V**,
tressel ou huile **V** prue apres le broyer avec de sa propre huile,
ou huile d'Afrique ou huile de Charente **C** de
Charente, Apres y adjouster de l'huile de noix
ou de l'huile cuite avec l'huile d'Afrique, ou bien avec huile
ficee au Soleil. **L**o tout bien mis a lait
mis sur le feu, et on bouillant l'ensemble soit dis-
solution parfaite procurée, apres laquelle on
pourra donner confiture suffisante a plaisir
avec le vernis des printres composé de Charente de Veneise, et d'huile blanche de Charente.
ana.

Dautant que ce vernis est fort ficeatif, il
n'en fault faire qu'un pour l'usage present, le
souvent a mesme qu'on en aura a faire. Et
pour avoir estoit d'ambre touzjours, preste
de la ficeation parfaite, il faut faire
en un tresson, arrondi et parfaitement imber
de sa propre huile, qui par lape de temps on
aura dedans son corps, et l'huile parfaite-
ment, le rendant plus ficeable des autres
façons suffisantes.

Laissez le tresson de soy mesme faire l'affroide
d'infus. Son au Soleil.

The heading of the true amber varnish recipe on fol. 43r is remarkable, though not exceptional in this collection, for the detailed information it contains on how the ensuing recipe had been procured. Mayerne titled it 'The True Varnish of Amber as below, as it has been made in his presence & written down while it was made, by Joseph Petitot, who gave it to me'. He also placed a Latin note in red in the margin with an editorial reminder: 'NB. Ultima dictatio fac' (fig. 7).⁵⁷ This folio provides an excellent example of Mayerne's method of collecting eyewitness accounts from living sources. The title informs us that the recipe had been recorded by the above-mentioned painter Joseph Petitot. The heading frames the recipe as a first-hand observation and claims authority and authenticity: the same man who witnessed the making of this genuine varnish wrote down these instructions and – note well – not from memory, but while it was prepared, 'in his presence'. Mayerne consciously includes here the voice of the messenger in the written record. The observer is identified as a well-known artist, favoured at the French and English courts for his exquisite miniature portraits executed in enamel. Petitot's name gives the voice authority, ascribing it to the skilled hand of a master miniaturist, and not the invisible hands of anonymous amanuenses.⁵⁸

The epistemic discourse connected to amber in early modern scholarly discourse is noteworthy. Perhaps the idea of 'vernix d'ambre' as a particularly versatile material might have spoken to the imagination of early modern scholars in more ways: by the seventeenth century, amber had a longstanding reputation as precious gem, protective amulet, and powerful *materia medica*. Known to Pliny the Elder (23-79 CE), and a frequent component in Arabic pharmacology, it was prized by early moderns for its aesthetic and medicinal properties, most famously perhaps as a frequent ingredient in late medieval plague remedies.⁵⁹ The inclusion of vegetal ambers in sixteenth- and seventeenth-century collecting cabinets testifies to its appreciation among noblemen and prestige in learned circles.⁶⁰

Mayerne's royal predecessor, the above-mentioned physician and natural historian William Gilbert, also attests to amber's great reputation in scholarly discourse. 'Celebrated', he writes in *De magnete*, 'has the fame of the loadstone and of amber ever been in the memoirs of the learned'.⁶¹ The electrostatic properties of amber had already long been known, including by the Greeks who named it *electron*, 'because it attracts straw to itself, when it is warmed by rubbing', as Gilbert writes.⁶² He lists more historical names before he goes on to discuss the material's conspicuous 'powers of attraction', including the Latin *succinum* and the Arabicised and later Latinised Persian denomination *karabe*, in the French vernacular adapted as *carabé* – a term that recurs 10 times in MS 2052 (fig. 8).⁶³ Gilbert notes that amber was known as a popular panacea and comments, rather sceptically, on the uses of loadstones and ambers in learned debates.⁶⁴ Interestingly, his discussion suggests that amber was associated in medical and natural philosophical discourse with an extraordinary testimonial authority that could be mobilised to support one's case without any further explanations.

The aforementioned amber varnish trials that Mayerne conducted himself were followed up a few months later with further experimentations

6

MS 2052, fol. 48v, 'Vernix d'Ambre 8 febr. 1631', documentation of making amber varnish, written in Mayerne's hand, with a heading in red ink and in the top left margin Mayerne's calligraphed initial 'M'. (photo: © British Library Board)

⁷
MS 2052, fol. 43r, 'Le Vray Vernix d'Ambre de
Dessou/ comme la fait en sa presence/ &
escrit en le faisant Joseph Peti-/ tot, qui me l'a
donné', with a marginal note on the top right
in red ink: 'NB./ Ultima/ dictatio/ fac.' (photo:
© British Library Board).

Le Vray Vernix d'Ambre de Desso ⁴³
comme la fait en sa presence
Et écrit en le faisant Joseph Peti. **NB.**
tot, qui me l'a donné. *Verna dictatio fac.*

Sur Epij d'huile de lin fault 6 gros. i. 30ij
d'ambre, & $\frac{3}{4}$ i. 30ij de sandare-
cha ou gomme de genou. *Le tout bien mal-*
urifi; *Vous prendrez vostre huile de*
lin et boire Ambre gew-mettez dans un pot
de fer ou de cuivre qui soit un peu Gaulx
et froid d'intérieur (comme en un auquel que
on frigo le fera faire) et mettrez vostre
pot sur un feu de charbon, le laissant bouil-
lir auison domir lour, jusques à ce que
voyez que grose fumée s'evaper
et fort puante: lour vostre Ambre sera fon-
du. Vous le retirerez du feu, si vous
le voudrez espaisir mettez le dans un
plat sur un petit feu, et le laisserez faire
tempé que il deguise le graissure qui bon
plais; quand le aingi en cette confi-
rence, quand vous le voudrez avoir
plus liquide, mettez le sur le feu dans
un peuillot de fer, auquel un peu d'huile
d'ambre, ou huile de charbonniere, et le
faire si clair que vous voudrez.

Il appaist comme degne un plat de laze-
rue, coulé de laissure de trois lignes
mettre le plat sur une gaudre, 42. 18. 24
lignes, et les larmes ayant donee à la confi-
rence, et qui appaistez. *Enduire au froid, et*
couler le, et recouler en bouillie ou en friture
un maydalton, jusqu'quand bonne voulendre
le faire pour graue a la ferme faire, sauf que
ne plante de cuivre, faittre le vernis pardessus
il est fondre. Espendre le organique avec un plume-
et faire selon tant. Et. Vostre cy deuant.

recorded by another hand: 'My experiment on the preparation of Vernix d'ambre executed on 16 July 1631'. The report of this experiment covers one and a half folios and is followed by a subheading, perhaps added by Mayerne or one of his assistants: 'Speculation on diverse compositions of varnish'; yet this half folio remained blank.⁶⁵ The blank space below the subheading might suggest that the manuscript compiler added titles for subsections beforehand, which he planned to fill in later – a method typically used in commonplace books (figs. 9a, 9b).⁶⁶

Diverses descriptions de Vernix.

Vernix d'Ambre. Succinum.

Ambre ne se disoult pas dans le Bistrol comme
j'ay expérimenté, ainsi je caillotte, et quand bras
l'applique sur quelqu' chose, l'huile s'embout, et
l'ambre de meurt blanc, et ne fait rien qui vaille.
Avec l'huile d'Alpuc il se disoult mieux, mais le
meilleur inconvenient c'est qu'il se laisse
pas comme une croûte qui grange tout.
Il faut avoir une liqueur plus épaisse qui tient
en l'ambre fonds, et qui se brise quand il est
doucement touché deux transparente chose comme
j'ay trouué la description de ce Vernix
dans les commentaires sur la pothie Chirurgi-
que de Paracelse. *Vol. 2. fol. 44r. 1611.*

P. Carabe tritum optimi, et in vase coquido sofi-
tum, igni lento percolatum liquefiat. Cum Lqua-
ri indeposit statim in seco et gressu hinc vasa
coquido, et quiescat. Postmodum addit plus Chere-
bentina, et sic donec per se partis sensu au-
fendo, donec in eis Carabe sint. *Etij Chro-
zaw. fiat Balsamum indorum celestium es-
tidum, ex filamentis carptis. Si sit durus, addit
Olerum Linij.*

M. J'ay disoult de l'ambre preparé dans de
l'huile blanche de Cherebentina. C'est ay adjoust
environ la 4 partie de Cherebentina, et ainsi
ay fait le Vernix qui s'égoutte bien, *Etij Chro-
zaw. mandat apres lentement.*

Pour bien faire à mon avis ce Vernix fait
disparo comme s'enfuit. Prenez Ambre fort
bolle reduite en poudre impalpable, et preparer
la boite doulce sur le corps grasse avec l'essent de
l'huile blanche de Cherebentina, met
les en digestion sur table en le vaisselle de
rencontrer, bien tenu avec de l'huile et blanc d'oeuf
donnée d'abord moderement jugeant à tant que

8

MS 2052, fol. 44r, *Diverses descriptions de
Vernix. Vernix d'Ambre. Succinum*, heading
in red ink and in the margin, Mayerne's
calligraphed initial 'M' (photo: © British
Library Board).

The manuscript in context

Profuse, if not obsessive note taking was certainly not uncommon among the scholars and gentry of Mayerne's generation and was continued on a vast scale in the seventeenth century on both sides of the Channel. Early modern virtuosi accumulated extensive and diverse paper archives in the course of their lives that testify to a flourishing and expanding scribal culture and an increasing demand for diverse paper and writing technologies

in Mayerne's lifetime. It is important to note that this compilation of art-technological notes took shape in a period in which print culture was rising but still coexisted with a rich manuscript culture.⁶⁷ Close attention to formal and linguistic features is therefore of equal importance when analysing scholarly works written in manuscript as it is for those published in print.

We can argue, for example, that the conspicuous mix of European vernaculars and Latin on many of the folios written or annotated in Mayerne's hand is not coincidental but testifies to a time of transition in scholarly uses of Latin and the vernacular. Sietske Fransen has shown that for the first half of the seventeenth century Latin lost ground in Western Europe as the primary language for epistemic writings and natural knowledge text production, while the European vernaculars gained status as acceptable idioms for scientific discourse. Late sixteenth- and early seventeenth-century multilingual authors, educated in Latin, started to choose more frequently the vernacular when they published their work. The sixteenth century also saw an explosive rise in printed recipe compilations of great diversity, including medicinal and artisanal recipes for courtly and quotidian uses, many of which draw from Latinised traditions of compiling, writing, copying, translating, and transmitting recipes in medieval monastery contexts. In books of secrets and herbals, Latin nomenclature was also often inserted by publishers or translators next to local denominations for plants and other natural materials.⁶⁸

While Latin's impact on learning continued throughout the sixteenth and early seventeenth century with Latin-dominated curricula and books, we can discern a rise of the vernaculars, in particular Dutch, English, French, German, Italian, and Spanish in learned discourse – all of which except for Spanish are present in MS 2052, often on the same folio next to entries and annotations in Latin.⁶⁹ Indeed, many university-educated men, like Mayerne, used their mother tongues and other vernaculars next to Latin in their correspondence. In the seventeenth century Fransen identifies a 'definite change' with regard to the Latin hegemony in communicating natural knowledge in medicine and natural philosophy, among other domains.⁷⁰ For the French-speaking context, this change has been located in the decade between 1630 and 1640, roughly overlapping with the period that Mayerne was particularly active in investing time in his art-technological note taking.⁷¹ MS 2052 provides an intriguing example of this transitional phase in which the choice of language might be seen as a signifier of new modes of knowing and knowledge making, as Fransen concisely puts it. While the choice of the vernacular by some of the 'new scientists' has been interpreted as an intentional provocation to support a 'new style of science',⁷² we can perhaps discern a different strategy in Mayerne's frequent choice of Latin in his additions and marginal annotations. Framing artisanal knowledge 'drawn from the mouths' of skilled workers in Latin, the language of learned university-trained scholars, and in French, the prevailing language at European courts, can perhaps be seen as part of a scholarly strategy to elevate 'living sources' into a Latinised scientific discourse that had long been dominated by textually transmitted voices of the ancients.⁷³ In what follows I argue that Mayerne found authoritative examples in earlier medical traditions

that provided him with sophisticated models for the integration of living sources into extant systems of knowledge that have a long tradition in medical writing, extending back to Arabic manuscript transmission of ancient knowledge to the West.

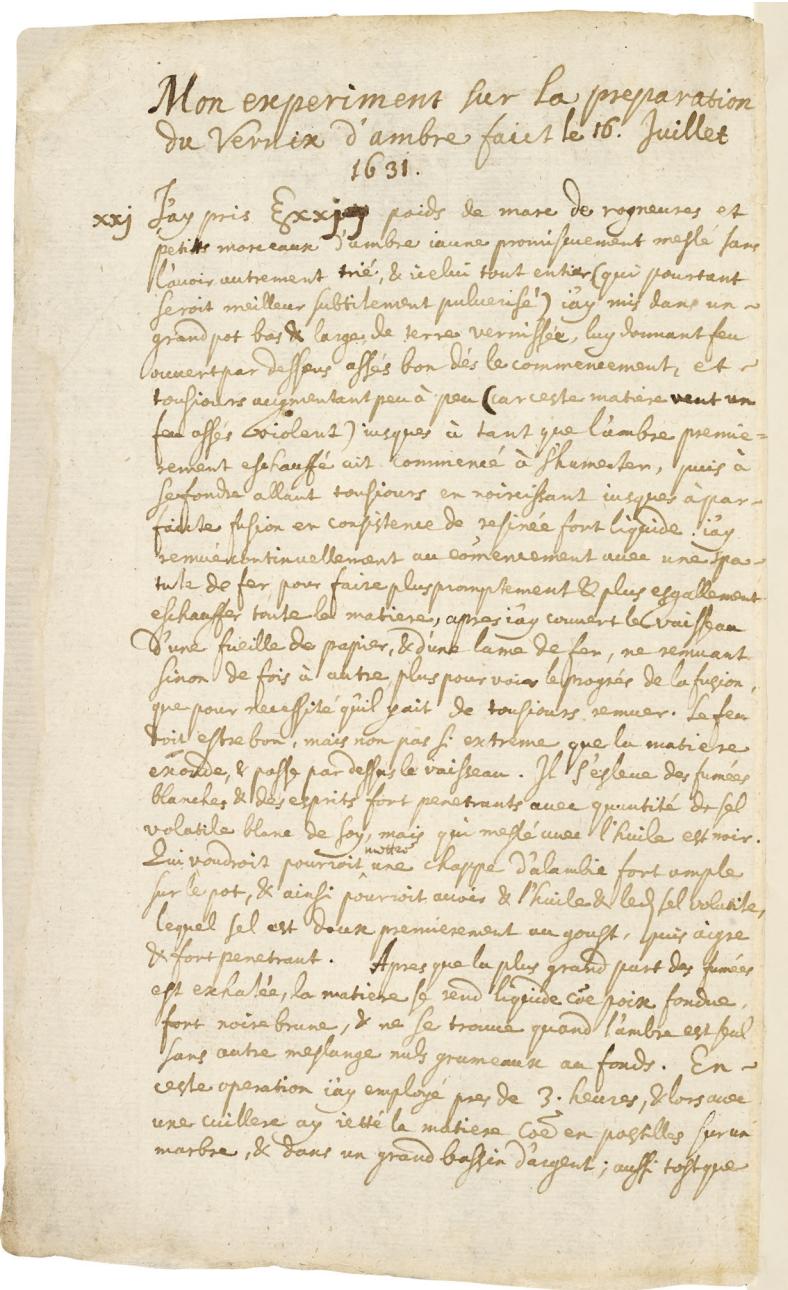
Recent scholarship highlights the impact of Arabic scholarship on knowledge-making practices in Western Europe and its enduring importance in European university curricula, in particular in medical teaching and pharmacology.⁷⁴ Early modern medical practitioners and humanists built on an extensive body of scholarship on plant- and mineral-based therapeutics that derived from ancient Greek and Arabic sources.

The University of Montpellier, from which Mayerne received his doctorate in medicine, was for example known for its considerable openness towards Arabic medicine and sciences and the incorporation of Arabic scholarship into its curriculum. The works of authors such as Ibn Sina (980-1037) and al-Rāzī (865-925), better known by their Latinised names Avicenna and Rhazes, had been taught at the university's medical school up into the early modern period. Theodore de Mayerne must have been familiar with Arabic medical traditions as well as with the influential writings of the Pseudo-Mesue, whose work was part of the core curriculum of Montpellier's medical faculty.⁷⁵ The enduring influence of the medical author al-Rāzī, a Persian practising doctor and 'chymist' who was himself an avid reader of ancient medical texts, becomes apparent in view of the many printed Latin editions of his work that appeared throughout the sixteenth century.⁷⁶ Al-Rāzī's medical treatise the *al-Hāwī*, 'The Comprehensive Book on Medicine', appeared in print under the Latin title *Continens* and saw (at least) five editions throughout the sixteenth century.⁷⁷ This multi-lingual compilation of ancient authors, also included Arabic texts and al-Rāzī's own notes. Most importantly, al-Rāzī's lifelong work of note-taking displays an engagement with diverse sources of knowledge: next to excerpts from ancient medical texts, he added observations from his own practice, as is evident for example from 'a large private notebook or common place book' that has survived in the Bodleian Library.⁷⁸ Arabic writings thus provided a learned model for the integration of observational notes and contemporary sources into a learned textual discourse of ancient scholarship.⁷⁹ European physicians also relied on Arabic scholarship of plant- and mineral based medicinal drugs, many of which were not known to the ancient Greek, much to the despair of a small, but influential group of sixteenth-century radical medical humanists who attempted to give a 'purified' Graeco-Roman foundation to Renaissance pharmacology.⁸⁰ Recent studies show, however, that Arabic knowledge of globally traded natural simples and their medicinal and artisanal virtues were highly valued among practicing physicians and humanists in Renaissance Europe.⁸¹ The Arabic contributions to pharmacology were later systematically integrated into early modern herbals and pharmacopoeia, including listings of *materia medica* that feature many of the substances described in detail by Arabic authors.

The German humanist and professor of medicine Euricius Cordus (1486-1535) acknowledged, for example, the important contributions of Arabic writers to pharmacological knowledge in his *Botanologicon* (1534), where he provides a list of the many medicines 'of the Arabs which neither

9a-b

MS 2052, fols. 72v and 73r, *Mon experiment sur la préparation du Vernix d'ambre faict le 16. Juillet 1691*; the entry is written in an anonymous hand, followed on fol. 73r by the heading 'Speculation sur diverses compositions de vernix', perhaps written in a different hand, London, British Library (photos: © British Library Board).



Dioscorides nor anybody else among the ancient Greeks mentioned.⁸² Notably, the first *materia medica* mentioned on Cordus's list is *ambre*, a term that was introduced into medieval Europe in the course of the Arabic translation movement.⁸³ Its Latinisation by the translators of Arabic medical works led to a confusion between animal amber (*ambre grisae*, *ambergris*) and vegetal ambers, which were often identified by colour or distinguished by their historical names in Latin (*succinum*) and the vernaculars (e.g. *bornstein*, *ambre jaune*).⁸⁴ In medicine and cosmetics, amber and ambergris were assumed to have similar beneficial properties,

la matière est friable, elle se sépare. Velle même en
craquant, & se rompt così en vers, estoit fort friable
entre les doigts.

De la pur quantité de ~~Exxij~~ il ~~en~~ est resté
environ ~~Exxij~~. Dine substance fort lèvre, lui
jaute, semblaient à de la Colophane trempée, qui n'a
pas fort mauvais odeur. Et ainsi est préparé l'ambre
ou *Lucinum*, pour estre la base des vernis, soit de
celuy de la Chine, soit de celuy dont on se fait aux-
tut, viole, & instruments, soit pour les lambri, meubles &
autres pieces de menuiserie. Soit aussi pour les cuirs dorés
pour lesquels particulièrement ce vernis est bon, à
cause qu' estoit jaune il rehausse lor.

Mais si l'on a recourtoir, on fait la couche d'argent
ou d'certain brum en feuille, il faudra adoucir à ce vernis
de l'aloë, & tant soit peu de saffran, adoucissant la temiture
extraite d'une bon esprit de vin au vernis de pie
fait, & ce à froid.

Ce vernis se doit appliquer froid, & se doit peicher au
soleil, quoq' qu' effe l'icelit de lui même.

Speculation sur diverses com- positions de vernis.

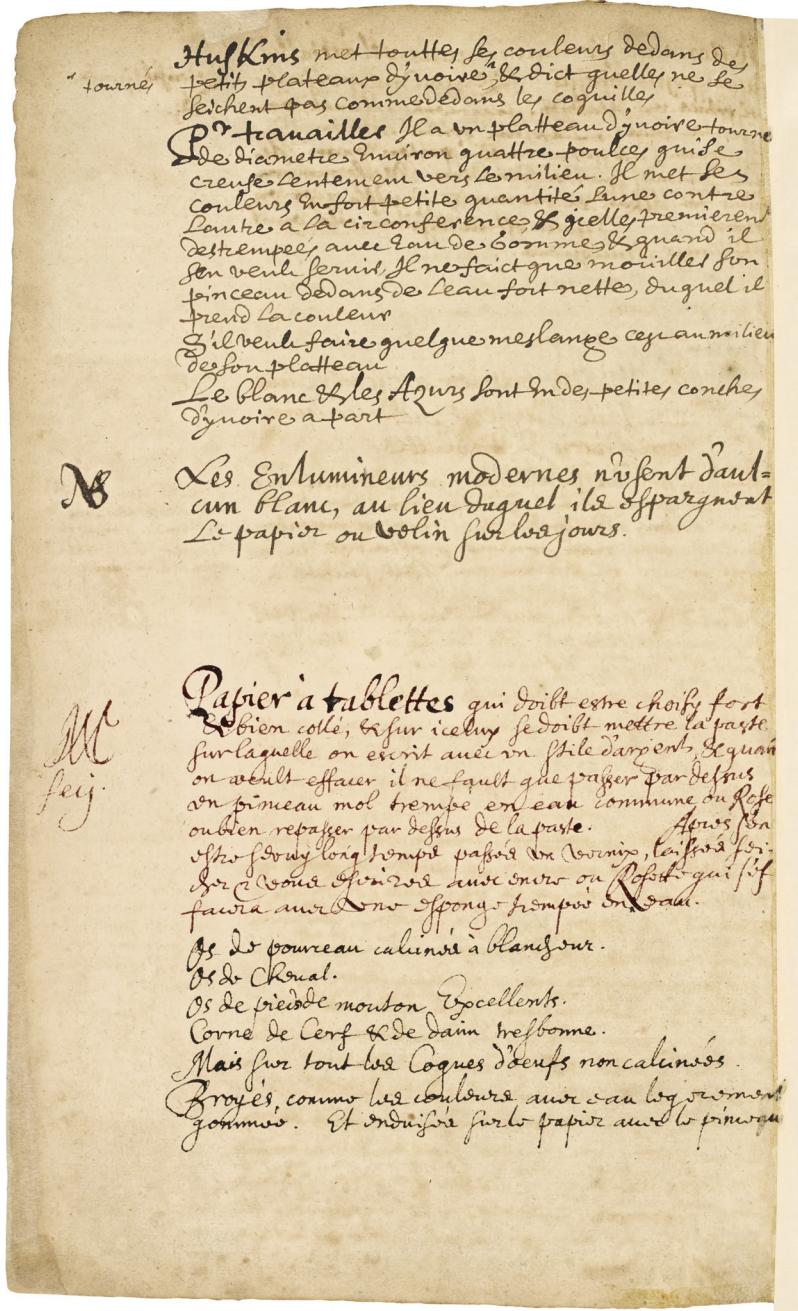
but for artisanal uses vegetal ambers were more common. The colour hues, saturation, and transparency of ambers mattered not only to collectors and natural historians but to apothecaries too, who also supplied artists and artisans with materials. The recipe on fol. 161 for *vernix d'Ambre* – which Mayerne apparently tried himself in London in 1638 – calls, for example, for 'the most transparent and white amber you can find', with a reference in the margin to a German apothecary, identified by the name Crudosius.⁸⁵ Interestingly, Mayerne's fellow countryman Conrad Gesner (1516-1565) – the Swiss physician, polymath, and prolific note taker – had published a

detailed taxonomy of fossilised resins including ambers (Latin *succina*) in his treatise *De omni rerum fossilium* (1565). The treatise was published in Latin, but Gesner chose to add German names with descriptions of the different hues and appearances of the natural varieties in gothic fonts, perhaps to facilitate their distinctions not only for natural historical purposes but also for artisanal applications.⁸⁶ The first entry on Gesner's listing of solid, non-transparent ambers specifies for example 'the most white and best amber' in Latin and German.⁸⁷

Recalling the notes on varnish making that the painter Petitot apparently took in a workshop, we can imagine that he was perhaps scribbling his observations into a little notebook like the ones the prolific writer and practising physician Sir Hugh Plat (c. 1552-1608) used a few decades earlier, when he collected the practical knowledge of London's practitioners for his *Jewell house of art and nature* (1594).⁸⁸ Or maybe Petitot used one of the other abundant drawing and note-taking devices, like those handy 'table books' or 'paper tablets' for which we find a series of recipes on fols. 29ff and very notably one in red marked with Mayerne's initial and the Latin notation *fecij* (made [it]) (fig. 10).⁸⁹

Surviving examples testify to the expansive 'info-lust' of early modern note takers – among which were clergy, physicians, lawyers, natural philosophers, and courtiers – and to the expanding note-taking activities in mercantile and domestic contexts of early modern societies more generally.⁹⁰ Historians have emphasised the profound influence of university-taught methods in commonplacing quotations and excerpts from authoritative sources, which early moderns copied by hand into notebooks or even cut and pasted from printed papers into their 'scrapbooks'.⁹¹ In the case of Hugh Plat's many manuscript notebooks, Malcolm Thick has convincingly argued that we can recognise the hand of a university-taught note taker, trained in commonplacing methods.⁹² Thick also notes that complete works from Plat's hand remained in manuscript, perhaps intended as a 'scribal publication for a select group'.⁹³ We could make a similar argument for Mayerne's manuscript notes. Numerous folios in MS 2052 display information on 'vernix' that is excerpted from books,⁹⁴ often from print publications in the European vernaculars, among which were popular sixteenth-century Italian books of secrets that saw many editions.⁹⁵

Modern readers of Mayerne's notes have been puzzled by the apparent lack of order of this recipe collection. However, greatly varied and diverse compilations of recipes were as common as keeping loose note collections in the early modern period. And what appears on first sight perhaps as a disorderly, preliminary heap of papers might have served the interests of its compiler best in its original unbound form. Recent scholarship suggests, for example, that Mayerne likely noted his medical observations on 'loose fascicles' – that is, papers folded once to make folios that could be compiled into unbound quires.⁹⁶ Flexible systems of loose notes that allowed for resorting and continuous extension were not exceptional among early modern scholars, and have recently attracted the attention of historians of science and of writing and reading practices, who started to study how they functioned as working tools in epistemic practices.⁹⁷ Close examination of



annotated folios shows that Mayerne availed himself of, for example, textual technologies that are reminiscent of scholastic and humanist-inspired methods for storing, sorting, selecting, and summarising information for his study of contemporary artisanal practices.⁹⁸ We can also discern the use of testimonial rhetoric, linguistic constructions, and writing technologies in Mayerne's manuscript that link his learned discourse on artisanal know-how to a long history of knowledge-making traditions in medical and anatomical practices.⁹⁹

10

MS 2052, fol. 29v, 'Papier à tablettes', in the margin, next to the subheading, Mayerne's calligraphed initial 'M' and the Latin 'fecij'; the entire recipe is written in red ink, London, British Library (photo: © British Library Board).

L'abevre de Vert

Beau vert. Aſſhen & Mafſicot, fort clair.

Aſſhen & Linke ombrage le fuflez vert.

Selon qu'on veult faire les vorts plus jaune
me le on y met plus de Mafſicot.

Plus vorts on y met plus de Linke auoc Vnpriſſe fran-
cois.

La Condrie.

Plus bleus on y met plus d'Aſſhen.

Plus blane à tout ce que doſens on
adouſſe du plane de plomb. Et.

Schitgeel glaw. y adouſſant tant soit
qu' d'Aſſhen.

quelquere vne glaçont leure braue arbre,
auoc le vold de gris, mais n'oubliés pas d'y
mettre le vernis.

Aultre vert. Mafſicot. Blane & Aſſhen.
enfoncie auoc Mafſicot & Linke pour
le plus noir adouſſer un poudre noir à
l'Aſſhen. En un poudre Schitgeel.

Aſſhen & Oore jaune fait un vert mort.
vne y pourree adouſſer un poudre blanc.

Pour les troncs des arbres. Aſſhen &
laque auoc Oore jaune, ou Vnbw,
ou Schitgeel.

feuilles mortes. Schitgeel, laque, un
vre d'ombw, ou un peu de minw, ou
leur un peu de vermillion par cy par la.

Etand on met vne Seconde couche de couleur sur
la premiure qui estoit, auſſi fort qu'elle estoit
feſche, incontinent la couleur s'emborit & ne
meurt point.

9
Le vert ne meurt
pas si quand on
le met en ombre
on adouſſe par la
palme que lques
gouttes de eſtre
ou d'huile d'afſſhen
ou de Chorben-
tino fort clair.
Cela fait emboire
la couleur, & ce
qui s'embord ne
meurt point.

A matter of authority

A French painter.
 The green does not die
 if one puts it on the
 work
 Upon adding on the
 palette a few
 drops of petroleum
 Or oil of spike.
 Or very clear
 Turpentine.
 This nourishes the
 colour, and what is
 nourished does not die.

On fol. 9 we can recognise visually distinct voices that are interlinked on the folio to yield an international discourse on experientially approved uses of distilled oils and spirit varnishes. Instructions for improving the properties of oil paints with additives have been drawn from different living sources and woven into a written account of artisanal expertise: a marginal note on fol. 9r divulges the secret of a French painter who adds 'on the palette a few drops of petroleum or of oil of spike, or very clear turpentine', because 'this nourishes the colour and what is nourished cannot die' (fig. 11a). On the verso of the same sheet a bright red note in the margins documents the savoir-faire of the Italian painter, Orazio Gentileschi (c. 1563-1639): 'excellent Florentine painter', who 'adds on the palette just a drop of amber varnish that comes from Venice, where they varnish the lutes, mainly for flesh colours & to make the white spread & to soften easily & also to make that it dries faster' (fig. 11b). Gentileschi's 'secret' is linked with a black manicule to a passage in the main text, in which Mayerne restates the approved virtues of distilled oils for artistic uses: a drop of oil of spike lavender to white and blue 'makes that they never die, which I repeat here because it is a great secret'.¹⁰⁰ To this conversation, Mayerne added the voice of a Flemish master; at the bottom we find the addition 'NB' marked in scarlet letters (from the Latin *nota bene* for 'note well'). It draws attention to another piece of technical information:

[t]o make your colours spread easily, & by consequence to mix well, & even don't die, like with the azures but generally for all colours, when painting, dip your brush lightly from time to time into the white oil of Turpentine from Venice (*Therebentine de Venise*) extracted au bain M.[arie] then with the said brush mix your colours on the palette.¹⁰¹

Mayerne documents here a painter's practice that appears to have been common knowledge in Flemish painters' studios.¹⁰² The source of workshop knowledge for making oil paints that allow for quick handling and fluid application¹⁰³ is identified in the margin as 'M. Rubens', written in Mayerne's majestic scarlet hand. Below, next to the line that specifies the secret additive in the vernacular, the learned physician glossed *Aqua di rasia*, a variation of the Latin name *aqua di rasa* for (oil of) turpentine.¹⁰⁴ On fol. 9 the compiler lets Rubens – an internationally acclaimed painter favoured by the English and Spanish aristocracy – and Gentileschi, court painter to Charles I, speak to validate practical knowledge deriving from workshop practice. With these textual operations, the 'painters' secrets' receive, as it were, royal approval. Common practical knowledge and trade 'secrets' are here validated by the hands of master painters and the testimony of a genteel witness.¹⁰⁵ The expert advices are accumulated in the margins and bleed into the main text, framing, enriching, and updating the collected information with commentaries. Mayerne's orchestration of information on the manuscript page is reminiscent of methods developed in medieval and Renaissance scholarship for the study of ancient (textual) cultures which have continuously been adapted and repurposed throughout the early modern period.

11a

MS 2052, fol. 9r, *Labeur de vert*,
 folio with recipes for making greens,
 and marginal notes in red ink written in
 Mayerne's French hand, London, British
 Library (photo: © British Library Board).

11b

MS 2052, fol. 9v, *'Labeur de vert'*
 continued, see fig. 11a, London, British
 Library (photo: © British Library Board).
 Next to the folio English translations of
 selected passages by the author.

On our folio, Mayerne presents himself as a reliable compiler of practical knowledge: at the very bottom, the royal physician added 'I saw it', using the Latin short term *Vidi*.¹⁰⁶ We encounter this little word frequently, scattered throughout the manuscript. In Mayerne's distinct calligraph, 'vidi' attains the quality of an epistemic marker, 'tagging' bits of knowledge collected from living sources as genuine know-how that is obtained from first-hand onsite observation. The linguistic construction affirms the validity of artisanal 'secrets' in two ways: *vidi/vidj* indicates that the note taker saw the described procedures *in situ* with his own eyes. And at the same time, the folio literally bears the hand of the witness, who recorded his first-hand observation in fine black and red inks.¹⁰⁷ With this case study I aimed to show how the notes of a learned physician might have contributed to the epistemic elevation

Speculation

#M. Gentileschi
 excellent florentine painter
 adds on the palette only one
 drop of Amber Varnish
 which
 comes from Venice,
 where they varnish the lutes
 principally for flesh colours,
 & to make
 # [manicule] the white spread
 & to soften easily & also
 to make that it dries faster
 In this manner he works
 when he wants, without
 waiting for the colours to dry
 completely
 & the varnish of which the red
 does not spoil
 the white at all. **Vidj.**

M. Rubens.

Agua di rasia
Vidj.

M The colours die when oil
 heaped up on top dries and forms a
 skin, which blackens in the air. There are some
 colours, & the Smalts among them that
 do not mix easily with oil,
 so that they always go to the ground without attaching, &
 that is the way they die easily. i: blacken.

Note the addition of spike oil
 to white & blue, which makes that they
 never die, which I repeat
 because it is a great secret.

To test whether the colors die, after
 they have been applied to canvas or
 wood, they need to be dried close to a
 fireplace &
 it will show very soon.

NB. To make your colours spread easily
 & by consequence to mix well, & and even
 don't die, like with the azures
 but generally for all coulours, when painting,
 dip your brush lightly from time to time
 into the white oil of Turpentine from Venice
 extracted au bain M.[arie] then with the said brush mix your
 colours on the palette.

*Quand on peint le ciel fault faire à un
Esmail ne doit
estre nolte que
fort legerement
auer le bleu sur
la palette. Car si
done le rennes
bravous auer le
conspicu, il meurt
failement.
S'ombrage on nolte
auer l'ys en poin
d'or jaune, et
tant soit poudre
laugue.*

*Quand on peint le ciel fault faire à un
Esmail auer Esmail et blanc, on auer
l'ordre et blanc, et noltant selon les oes-
cues de la laugue, V. Denillon, et autre en
l'autre. puis l'ayant feulé, et quand on bout
travailler auer jaune, Magicot etc. le fa-
dra mettre à un autre foy a part. Aultre
ment si on l'apprivoit du bleu, la couleur bu-
dira.*

N. *L'Esmail meurt failement, et quand
on l'apprivoit auer guil Brûle-beau, et à l'at-
touffement se trouue impalpable, si n'endoit
en point pourtant faire jugement jugeuse
tant que l'ayant nolte auer guil et
blanc de plomb, on boit si estant foy il ne
noirira point.*

*Les Esmails ordinaires dont on emploie nom-
eusement auer.*

*Aggris d'ngros Esmail trebleu, et l'ayant
brûlé impalpablement auer van et poudre
fins de vny auer bon fume.*

M. *La mort des couleurs est quand l'huile
li nageante au dessus se ferme et fait bu-
reau, qui noircit à lair. Il y a plusieurs
couleurs, et lors Esmails enroulées qui
ne se noltent pas aisement auer l'huile.
ainsi dont touziorde à fouds sans se lier, et
ainsi meurent failement. i: noircissent.*

N. *Notes l'addition de l'huile d'avoie
au blanc et au bleu, qui fait qu'il
ne meurent jamais, ce que j'appelle
par w que iest un grand secret.*

M. Gentileschi
toullent poudre
Florentin adouche
sur la palette une
gentle touziorde de
l'huile d'ambre de
vanis d'ambre de
nante de poudre, dont
on vernit les luthes
principalement à la char-
noue, et au pourpier
et l'huile de bleu
et l'huile de blanc
mont et faire auz
guil et poudre plus tost
par le moyen il meurt
le quand il meurt, sans
attendre que le cou-
leur soit tout à fait
meurte que que
longue nolte point
le blanc. V.

M. Rubens. **N.** *Pour faire que voe couleur se nolte
failement, et par conseqvient se nolte bien, et nol-
te ne meurent pas, comme pour l'azur
mais generallement on touche couleur, on per-
touche legerement de foy a autre. V. finiture
dans de l'huile blanche de l'azur bleu de V. En-
pochette au bain. M. puis auer le pinceau nolte les
couleurs sur la palette.*

Aqua di ragia.

V.

nb

of (practical) knowledge obtained from the hands and mouths of living master painters.

With the next case study, an analysis of an entry on coloured-ink recipes and experiments, I argue that the materiality of Mayerne's writing activities forms an intrinsic part of his art-technological project as do the means and methods with which this manuscript compilation has been produced, and that they too deserve our close attention.

On 4 November 1646, the year that the royal physician had reached the eminent age of 73, Mayerne decided to devote his time and attention to colour making and to experiment with a *tinctoria* recipe for a plant-based colour for writing and limning. He 'put into a tin tub on the fire a good amount of black berries on the outside [the colour] of Columbines, their pulp [like] a privet or ligustrum, left them to boil in fresh spring water, all pure, until more than half of the water had been consumed, the decoction became deeply tainted' (fig. 12).¹⁰⁸

Mayerne appears to have followed here a recipe that calls for a specific species of berries 'which the Germans call Heidelbeere, & the English Billberries or Hurtleberries' and provides instructions to cook them *au bain marie* and then to extract the berry juice by pressing them until they yield 'a red colour, very beautiful and very oriental'. This fine red colour can be altered by adding alum until 'it will make a beautiful purple, more or less dark (...)' (fig. 13).¹⁰⁹ Similar recipes for colour making with local varieties of berries go back to Pliny and continue to appear in late medieval Latin and vernacular recipes for book illumination.¹¹⁰ The sort of berry that the recipe in his collection calls for is identified by its Latin name – *vaccinia nigra* – which Mayerne glossed in the margin of fol. 23v, next to the local plant names in the vernacular. Below the written instructions and some intriguing colour sampling, a commentary was added that is taken from an early modern plant catalogue, the popular *Herball, or, generall historie of plantes, gathered by John Gerarde of London, master in chirugerie* (1st ed. 1597; enlarged 2nd ed. 1633). John Gerard (c. 1545-1612), garden curator at the College of Physicians, copied from earlier herbals,¹¹¹ but he also added own observations to the plant descriptions, often concerning artisanal uses. For example, in the Herball's entry on 'wortleberries', Gerard added to his description of *vaccinia rubra*:

(...) small berries in shew and bignesse like the former [*vaccinia nigra*], but that they are of an excellent colour, and full of iuyce, of so orient and beautifull a purple to limne withall, that Indian *Lacca* is not to be compared thereunto, especially when this iuyce is prepared and dressed with Allom according to art, as my selfe have proved by experience.¹¹²

Fol. 23v displays an impressive variety in inks, textual features, languages, and hands gathered from different sources. Apparently, the praising words for colourants extracted from bilberries, that were copied from Gerard's herbal into MS 2052 prompted further experimentation: the following sheets – 24, 25v, and 26; dated 4, 5, and 6 November 1646¹¹³ – are remarkable for being written in Mayerne's hand with a decoction made from bilberries (*vaccinia nigra*) for which the making process is described

on fol. 23v. On the next sheet (fol. 24r, fig. 12) Mayerne reports on his own bilberry *tinctoria* experiment and states that the decoction 'when applied to paper gives a dark purple not too brilliant which you can see on the following sheet', adding as an example the three letters: 'A.A.A. &tc.' and the words 'with this decoction this has been written'.¹⁴ Further colour trials are recorded with the addition of rock alum ('B.B.') and quick lime ('C.C.'). On the verso of a smaller scrap of paper, fol. 25v, that has been inserted into the sheets in folio format, we find more colour trials that are marked with C. (fig. 14).¹⁵ The last sheet, fol. 26v, displays strokes and 'doodles' in quill and brush with explanatory annotations and a drawing of a drake-like figure that serves to illustrate a limning technique for shadowing by layering transparent watercolours. The sheet also features a quotation in Latin, the first line of a popular quote from an ancient satire, below which the learned physician placed his flamboyant signature and his Greek motto in a cryptic arrangement of calligraphed letters (fig. 15).

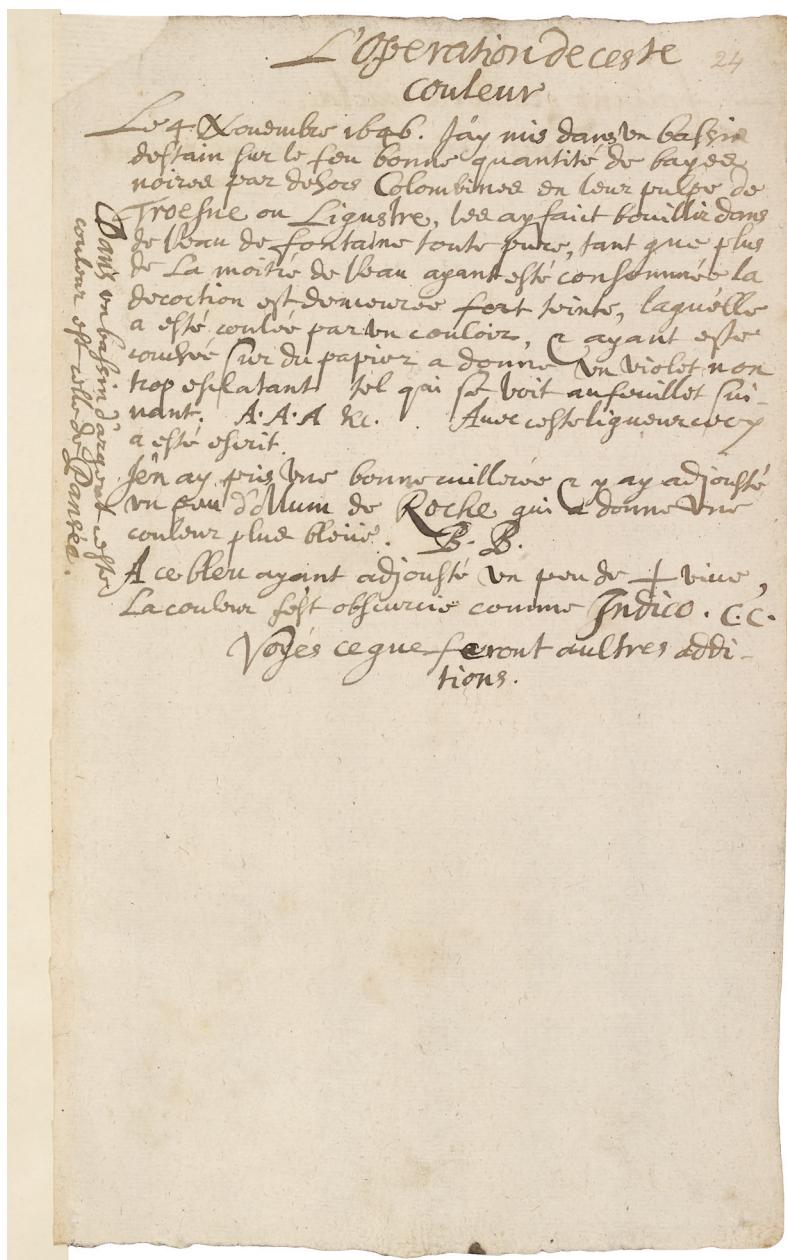
Omnibus in terris quae sunt a Gadibus usque/ Auroram et Gangem
pauci dignoscere possunt/ vera bona/ atque illis multum diversa/
remota erroris nebula.¹⁶

The full quote in English reads: 'In all the lands that stretch from Cadiz, all the way to the Dawn and Ganges, few can discern the true goods from those of a great diversity [which have been] withdrawn from the mist of errors'.¹⁷ Mayerne might have intended this Latin proverb as a succinct motto for his art-technological project, referring here to the laborious task of collecting recipes and then identifying with many a trial and experiment the true and profitable secrets. Such a distinction between 'experimented recipes' and profitable 'beautiful secrets' is echoed in the preface of an immensely popular French edition of an anonymous sixteenth-century book of secrets, addressing its readers as follows:

As it happens to be, benign reader, I took pleasure during the passing years, not without great labour and exhaustion on my part, in collecting and accumulating several sorts of experimented recipes, which may point unto a great number of beautiful secrets.¹⁸

Fol. 26, which appears perhaps on first sight as an oddment with some arbitrary doodles, reveals itself on closer inspection as a systematic testing of the writing and painting properties of a plant-based *tinctoria*, which has been compared to a precious imported dyestuff. The true *Lacque*, Mayerne has learned from conversations with an accomplished miniaturist, comes from the East Indies and 'is of an excellent colour resembling the most beautiful red anemones that one can imagine'.¹⁹ This example shows how Mayerne turned the folios into a site of manual experimentation that bears the traces of a recipe trial and functions as a material archive that can be reconsulted to test, for example, for lightfastness and to compare to future samples.²⁰ In addition, fol. 23v displays annotations that have been added to the recipe text in different coloured inks and that allow for diachronic observations of colour changes.²¹

But what, then, was Mayerne's motivation for conducting this time-consuming research and producing this heap of manuscript notes, which are now known to us as the *Mayerne manuscript*? Mayerne's biographer, Hugh Trevor-Roper, speculates that this project was motivated 'by a real thirst for knowledge and a desire to leave a record' of his 'chemical discoveries' that – under better historical and political conditions – would have brought 'these disorderly notes' into the proper format of a learned book. That these manuscript notes never made it into print during Mayerne's lifetime was for Trevor-Roper essentially a testimony to Mayerne's 'inability to impose a final form' to his learned efforts.¹²² By contrast, my own findings suggest



12

MS 2052, fol. 24r, *L'Operation de ceste couleur*; written in Mayerne's hand, apparently with a bilberry ink for which the making process is documented on this folio. Next to the folio an English translation of selected passages by the author.

that Mayerne's extant study of artisanal practices, originally compiled into a loose note system, functioned as a working tool that was born as much from epistemic as from practical and economic interests.

Perhaps Theodore de Mayerne, Europe's most famous physician, was tired of listening to his patients, the English gentry and nobility agonising about their little complaints, and of being exposed to the risks that first physicians faced when war and political tumult spread their poisons at European courts. Perhaps he preferred to attend to the mute bodies of colours (*le corps du vert de terre, le corps du bleu*) that die and darken in silence – and yet if treated well and with care, tempered and applied by a

The Operation of this
colour

On 4 November 1646 I put into a tin tub on the fire a good amount of black berries on the outside [the colour] of Columbines, their pulp [like] a privet or ligustrum, left them to boil in fresh spring water, all pure, until more than half of the water had been consumed, the decoction had become deeply tainted, [it] was strained through a sieve, and applied to paper it gave a violet, not too brilliant colour, which you can see on the sheet following A.A.A. &c. With this liquid this has been written.

I took from it a good spoonful, and added to it a little bit of Roche Alum which gave it a deep blue color. B.B.

To this blue I added a bit of [symbol for raw chalk] quick lime, the colour darkened like Indigo. C.C.

See what other additions will do.

Marginal vertical note:

In a silver tile this colour is [like] that of a Pansy.

Cyanus. Les Bleuets qui se trouvent dans les bleds, sont une très belle couleur bleue, sans addition quelconque on en expimie le sué, lequel en y mêlant de l'album ne change point de couleur, autrement sans addition est très beau quand on l'applique, mais est assez décent et effard. Si vous y adoucissez une goutte d'huile de tarte, il se fait un très beau verd de mer fort oriental à l'instant, mais qui peu après se flétrit. De ce vert d'or jaune sale, c'est dure dure, sale.

Si j'ay pris de ce sué, & l'ay iette dessus du Legmos ou tournefort, au commencement il a rougi un petit, puis après a fait un bleu cie d'Indes, non trop bon, ni haut, lequel est fort propre pour enfouir le bleu premier fruit du sué de la fleur.

Si dessus ce bleu premier vous passez un peu d'huile de tarte, iceluy bleu ayant esté premièrement en bleu avec un peu d'album, il se fait un verd très excellent, comme si l'avoit vendet.

Ce bleu premier malgré avec yotta gummii fait un vert de sale bon pour sombrer. Prenez le jus de la gaffron une partie, sué de bleuets trois parties, méllez & adoucissez une goutte ou deux d'huile de tarte, il se fera un verd fort gay, comme verd de vesse, lequel néanmoins en le peignant s'effaceit, & est bon pour enfouir.

Le bleu de cyanus ne vaut rien & meurt incontinent. Non pas si tôt sur papier not, ayant fait du jus

*Vauvina mi-
gra*
Le sué des bayes noires, que les Allemands appellent Heidelbeere, & les Anglois Bilberries ou Hurleberries extrait, en les mettant en double vaieffeu dans de l'eau bouillant, & les pressant, est d'une couleur rouge très belle & hésoréntale. Si vous y adoucissez de l'album, cela fait un pourpre très beau, plus ou moins obscur, selon la quantité d'album, que vous y dissoudrez. Et il gaigne un fort.

Mort à coup de l'huile qui est de l'autre cogne.

Gerard parle dans son Herbarie de vaccinia rubra, qui ne diffèrent de l'autre que de la couleur des bayes, & dit que du jus d'elles avec de l'album se fait une couleur qui ne cede point à la laque des Indes Orientales, Je n'avois mon si elle dure.

skilled hand that knows its materials, these colours will not die at all (*ne meurent point*), but spread easily (*sestend merveilleusement*) and shine with vivacity and vibrancy – like the most beautiful flowers one can imagine.¹²³

Surely Mayerne was not the first learned man who set out to gather from experienced hands of artists and craftsmen the means and methods for producing the *vera bona* fruits of artisanal labour. Most prominently was Sir Hugh Plat, who left us an extensive study of artisanal subcultures in Elizabethan London.¹²⁴ There are many commonalities between Plat's and Mayerne's endeavours. Most importantly, the committed effort to integrate artisanal and practical knowledge as 'vernacular sciences'¹²⁵ into a written discourse, the hands-on attitude with which collected information is digested and further explored, and last but not least the practical and economic interests that co-shaped their written legacy. In contrast to Mayerne, Hugh Plat actually did turn his artisanal 'fieldwork' into a printed publication.¹²⁶ A look at Plat's editorial process provides some illuminating insights and clues for the hypothesis that Mayerne's collection of art-technological notes might never have been intended to be published as a printed book. In the case of Plat, Deborah Harkness has uncovered an interesting editorial process that strips Plat's detailed handwritten records of any circumstantial or contextual information that testified to the many living sources from which he drew his knowledge.¹²⁷ Harkness has shown how Plat systematically constructs, from the many silenced voices of his contributors, one authoritative voice in his printed publications, and argues that Plat's authorial voice presents instructions in the normative manner of 'a schoolmaster'.¹²⁸

13

MS 2052, fol. 23v, *Le Suc des bayes noires*

(...); Recipe for making coloured ink with the juice of bilberries written in an anonymous hand, including coloured ink samples; the red annotations are probably in Mayerne's hand. London, British Library (photo: © British Library Board). Next to the folio an English translation of selected passages by the author.

Vaccinia nigra

[Color samples in four strokes in a row underneath each other]

The juice of black berries, which the Germans call Heidelbeere, & the English Billberries or Hurtleberries, that is extracted by putting them into a double dish in boiling water, and pressing them, is of a red colour, very beautiful and very oriental. If you add to it alum, it will make a very beautiful purple, more or less dark, depending on the quantity of alum, that you dissolve in it. **vitriol and gall harm them**

[Color samples in two strokes, horizontal]

Dead because of the ink that is on the other side.

Gerard speaks in his Herbal of vaccinia rubra which does not differ from the other one, except for the colour of the berries & says that the juice of these ones with alum makes a colour that is on par with the Lacque of the East Indies, to my knowledge, if it lasts.

By comparison, I wonder whether Mayerne would have intended his carefully orchestrated polyphony to be submitted to such a rigorous editorial process. Many of the folios in MS 2052 display diverse layers of deliberations, visually organised on the folio, that would get lost in translation into print. Mayerne must have been well aware that the textual and material transformation from manuscript into printed book would go at considerable cost to the rich and varied epistemic – and practical – features of his collection. Eventually, none of these papers went to the press during his lifetime, leaving it open to speculation whether Mayerne's paper toolkit for the study of artistic practice was indeed ever meant to be translated into print.

But perhaps Mayerne had indeed a publication in mind, one that embodied all the *vera bona* bits of knowledge that he and his assistants, collaborators, and informants had painstakingly collected. Maybe he had envisioned them as part of a greater, profitable project – a 'new' kind of catalogue, displaying the refined products of an early modern 'boutique', 'pharmacy', or 'drugstore',¹²⁹ specialised in serving artists and a growing community of note takers, as well as the un-apprenticed hands of arriving painters, dilettantes, and amateurs. To envision such a project might make sense in context of Mayerne's many other writing and publication projects, which include a 'catalogue of medicines necessary for the preparation of a royal dispensary', drafts for a pharmacopoeia, and his involvement in the regulation, production and trade of medicinal products with the publication of the *Pharmacopoeia Londinensis* (1618).¹³⁰ And, perhaps, even more so in light of his entrepreneurial activities, including the establishment of a distillation company (1638), accompanied by a royally approved publication, *The Distiller of London. Compiled and set forth by the speciall License and Command of the Kings most Excellent Majesty: For the sole use of the Company of Distillers of London. And by them to be duly observed and practized* (1639) – but this is a topic for another article.¹³¹

Conclusion: a working tool to learn from and with artisans

I have argued in this essay that a close examination of the original folios provides valuable insights into Mayerne's methodology and that note-taking technologies formed an essential part of his art-technological project. I provided a historical contextualisation and critical reassessment of this much-cited source to show how this learned physician went about to learn from and with artists and craftsmen. Moreover, I have argued that Mayerne's handwritten records documenting and exploring artisanal know-how testify to scholarly efforts that contributed to the epistemic elevation of practical knowledge and skilled expertise of artists and artisans. Finally, I aimed to show how problematic it is to study MS 2052 in isolation.

We should keep in mind, then, that Mayerne's medical and artisanal papers have only posthumously been neatly divided and studied independently along our modern disciplinary lines. If we put the *Mayerne manuscript* into perspective with Mayerne's medical casebooks – the famous *Ephemerides*, spanning almost half a century of his clinical praxis in Britain¹³² – we see more commonalities that give us insight into Mayerne's methodical note-taking activities to accumulate and digest medical and

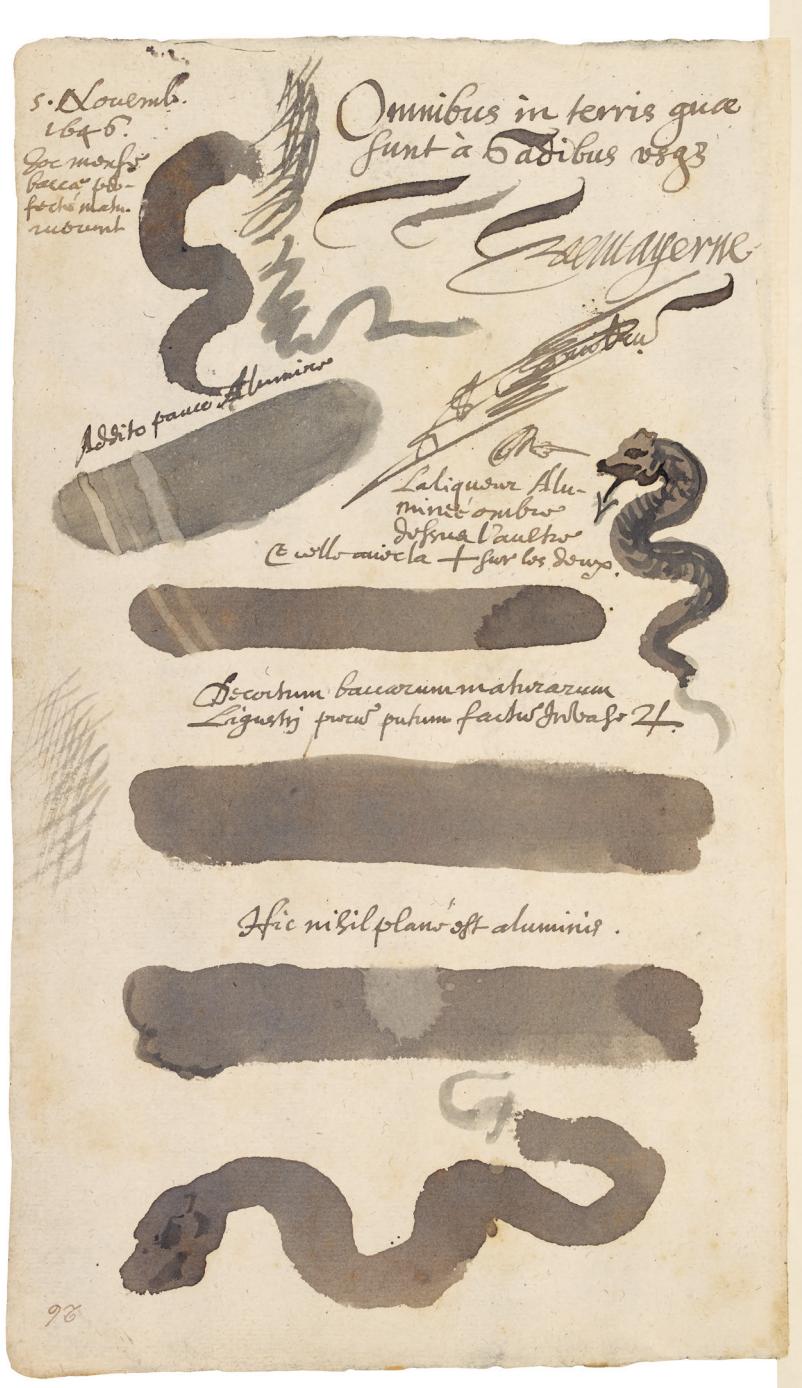


14

MS 2052, fol. 25v, Paper slip with bilberry ink trials, bound upside down and here reproduced in reverse. London, British Library (photo: © British Library Board)

15

MS 2052, fol. 26r; Paper slip with bilberry ink trials, bound upside down and here reproduced in reverse. London, British Library (photos: © British Library Board)



artisanal knowledge. In the case of his medical notebooks it has been argued that they functioned as 'instruments of deliberation' and should be considered as genuine and indispensable working tools to the practising physician.¹³³ To put it in Mayerne's own words:

In great and chronic diseases that require hours of deliberation, it is my habit not to undertake or to give council in the arena. Instead, working alone, I record the symptom in my Ephemerides, consulting my silent doctors about them. As a result, having diligently brought all things to a reckoning, I fortify myself and form an idea of the condition. From this I choose my medicines, having examined them carefully and acknowledged any harmful ones. Thus I acquire a knowledge of prescribing medicine.¹³⁴

For Mayerne, his medical note taking and the resulting casebooks were epistemological tools, central to finding the right treatment.¹³⁵ They are manifestations of the interwoven domains of note taking, diagnosis, medicine prescription, and production. I propose that this is also what the *Mayerne manuscript* meant to Mayerne. For the compiler, who set out to attain artisanal expertise, the manuscript notes are no preliminary scribbles, but an indispensable working tool and instrument of deliberation to acquire and to document technical and material know-how from artists and artisans.¹³⁶

Notes

*The author is a member of the ARTECHNE project and has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 648718).

1 Birch (1756) 1968, 93. Thomas Birch served as secretary from 1752 to 1765. Miller 2004.

2 Manuscript 1627-1628, revised 1649. Cf. Howarth 2004; and Muller & Murrell 1997, 12, 29, 58.

3 Cf. Parmentier 2017 on Mayerne's artisanal network.

4 Cf. Trevor-Roper 2006 on Mayerne's biography.

5 This essay focusses on MS 2052. For a listing of Mayerne's papers and medical casebooks in the British Library and the Royal Society, see Trevor-Roper 2006, appendix C, 372-374; and Nance 2001, appendix 1, 201-204; and Keller 2018, appendix 117-119.

6 Berger 1901 lists 350 recipes. On folios omitted from Berger's transcript, cf. Kern 2015 and Rinaldi 1995.

7 Fol. iv-r.

8 Trevor-Roper 2006, 55; Nance 2001, 31-35.

9 An exception to this is the work of

Mayerne's biographer, the historian Hugh Trevor-Roper, Trevor-Roper 1993 and Trevor-Roper 2006, and an important study of Mayerne's papers on coloration technologies in the archives of the Royal Society: Keller 2018, which appeared when this article had already gone into copy-editing/press. I am grateful to Vera Keller for allowing me to read the final proofs of her chapter. Readers are recommended to consult this excellent publication including a much-needed list of Mayerne manuscripts in British Libraries that contain art technological information.

10 Berger 1901 (German); De Graaf 1958 (Dutch); Versini & Faidutti 1973 (French); Rinaldi 1995 (Italian); Fels 2010 (English); Bischoff 2004 (German).

11 E.g., Kirby 1999.

12 Mayerne frequently uses the term *speculation* in MS 2052 when he makes a proposition based on collected information and (his own) observations that need further testing and investigation. See fol. 14v, 19r, 21v, 30v, 73r.

13 The current binding with the leaves mounted individually was done in-house at the British Library and is from a recent date. The codex includes

a treatment record at the end (fol. vi-v), with a dated entry: 29.12.1981 'Examined after binding, R.M.'. The compilation was bound in some form after Mayerne's death, perhaps upon entering Sir Hans Sloane's collection in the 18th century.

14 The shelf number of the manuscript has been corrected twice in a hand that has been ascribed to Sloane. Rinaldi 1995, 75. On Sloane's purchase of Mayerne's medical papers, see Trevor-Roper 2006, 372-374; and Trevor-Roper 1993.

15 The manuscript has been paginated twice in pencil; one version is crossed out. The manuscript note with the latest date (6 November 1646) is in the current pagination on fol. 24 and followed by earlier dated sheets, indicating that the pagination in pencil is not chronological and from a later date.

16 Cf. Berger 1901, 94-95; De Graaf 1958, 3-4; and Rinaldi 1995, 4. See also Kern 2015.

17 Fol. 24: 'L'Operation de ceste couleur'. The entry ends with the following remark: 'Have a look what other additions would do' ('Voyés ce que feront autres additions').

18 Cf. Trevor-Roper 1993; and Trevor-Roper 2006, 331-348.

19 Eastlake 1847; Berger 1901.

²⁰ 'Das Mayerne Ms.' or 'Das De Mayerne MS.' Berger 1901. The transcript in Berger 1901 is comprehensive but not complete. Some (marginal) notes are missing, as are a few entire leaves, e.g., fol. 36r. It is still considered by many as the authoritative edition of the *Mayerne manuscript*. The most comprehensive and reliable publication of the manuscript's textual content is Simona Rinaldi's scholarly Italian edition based on her PhD dissertation. Unfortunately, this edition does not contain a transcript. Rinaldi 1995. My special thanks go to Jurjen Munk and our collaborators for their work on an improved open access transcription of MS 2052, online available in ARTECHNE database. <http://artechne.hum.uu.nl/node/94995>.

²¹ Eastlake (1847) 1960, 546.

²² *Ibid.*, 547.

²³ See, e.g., Rublack *et al.* 2015; Rublack 2016 on 16th-century 'chromatic politics'; and e.g., Baker *et al.* 2015; Feeser *et al.* 2012; and Wiseman 2013. And for diverse historical monographs devoted to one colour, see, e.g., Bucklow 2016; Padilla *et al.* 2015; and Pastoureau 2001, 2008, 2014, 2017.

²⁴ See, e.g., Eastlake 1847; De Graaf 1958; Keller 1993; and Stock 2012, and, more recently, the publications resulting from the research project 'The impact of oil. A history of oil painting in the Low Countries and its consequences for the visual arts, 1350-1550', conducted at Utrecht University (2007-2015) under supervision of Jeroen Stumpel. <https://www.nwo.nl/en/research-and-results/research-projects/i/19/2019.html>.

²⁵ Muller & Murrell 1997, 14-20.

²⁶ *Ibid.*, 58.

²⁷ See the digitised manuscript. http://www.bl.uk/manuscripts/Viewer.aspx?ref=sloane_ms_2052_f001r; open access online transcription of MS 2052 in ARTECHNE database. <http://artechne.hum.uu.nl/node/94995>.

²⁸ Fol. 38v: 'Autre couleur de Hyacynthe pour colorir des doublets./ Il y en a qui ne prennent autre chose que du sang de dragon/ en larme lequel on trouve facilement chez les droguistes'.

²⁹ Fol. 73.

³⁰ It includes a series of recipes for paper tablets (fol. 29v-30v) and instructions for making transparent parchments to be used for copying (fol. 53v) and for making windows that look like glass (fol. 41v). Cf. Bol *et al.* 2014.

³¹ Cf. Stevenson 1990.

³² Fol. 18v. The recipe for 'waterproofing ducal gaiters' has apparently been mistranslated by editors of MS 2052. See Trevor-Roper 2006, 342, 416n45, referring to Berger 1901; and Versini & Faidutti 1973.

³³ Cf. Bischoff 2004; Kern 2015.

³⁴ See, for identification of hands in Ms 2052, e.g., Rinaldi 1995, 3-5.

³⁵ Fols. 164-166. Cf. Trevor-Roper 2006, 344, on Petitot's close contacts with Mayerne.

³⁶ Fols. 68r-72r.

³⁷ Fols. 68-71. Rinaldi 1995, 4. On John Colladon, see also Fransen 2011.

³⁸ Fol. 42r: 'Procédure du Peintre pour/ tirer sur le parchemin. & pour/ travailler a la plume & avec le plomb', hand ascribed to John Colladon. Rinaldi 1995. Addition above in red ink probably written in Mayerne's hand: 'Rotermond Hollandois de la Hayes'.

³⁹ Fols. 18v, 19v. On the historical figure Captain Sallé, see Parmentier 2017, 266.

⁴⁰ Fol. 161r.

⁴¹ Fol. 43v: 'Rx. Carabé le plus jaune', with a marginal note in Mayerne's signature red hand: 'M. de la Garde./ NB./ Venu d'un excellent faiseur de Luths'.

⁴² Fol. 46.

⁴³ The *Oxford English Dictionary* defines polyphony as a musical term for 'the simultaneous and harmonious combination of a number of individual melodic lines' and, more generally, as a 'multiplicity of sounds and voices'. I draw here also on its literary definition as 'a multiplicity of independent (...) narrative voices, none of which is given predominance' and its use as a narrative technique. See *OED Online*, s.v. 'polyphony', www.oed.com/view/Entry/147305.

⁴⁴ Trevor-Roper 1993, 271; Trevor-Roper 2006, 341-345; Parmentier 2017.

⁴⁵ Fol. 20, 'Voir le chevrotin'. The French term refers to soft kid leather, often used for making fine gloves.

⁴⁶ E.g., Cooper 1973, 308ff; and, more recently, Luterbacher 2018 on 16th-century Japanese 'vernix'; and Callis 2019 on the German humanist Martin Crusius (1526-1607) and his notebooks on Turco-Graeco culture.

⁴⁷ E.g., Miller 2017; Harkness 2007; and Thick 2010. On antiquarianism and the study of past and contemporary artisanal cultures, see esp. Miller 2011, 3-6.

⁴⁸ The pre-modern term 'amber' was likely used more generally for a wide range of warm-coloured and hard resins with shared visual appearances and handling properties, including copal, Leonhard *et al.* 2001, 9; in MS2052, e.g., fol. 151, red marginal note. For studies on artistic uses of ambers citing Mayerne, see, e.g., White & Kirby 1994; Holmes 1999; and Leonhard *et al.* 2001.

⁴⁹ In both editions amber (*succinum*) and ambergris are listed as *marina* (belonging to the sea) in the catalogue of simples. And *succinum* is mentioned as an ingredient in recipes ascribed to Mesue, *Pharmacopœa Londinensis* 1618, e.g., 12, 56, 59, 76. On Mayerne's involvement in the making of the first London pharmacopœia, see Trevor-Roper 2006, 216-217. On the history of pharmacopœias and lists of simples, see, e.g., De Vos 2010; Anderson 2013; and Anderson 2017. Mayerne's use of amber for a cosmetic treatment is mentioned in Dunea 2014, unfortunately without bibliographical reference.

⁵⁰ Gilbert (1600) 1901, esp. book 2, ch. 2; and in MS2052, e.g., fol. 44r: 'Diverses descriptions de Vernix./ Vernix d'Ambre. Succinum'.

⁵¹ On the flourishing export trade of amber from Western Europe to the markets of the Arabic-speaking world from 9th/10th century CE onwards, see Frankopan 2015, 106, 116. On the history of Baltic amber, see, e.g., Riddle 1964; and Rice 1987.

⁵² Fol. 43: 'Le Vray Vernix d'Ambre de Dessou/ comme la fait en sa presence/ & escrit en la faisant Joseph Peti-/ tot, qui me la donné'. Marginal note top right in red ink: 'NB./ Ultima/ dictatio/ fac'; fol. 43v: 'Le Vray vernix des Luths & violles'.

⁵³ Berger 1901, 404-407, lists 'the most excellent artists', but the many artisans mentioned in MS 2052 are not included in Berger's list. See Parmentier 2017 for the most recent scholarship on Mayerne's broad artisanal network.

⁵⁴ Fol. 52r: 'Vraye description du Vernix d'Ambre/ & de la Chine que m'a dicté Jehan Haitier/ NB. 9 Mars 1933'. On Haitier, see Parmentier 2017, 263.

⁵⁵ Fol. 49: 'Pour bien faire il faut fonder la gomme Lacque/ avec l'Ambre fondu, selon la facon de Haitier & faire le reste selon l'art'.

⁵⁶ Fol. 48v: 'M Vernix d'Ambre 8 Feb 1631'. This experiment appears to follow up on Mayerne's prompt on fol. 44v, with which he ends his 'Diverses descriptions de Vernix' and suggests to do more trials with another extract to make this varnish: 'Voyés si l'Extraite de Carabé ne sera pas/ un excellent préparatif pour

faire ce Vernix./ Il se fait en versant sur la poudre d'iceluy tres/ subtile de l'esprit de vin qui surnage, & diger/ant quatre [heures] au baing. Retirés vostre esprit./ L'Ambre demeurera au fonds du vaisseau en for/me de Baulme liquide'.

57 Fol. 43r: 'Le Vray Vernix d'Ambre de Dessou/ comme la fait en sa presence/ & escrit en le faisant Joseph Peti/tot, qui me la donné'. The Latin marginal note gives insight in Mayerne's note-taking method: 'Nota bene: Make a final edited account' (My own translation). The Latin 'fac.' is a frequently used abbreviation in recipe literature, imperative of Latin *facere*, to make/take/do something. It is also used in alchemical recipes, cf. *Liber secretorum alchimie*, which dates back to 1257. De Pisa 1990. The Latin term 'dictatio' likely refers to a scholastic concept for oral accounts that had been written down and edited ('été écrit, redigés'), e.g., sermons, perhaps also medical dictations. Leclercq 1962, 5.

58 See Shapin 1989 and Hentschel 2008 on the invisibility of anonymous amanuenses.

59 Pliny the Elder (1st century CE) 1855, esp. book 37, ch.11-12. On its use in composite medicines with complex lists of ingredients, many of which were introduced by Arabic authors and unknown to the ancients, see Riddle 1964.

60 Duffin 2018.

61 Gilbert (1600) 1901, 46.

62 *Ibid.*, 46-47.

63 *Ibid.* In MS 2052 also spelled as *charabe* and *chacrabe*. Fols. 43, 44, 48, 49, 151.

64 'So in very many cases, there are some who, when they are pleading a cause and cannot give a reason for it, bring in loadstone and amber as though they were personified witnesses'. Gilbert (1600) 1901, 46-47.

65 Fol. 72v: 'Mon experiment sur la préparation/ du Vernix d'ambre fait le 16. Juillet/ 1631'; and fol. 73r: 'Speculation sur diverses compositions de vernix'.

66 On commonplace books and methods of commonplacing in the early modern period, see Blair 2010, esp. 131-132; and Yeo 2014, esp. 13-25.

67 Thick 2010, 381. See also Blair 2010; Yeo 2014; Miller 2000, 2011, 2015, 2017; and Sirat 2006.

68 See, e.g., the vernacular editions: *Le bâtiment des recettes* 1560 (Deblock 2015); Von Cuba & Von Breydenbach 1485 and 1486; and Gerard *et al.* 1633, which is cited by Mayerne on fol. 28. My thanks go to Birgit Reissland, researcher of heritage on paper at the Cultural Heritage Agency of the Netherlands (RCE), for bringing the multilingual nomenclature of German herbals to my attention.

69 Fransen 2017, 629.

70 *Ibid.*, 632. See also Fransen *et al.* 2017.

71 Blair 2010, cited after Fransen 2017, 632; Trevor-Roper 2006, 331-348.

72 Fransen 2017, 633.

73 For further readings, see Dupré 2018.

74 E.g., Siraisi 1987; and Siraisi 2007; and Hasse 2016, 317-407, provide an impressive list of publications of Arabic authors that were available in Latin print editions in the Renaissance.

75 Hasse 2016, 17-20, 397-403; Baghdiantz McCabe 2008, 110-111, 118; Siraisi 2007, 259; Tibi 2006. For more on the influence of medieval pharmaceutical treatises ascribed to Yūhānnā ibn Māsawayh (anglicized John Mesue) or Pseudo-Mesue, see De Vos 2013.

76 Hasse 2016, 398-403.

77 The *al-Kitāb al-Ḥāwī fī al-tibb* was first translated into Latin in 1279. *Ibid.*, 398-399; Tibi 2006, 206.

78 MS Marsh 156, see object description at *Digital Bodleian*. <https://digital.bodleian.ox.ac.uk/inquire/p/2c397123-a8bd-4f8b-bd38-dc9f90534e2b>. Mayerne shared also a keen interest in writing technologies and inks with Arabic physicians. See, e.g., Zaki 2011.

79 Mayerne owned a Latin translation of a later Arabic work that was intended to complement and improve al-Rāzī's medical work: *The complete book of the medical art* (*Kitāb Kāmil al-ṣinā'ah al-tibbiyyah* also known as *al-Kitāb al-Malikī* or *The Royal book*), ascribed to Ali ibn al-Abbās al-Majūsī, in Europe known as Haly Abbās. The Latin translation was first published in Venice in 1492 and reprinted as *Liber totius medicinae necessariae continens* (...) in Lyons in 1523 by J. Mynt. A volume of the latter edition had successively been owned by Leonardo Botallo of Asti, physician to Francis I of France, and Mayerne. Allan 1985, 34.

80 Hasse 2016, 141-178.

81 *Ibid.*, 141-178.

82 Cordus 1534, 163. An English translation in Hasse 2016, 148-149.

83 The Latinised Arabic term *ambra* was often used interchangeably for the animal substance (*ambra grisea*, *ambergris*), a bodily excretion of a whale – mentioned once in MS 2052 on fol. 20r – and *materia medica* that was distinguished by colour from the fossilised resin. Both were thought to have similar beneficial properties, and they often appear together in medical ingredient lists. Riddle 1974, 174. On the etymology of 'amber', see Riddle 1964. On *ambergris*, see also Dannenfeldt 1982; and Dumas 2014.

84 Fols. 19, 48, 49, 52. Riddle 1974, 174, lists, e.g., five different denominations that were in use in the 13th century for vegetal ambers.

85 Fol. 161: '(...) de l'Ambre la/ plus claire et blanche que pourrés trouver (...)'.

Marginal note top left: 'Feci Londini,/ Septem br. 1638./ George Crudosi./ Allemand Apotiquaire'.

86 Gesner 1565, 22-24v. Gesner's treatise includes more descriptions of materials used by craftsmen, e.g., a Goldsmith's stone for gilding, 22, and a plaster 'good for casting fine images', 25. On Gesner's diverse note taking and excerpting technologies, see Blair 2010, 213-229.

87 'SUCCINA CRASSA nonpellucida 1. Succinum Prussicum candidissimum, & maximè preciosum, non pellucidum', and in German gothic fonts: 'Der allerweissste un(d) beste ackstein oder bornstein'. Gesner 1565, 23.

88 The term 'note boke' entered into English in the second half of the 16th century; other contemporary terms include 'writing-book', 'day-book', and 'ephemerides'. Yeo 2014, 13. The latter term is used by Mayerne for his case studies of patient treatments that document his daily practice as physician. See Nance 2001, 33.

89 From Latin *facere* (to do; make; try). Six entries in MS 2052 are marked in Mayerne's hand with 'fecij/ t': fol. 15r, 45v, 161r. Three of them relate to paper and writing technologies: fol. 61r-v, and the here-cited 29v. On uses of erasable 'drawing tablets', see Van de Wetering 1991.

90 See, e.g., DiMeo & Penell 2013; and Leong & Rankin 2011.

91 Blair 2010, esp. 73, 213-229.

92 Thick 2010.

93 *Ibid.*, 279.

94 We find in MS 2052 references to authors, book titles, and sometimes even page numbers. E.g., fol. 51r: 'Summa de Secreti universali in ognī materia di Don Timetheo Rosello Lib. 6, cap. 39 & 40, pag. seu folio 127'.

95 All textual references in MS 2052 are identified and listed in Parmentier 2017.

270. On books of secrets, see Eamon 1994.

96 Nance 2001, 59n26.

97 Cf. Blair 2010, esp. 216–229, on what we could call Conrad Gesner's 'paper slip economy'; Yeo 2014, esp. ch. 6, 'Robert Boyle's loose notes', 151–175.

98 Cf. Ann Blair's four S's of early modern text management. Blair 2010, 3.

99 Cf. Ragland 2017; Pomata 2010; McVaugh 2016; and Siraisi 2007.

100 Fol. 9v: 'Notés. L'addition de l'huyle d'aspic/ au blanc & au bleu, qui fait qu'ils/ ne meurent jamais, ce que je repepe/ parce que c'est un grand secret.'

101 Fol. 9v: 'NB. Pour faire que vos couleurs s'estendre/ facilement, & par consequent se meslent bien, & mesmes/ ne meurent pas, comme pour les azurs;/ mais generalement en toutes couleurs, en peignant/ trempes legerement de fois a aultre votre pinceau/ dans de l'huile blanche de Therebentine de Venise/ extraite au baing M. puis avec ledict, pinceau meslez vos/ couleurs sur la palette'. Notes left margin: 'M. Rubens'/ 'Acqua di rasia'/ 'Vidj'.

102 On 'l'huile blanche de Therebentine de Venise', cf. Eastaugh 2008, 289. See also White & Kirby 1994, 71–74; and Kirby *et al.* 2010, 457 on historical uses of resinous compounds and essential oils (spirits) in paint studio's and for a discussion of oil of turpentine (commonly referring to a distillation of pine resins) and Venetian/Venice Turpentine (larch resins). Mayerne notes in the margin the Latin term *acqua di rasa* that is commonly used to refer to pine resin distillates. On the recto of the same folio (fol. 9r) Mayerne refers in a marginal note to 'huyle d'aspic ou de Therbentine fort claire' (no mention of Venice) as additives to oil paints. Jo Kirby Atkinson, former senior conservator at the National Gallery, London, pointed out that 'ordinary pine resin turpentine' works better for some of the uses mentioned by Mayerne than Venice Turpentine and emphasises that further research is needed into the trade and availability of *Therebentine de Venise* in early modern England to assess economic (dis)advantages of using turpentine from Venice rather than local pine resins (personal email correspondence, 6 July 2018; see also White & Kirby 1994). According to Kirby Atkinson, larch resin distillates do not work well for cleaning oil-paint brushes, raising questions about the modern English translation as 'Venice Turpentine' that is today readily understood to refer to Venetian larch resins. Cf. Scott 2002, 295. I am grateful to Jo Kirby Atkinson for bringing the complexities regarding early modern uses of turpentine resins and their distillates to my attention. On (spirit) varnish recipes, see also Eastlake (1847) 1960, 471–478; Stols-Witlox 2001; and Stoner & Rushfield 2012, 255–257. On painter's enduring interest in essential oil and amber varnishes, see, e.g., Fels 2010.

103 On historical reconstructions, testing the use of spirit varnishes as diluents to improve the handling properties of oil paints, see Keller 1993, 99.

104 Cf. Kirby *et al.* 2010, 459. Berger 1901 mis-transcribes the term as 'Acqua di ragia'. See also Mayerne's own explanation on fol. 150r, where he quotes Rubens in Italian and adds in Latin a definition in brackets for an oil of turpentine obtained from the 'soft and white resin of a tree belonging to the Pinacea family' ('i. cum oleo alba therbentinae [inserted above and in marginal note] extracto ex bice molli & alba/ qua colli/gitur ex/ arbore pi/ cea, est boni odo/ris, &/ distillatur cu[m]/ Aqua in/star Oleij/ albi The/rbentinae'). See also Kirby 1999, 13, on Van Dyck's notes on 'acqua di rasa'.

105 See, e.g., also marginal note on fol. 144v: 'Junij 19./ Fetz ex-/pertus e(st)/& valde probat' (June 19. Fetz is an expert & and very experienced). On fol. 5r 'Mr. Elie Fetz' is identified as a painter from Konstanz.

106 From the Latin verb *videre* (to see).

107 On fol. 5v, Mayerne reports, e.g., on a new method 'For restoring a painting that is severely cracked because of an abundance of glue in its ground layer or canvas'. Mayerne added detailed information that makes it possible to trace the instance to a particular day and to specific works: 'This invention was made by chance in my presence on 24 December 1641 & practiced on a landscape by Abraham la Tombe, & on a portrait of the count de la Suze all cracked' and marked this first-hand observation with the 'epistemic marker' *vidj* in the margin. Mayerne's 'vidj' echoes repeated trials and testimonial strategies in medicine and anatomy, recently discussed by Evan R. Ragland, who points out that 'these trials appear as brief first-person accounts of the way things happened during a trial', arguing that 'taken together, these instances of repeated trial-making form a picture of a learned culture that increasingly depended on the making of first-person, contrived tests of things. The search for new things and the frequent confrontation of theoretical claims with personal experience exceeded the common practices of learned medieval medicine. Renaissance learned physicians, using humanist scholarly methods, elaborated on models and methods from ancient texts and university settings'. Ragland 2017, 527.

108 Fol. 24r.

109 Fol. 23r.

110 This bilberry recipe might very well have been copied from an existing text, perhaps transmitted through the family of Strasbourg manuscripts that lists an almost literal German version of this recipe. Cf. Neven 2016, 118, rx 63. Or perhaps it relates to Valentinius Boltz von Ruffach's widely circulating *Illuminierbuch* (1549, 1st ed.), often quoted in MS 2052, that contains a series of bilberry (*heidelber*) recipes for violets and blues. Benziger (1913) 2014, 78, 82. See also Zindel 2010, 646.

111 Compare e.g. the entry on *vaccinia rubra/ nigra* across different editions: Dodoens 1554 (Dutch); Dodoens & Clusius 1557 (French); and Dodoens *et al.* 1578 (English).

112 Gerard *et al.* 1633, lib. 3, ch. 73, 1415. Quoted in MS 2052, fol. 23v: 'Gerard parle dans son Herbier de vaccinia rubra, qui ne different de l'autre que de la couleur de bayes, & dit que du jus d'icelles avec de l'allum se fait une couleur qui ne cede point à la Lacque des Indes Orientales, scavoir mon si elle dure'. Gerard became 'Surgeon and Herbalist' to James I in 1604. Knight 2009, 75. On stick lac as a source for making pigments and dyes, cf. glossary in Kirby *et al.* 2010, 253, and Eastaugh 2008, 220. On late medieval trade, early modern routes, and merchants' quality assessment of stick lac, see, e.g., DeLancey 2010, esp. 81.

113 Fol. 25, dated 6 November, and fol. 26, dated 5 November were bound in inverted order, and the latter upside down.

114 Fol. 24r: 'Avec ceste liqueur cecy a esté escrit'.

115 MS 2052 comprises many sheets of diverging sizes, mostly smaller than the folio format of the series in Mayerne's hand with which the codex opens (fol. 1–34); fol. 57, 25–27 (omitted and not transcribed in Berger 1901), 34, 46, 49, (50), 55, 56/57 bifolio, 75, 76, 80–83 enlarged format, 95/96 bifolio, 123–135; series of same small-sized papers, probably coming from the same

notebook, including one bifolio 133/134, 136 ripped bifolio, 137, 138/139 bifolio, 146, 152, 162.

116 Juvenal Satires 10.1-4, cited after Uden 2015, 144ff.

117 My own English translation, which diverges from Uden 2015, 144: 'In all the lands that stretch from Cadiz, all the way to the Ganges and the dawn, few can distinguish [dinoscere] between the true goods and those that, once the mist of delusion has been removed, are its distant opposite'.

118 'Comme ainsi fust, bening lecteur, que ces ans passez, non sans mon grand travail et fatigue, j'usse prins plaisir d'assembler et accumuler plusieurs sortes de receptes experimentees, lesquelles peussent enseigner grand nombre de beaux secretz (...). Preface in *Bastiment de receptes, traduit d'Italien en François* (1560), cited after Deblock 2015, 98. The Italian original, *Difizio di ricetti* (1525), is the first-known printed book of secrets (now lost) that was soon translated into other European vernaculars. The French translation saw an extraordinary number of editions and became a true 'bestseller'. Cf. Deblock 2015, 42, 213-240.

119 Fol. 29r: 'Tiré des discours tenues avec Mr. Huskies Excellent peintre En/ lumineur. Le 14 Mars 1634. (...) La Lacque qui vient des Indes Orientales/ est une excellente couleur representant les/ plus belles anemones rouges qui se puissant voir (...)'.

120 These insights are based on historically informed recipe reconstructions conducted by the author in collaboration with technical art history master students of the University of Amsterdam, during a hands-on workshop at an expert meeting, and at home. See events on the website of the ERC ARTECHNE Projects and reconstruction reports in ARTECHNE database (forthcoming). My thanks go to Benjamin van Enter and Annalena de Groot for making reconstructions and to Art Gaibor Proaño and the Cultural Heritage Agency for providing expertise, materials and laboratory space.

121 Even today historical samplings, that include the information on how they were made on the same folio, are of great value to conservation scientists and technical art historians to assess processes of colour degradations and for their use as reference collections.

122 Trevor-Roper 1993, 282; Trevor-Roper 2006, 346-347.

123 Fol. 6v, marginal note; fol. 92v, 94v, 29r. MS 2052 contains many more references to the bodies (*corps*) of colours that can be enlivened, modified, and killed in various ways. A vivid body language of colours was apparently not uncommon at that time; we encounter it in other art-technological sources in the European vernaculars, e.g., in BNF MS Fr. 740, a late 16th-century anonymous manuscript in a French hand that is currently being investigated by members of the Making and Knowing Project, led by Pamela Smith (Smith & Beentjes 2010; Beentjes & Smith 2013; Smith 2016; Bilak *et al.* 2016). References to 'bodies of colour' can also be found in Richard Haydocke's *A tracte containing the artes of curious paintinge, carvinge, & buildinge (...)* Englished by RH, London 1598 – a translation of the first five books of Giovanni Paolo Lomazzo's *Trattato della pittura* (1584) (cf. Ackerman 1967; Leonhard 2015), but this early modern body language of colours is the topic of another paper. More generally, on early modern discourses on colours and colour making, see Baker *et al.* 2015. I am grateful to my reviewer for bringing Haydocke's treatise to my attention.

124 Harkness 2007, 2011-2253; Thick 2010.

125 Harkness 2007, xvii; Smith 2004, 142-149.

126 Harkness 2007, 2011.

127 *Ibid.*, esp. 236.

128 *Ibid.*, 235.

129 MS 2052 mentions on fol. 46r 'les boutiques, & boëstes des Apotiquaires' and on fol. 38v 'les droguistes'. In pre-1650 sources 'catalogue' was commonly used in the simple sense of list, register or enumeration, see *OED Online*, s.v. 'catalogue', www.oed.com/view/Entry/28711. Both herbals and pharmacopoeias with listings of plants, simples, and medicines, emerged in contexts of economic, practical, and epistemic interests. See, e.g., the 'catalogus rerum fossilium Io. Kentmani' in Gesner 1565, no pagination. On botanical catalogues 'as a genre' and Gerard's earlier published *Catalogus arborum* (1597), see, e.g., Knight 2009, 71-75.

130 Trevor-Roper 2006, 216-217. Quotation taken from Sloane MS 2056, cited after Trevor-Roper 2006, 216n23.

131 De Mayerne & Cademan 1639; Trevor-Roper 2006, 331-349. More research, however, needs to be done on Mayerne's entrepreneurial activities, in particular with regard to royal privileges, licenses, and patents, to understand his experimental interests in crafts knowledge – recently this has been done convincingly for Francis Bacon: Pastorino 2017.

132 The *Ephemerides morborum et elenchus remediorum variis aegris praescribendorum per Annos XL Mayerno Quaerctano &c.* count 18 mostly short titled volumes, and total more than 3,000 folios. The dated casebooks were written between 1603 and 1653. In contrast to MS 2052 these manuscripts were put in chronological order, indexed, and bound by Mayerne, probably at the end of his life. Nance 2001, 23. Nonetheless, they can best be understood as 'a sprawling work in progress, a vast unfinished monument to a physician's practice'. *Ibid.*, 35.

133 Cf. Nance 2001, 24; Kassell 2014; and Yeo 2014, 17.

134 Quoted from De Mayerne 1603, 46, English translation cited after Nance 2001, 24n5. Nance inserted '[from his books]' after 'silent doctors', which I have left out; Mayerne's 'conversations' might also include correspondence or notes.

135 They could also be described as historical examples of the material cultures of extended/distributed and embodied cognition processes, which only recently have attracted the attention of cognitive scientists, philosophers, and archaeologists of mind. See, e.g., Yeo 2014, 32; and Malafouris 2013.

136 Cf. Yeo 2014 on early modern scribal cultures coexisting with books and print culture in which 'note taking mattered in ways we need to reimagine' and on the advantages of 'flexible' paper systems of loose notes. Yeo 2014, 13, xiv, xvi, 151-173.

Bibliography

Manuscripts

MS 2052

MS Sloane 2052, British Library, London, c. 1620-1646.
http://www.bl.uk/manuscripts/FullDisplay.aspx?ref=Sloane_MS_2052, last accessed 23 May 2018.
 An improved open access transcription of MS 2052, based on Berger 1901 is online available at the ARTECHNE database.
<http://artechne.hum.uu.nl/node/94995>, last accessed 17 September 2018.

MS Marsh 156

MS Marsh 156, Bodleian Libraries, Oxford, before 925 CE.
<https://digital.bodleian.ox.ac.uk/inquire/p/2c397123-a8bd-4f8b-bd38-dc9f0534e2b>, last accessed 7 September 2018.

BNF MS Fr. 740

BNF MS Fr. 740, Bibliothèque nationale de France, Paris, late sixteenth century.
<https://gallica.bnf.fr/ark:/12148/btv1b1050001g.r=fr.%20640?rk=1502152>, last accessed 10 September 2018.

Printed and online sources

Ackermann 1967

G. Ackerman, 'Lomazzo's treatise on painting', *Art Bulletin* 49 (December 1967), no. 4, 317-327.

Allan 1985

N. Allan & Wellcome Institute for the History of Medicine, *Islamic science. Crossroad of cultures. An exhibition at the Wellcome Institute for the History of Medicine (...) 19 June to 12 November 1985*, London 1985, <http://archive.org/details/b20456906>, last accessed 22 May 2018.

Anderson 2013

S. Anderson, 'Pharmacopoeias of Great Britain', in: International Society for the History of Pharmacy, *History of the pharmacopoeias of the world*, Berlin 2013, 1-8.
<http://www.histpharm.org/ISHPWG%20UK.pdf>, last accessed 10 September 2018.

Anderson 2017

S. Anderson, "The rejection of tradition in favour of experience". The publication of British pharmaceutical texts abroad 1670 to 1890', *Pharmaceutical Historian* 47 (2017), no. 2, 21-32.

Baghdantz McCabe 2008

I. Baghdantz McCabe, *Orientalism in early modern France. Eurasian trade, exoticism, and the Ancien régime*, Oxford & New York 2008.

Baker *et al.* 2015

T. Baker, S. Dupré, S. Kusukawa & K. Leonhard (eds.), *Early modern color worlds*, Leiden 2015.

Beentjes & Smith 2013

T. Beentjes & P. Smith, 'Sixteenth-century life-casting techniques. Experimental reconstructions based on a preserved manuscript', in: D. Saunders, M. Spring & A. Meek (eds.), *The Renaissance workshop*, London 2013, 144-151.

Benziger (1913) 2014

J. Benziger, *Valentin Boltz von Ruffach. Illuminierbuch. Wie man allerlei Farben bereiten, mischen und auftragen soll. Allen jungen angehenden Malern und Illuministen nützlich und fürderlich* 1549, reprint, Vaduz 2014.

Berger 1901

E. Berger, *Quellen für Maltechnik während der Renaissance und deren Folgezeit (XVI.-XVIII. Jahrhundert) in Italien, Spanien, den Niederlanden, Deutschland, Frankreich und England. Nebst dem de Mayerne Manuscript, zum 1. Mal herausgegeben, mit Übersetzung und Noten versehen, Beiträge zur Entwicklungsgeschichte der Maltechnik*, Munich 1901.

Bilak *et al.* 2016

D. Bilak, J. Boulboullé, J. Klein & P. Smith, 'The making and knowing project. Reflections, methods, and new directions', *West 86th. A Journal of Decorative Arts, Design History, and Material Culture* 23 (2016), no. 1, 35-55.

Birch (1756) 1968

T. Birch, *The history of the Royal Society of London*, vol. 2 (1664-1671), with introduction by A.R. Hall, reprint, London 1968.

Bischoff 2004

G. Bischoff, *Das De Mayerne-Manuskript. Die Rezepte der Werkstoffe, Maltechniken und Gemälderestaurierung*, Munich 2004.

Blair 2010

A.M. Blair, *Too much to know. Managing scholarly information before the modern age*, New Haven 2010.

Bol *et al.* 2014

M. Bol, A. Wallert & H. de Groot, 'Glass and parchment with a view. Oil paint and the imitation of (stained) glass windows, 1400-1600', *Making and transforming art. Technology and interpretation*, Proceedings of the fifth symposium of the ICOM-CC Working Group for Art Technological Source Research, Brussels 22-23 November 2012 (H. Dubois *et al.*, eds.), London 2014, 129-130.

Bucklow 2016

S. Bucklow, *Red. The art and science of a colour*, London 2016.

Callis 2019

R. Callis, 'Reconstructing the Ottoman Greek world. Early modern ethnography in the household of Martin Crusius', *Renaissance Quarterly* 72 (2019), no. 1, 148-193.

Cooper 1973

M. Cooper, *This island of Japon. João Rodrigues' account of 16th-century Japan*, Tokyo 1973.

Cordus 1534

E. Cordus, *Euricci Cordi, Simesusii medici, Botanologicon*, Cologne 1534.

Von Cuba & Von Breydenbach 1485

J. von Cuba & B. von Breydenbach, *Gart der Gesundheit*, Augsburg 1485.

Von Cuba & Von Breydenbach 1486

J. von Cuba & B. von Breydenbach, *Gart der Gesundheit*, Augsburg 1486.

Dannenfeldt 1982

K. Dannenfeldt, 'Ambergris. The search for its origin', *Isis* 73 (1982), no. 3, 382-397.

Deblock 2015

G. Deblock, *Le bâtiment des recettes. Présentation et annotation de l'édition Jean Ruelle, 1560*, Rennes 2015.

DeLancey 2010

J. DeLancey, 'Shipping colour. Valute, pigments, trade and Francesci di Marco Datini', in: Kirby *et al.* 2010, 74-85.

DiMeo & Penell 2013

M. DiMeo & S. Pennell (eds.), *Reading and writing recipe books, 1550-1800*, Manchester & New York 2013.

Dodoens 1554

R. Dodoens, *Cruydeboeck*, Antwerpen 1554 (1st edition).

Dodoens & Clusius 1557

R. Dodoens & C. Clusius, *Histoire des plantes, en laquelle est contenue la description entière des herbes, c'est à dire, leurs especes, forme, noms, temperament, vertus & operations: non seulement de celles qui croissent en ce pays, mais aussi des autres estrangères qui viennent en usage de médecine. Par Rembert Dodoens medecin de la ville Malines. & Normallement traduite de bas aleman en françois, par Charles de l'Escluse*. Anvers 1557.

Dodoens *et al.* 1578

R. Dodoens, H. Lyte, P. van der Borcht & A. Nicolai, *A new herball, or historie of plantes: wherin is contayned the vvhole discourse and perfect description of all sortes of herbes and plantes, their diuers & sundry kindest, their straunge figures, fashions, and shapes, their names, natures, operations and vertues: and that not onely of those whiche are here growyng in this our countrie of Englande, but of all others also of forrayne realmes, common vsed in physicke*, London 1578.

Duffin 2018

C. Duffin, 'Amber in historical *materia medica* collections. The material culture of a prominent geopharmaceutical', in: I. Polyakova, T. Suvorova & C. Duffin (eds.), *Collection in the space of culture. Paper abstracts from the international conference 18-21 September 2017, Kaliningrad Regional Amber Museum*, Kaliningrad 2018, 109-111.

Dunea 2014

G. Dunea, 'Theodore de Mayerne. Prince of all doctors', *Hektoen International* 6 (2014), no. 3. <http://hekint.org/2017/01/29/theodore-de-mayerne-prince-of-all-doctors/>, last accessed 29 June 2018.

Dumas 2014

G. Dumas, 'Les substances marines dans le livre des simples médecines', in: C. Connocchie-Bourgne (ed.), *Mondes Marins Du Moyen Âge*, Aix-en-Provence 2014, 131-43.

Dupré 2018

S. Dupré, 'Introduction. Science and practices of translation', *Isis* 109 (2018), no. 2, 302-307.

Eamon 1994

W. Eamon, *Science and the secrets of nature. Books of secrets in medieval and early modern culture*, Princeton 1994.

Eastaugh 2008

N. Eastaugh (ed.), *Pigment compendium. A dictionary and optical microscopy of historical pigments*, new ed., Amsterdam 2008.

Eastlake 1847

C.L. Eastlake, *Materials for a history of oil painting*, London 1847.

Eastlake (1847) 1960

C.L. Eastlake, *Methods and materials of painting of the great schools and masters*, New York 1960.

Feefer *et al.* 2012

A. Feeser, M. Goggin & B. Tobin (eds.), *The materiality of color. The production, circulation, and application of dyes and pigments, 1400-1800*, Farnham & Burlington, VT 2012.

Fels 2010

D.C. Fels, *Lost secrets of Flemish painting. Including the first complete English translation of the De Mayerne Manuscript*, B.M. Sloane 2052 (rev. ed.), Floyd, VA 2010.

Frankopan 2015

P. Frankopan, *The silk roads. A new history of the world*, London 2015.

Fransen 2011

S. Fransen, 'Iconography and identity in early 17th-century medical portraiture. The case of the unknown physician', *British Art Journal* 12 (2011), no. 3, 26-31.

Fransen 2017

S. Fransen, 'Latin in a time of change. The choice of language as signifier of a new science?', *Isis* 108 (2017), no. 3, 629-635.

Fransen *et al.* 2017

S. Fransen, N. Hodson & K.A.E. Enenkel (eds.), *Translating early modern science*, Leiden & Boston 2017.

Gesner 1565

C. Gesner, *De omni rerum genere, gemmis, lapidibus, metallis, et huiusmodi, libri aliquot, plerique nunc primum editi*, Tiguri 1565.

Gerard *et al.* 1597

J. Gerard, J. Norton, R. Priest & R. Dodoens, *The herball, or, generall historie of plantes. Gathered by John Gerard of London, master in chirurgerie*, London 1597.

Gerard *et al.* 1633

J. Gerard *et al.*, *The herball, or, generall historie of plantes*, London 1633 (enlarged ed.).

Gilbert (1600) 1901

W. Gilbert, *William Gilbert of Colchester, physician of London. On the magnet. Magnetick bodies. Also, and on the great magnet the earth, a new physiology, demonstrated by many arguments & experiments (Royal College of Physicians of London, n 80046799)*, London 1901.

De Graaf 1958

J.A. van de Graaf, *Het De Mayerne Manuscript als bron voor de schildertechniek van de Barok*, British Museum Sloane 2052, Mijdrecht 1958.

Harkness 2007

D.E Harkness, *The jewel house. Elizabethan London and the Scientific Revolution*, New Haven 2007.

Hasse 2016

D.N. Hasse, *Success and suppression. Arabic sciences and philosophy in the Renaissance*, Cambridge, MA & London 2016.

Hentschel 2008

K. Hentschel (ed.), *Unsichtbare Händ. Zur Rolle von Laborassistenten, Mechanikern, Zeichnern u. a. Amanuenses in der physikalischen Forschungs- und Entwicklungsarbeiten*, Diepholz 2008.

Howarth 2004

D. Howarth, 'Edward Norgate (1581-1650). Miniature painter, musician, and writer on art', *Oxford dictionary of national biography*, Oxford 2004, <http://www.oxforddnb.com.proxy.uba.uva.nl:2048/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-20252>, last accessed 21 May 2018.

Kassel 2014

L. Kassell, 'Casebooks in early modern England', *Bulletin of the History of Medicine* 88 (2014), no. 4, 595-625.

Keller 1993

R. Keller, 'Leinöl als Malmittel', *Restauro* 2 (1973), 74-105.

Keller 2018

V. Keller, 'Scarlet letters. Sir Theodore de Mayerne and the early Stuart color world in the Royal Society', in: V. Keller, A.M. Roos & E. Yale, *Archival Afterlives. Life, death, and knowledge-making in early modern British scientific and medical archives*. Scientific and learned cultures and their institutions, volume 23. Leiden & Boston 2018, 72-119. https://doi.org/10.1163/9789004324305_004.

Kern 2015

U. Kern, 'The art of conservation I. Theodore de Mayerne, the King's black paintings and seventeenth-century methods of restoring and conserving paintings', *The Burlington Magazine* (October 2015), no. 157, 700-708.

Kirby 1999

J. Kirby, 'The painter's trade in the seventeenth century. Theory and practice', *National Gallery Technical Bulletin* 20 (1999), 5-49.

Kirby et al. 2010

J. Kirby, S. Nash & J. Cannon (eds.), *Trade in artists' materials. Markets and commerce in Europe to 1700*, London 2010.

Knight 2009

L. Knight, *Of books and botany in Early Modern England. Sixteenth-century plants and print culture*, Surrey, UK & Burlington, VT 2009.

Leclercq 1962

J. Leclercq, *Recueil d'études sur Saint Bernard et ses écrits*, Storia e Letteratura, nos. 92 & 104, Rome 1962.

Leong & Rankin 2011

E.Y.T. Leong & A.M. Rankin (eds.), *Secrets and knowledge in medicine and science, 1500-1800*, Farnham, UK & Burlington, VT 2011.

Leonhard 2015

K. Leonhard, 'Painted gems. The color worlds of portrait miniature painting in sixteenth- and seventeenth-century Britain', in: Baker et al. 2015, 140-169.

Leonard et al. 2001

M. Leonhard, N. Khandekar & D. Carr (eds.), "Amber varnish" and Orazio Gentileschi's "Lot and his daughters", *The Burlington Magazine* 143 (2001), no. 1174, 4-10.

Luterbacher 2018

S. Luterbacher, 'Surfaces for reflection. East Asian Namban lacquer in the Iberian world', conference paper, Renaissance Society of America Annual Meeting, New Orleans 2018, <http://tinyurl.com/y75u92m4>, last accessed 23 May 2018.

Malafouris 2013

L. Malafouris, *How things shape the mind. A theory of material engagement*, Cambridge, MA 2013.

De Mayerne 1603

T. de Mayerne. *T. Mayernei Turqueti (...) Apologia. In qua videre est inviolatis Hippocratis & Galeni legibus, remedia chymicè preparata, tuto usurpari posse. Ad cuiusdam anonymi calumnias responsio*. La Rochelle 1603.

De Mayerne & Cademan 1639

T. de Mayerne & T. Cademan, *The distiller of London, compiled and set forth by the speciall licence and command of the Kings Most Excellent Majesty. For the sole use of the Company of Distillers of London. And by them to be duly observed and practized. Examined and corrected by T. de Mayerne and T. Cademan*, London 1639.

McVaugh 2016

M. McVaugh, 'When universities first encountered surgery', *Journal of the History of Medicine and Allied Sciences* 72 (2016), no. 1, 6-20.

Miller 2000

P.N. Miller, *Peiresc's Europe. Learning and virtue in the seventeenth century*, New Haven 2000.

Miller 2004

D.P. Miller, 'Thomas Birch (1705-1766). Compiler of histories and biographer', *Oxford dictionary of national biography*, Oxford 2004, <http://www.oxforddnb.com.proxy.uba.uva.nl:2048/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-2436>, last accessed 21 May 2018.

Miller 2011

P.N. Miller, 'Peiresc's "History of Provence". Antiquarianism and the discovery of a Medieval Mediterranean', *Transactions of the American Philosophical Society* 101 (2011), no. 3, i-104.

Miller 2015

P.N. Miller, *Peiresc's Mediterranean world*, Cambridge, MA & London 2015.

Miller 2017

P.N. Miller, 'Peiresc in the Parisian "Jewel house"', in: S. Dupré & C. Göttler (eds.), *Knowledge and discernment in the early modern arts*, London & New York 2017, 213-235.

Muller & Murrell 1997

J.M. Muller & J. Murrell, *Edward Norgate. Miniatura, or The art of limning*, New Haven 1997.

Nance 2001

B. Nance, *Turquet de Mayerne as Baroque physician. The art of medical portraiture* (*Clio medica* 65), Amsterdam 2001.

Neven 2016

S. Neven, *The Strasbourg Manuscript. A medieval tradition of artists' recipe collections (1400-1570)*, London 2016.

Padilla et al. 2015

C. Padilla, B. Anderson & B. Clark (eds.), *A red like no other. How cochineal colored the world. An epic story of art, culture, science, and trade*, New York & Santa Fe 2015.

Parmentier 2017

C. Parmentier, 'Le réseau au cœur de la méthodologie de Théodore de Mayerne', *CTHS – La France Savante* (édition électronique), Actes des congrès nationaux des sociétés historiques et scientifiques, Paris 2017, <http://cths.fr/ed/edition.php?id=7216>, last accessed 23 May 2018.

Pastorino 2017

C. Pastorino, 'The philosopher and the craftsman. Francis Bacon's notion of experiment and its debt to early Stuart inventors', *Isis* 108 (2017), no. 4, 749-768.

Pastoureau 2001

M. Pastoureau, *Blue. The history of a color*, Princeton 2001.

Pastoureau 2008

M. Pastoureau, *Black. The history of a color*, Princeton 2008.

Pastoureau 2014

M. Pastoureau, *Green. The history of a color*, Princeton 2014.

Pastoureau 2017

M. Pastoureau, *Red. The history of a color*, Princeton 2017.

Pharmacopœa Londinensis 1618

Pharmacopœa Londinensis, in qua medicamenta antiqua et nova usitatisima, sedulò collecta, accuratissimè examinata, quotidiana experientia confirmata describuntur, London 1618.

A physical directory (1649) 2003

N. Culpeper, *A Physical Directory, or, A Translation of the London Dispensatory Made by the Colledge of Physicians in London (...) by Nich. Culpeper, Gent*, London & Ann Arbor MI & Oxford (1649) 2003. <http://name.umdl.umich.edu/A35390.0001.001>, last accessed 10 September 2018.

De Pisa 1990

C. de Pisa, *The book of the secrets of alchemy*, Leiden 1990.

Pomata 2010

G. Pomata, 'Sharing cases. The Observationes in early modern medicine', *Early Science and Medicine* 15 (2010), no. 3, 193-236.

Ragland 2017

E.R. Ragland, 'Making trials' in sixteenth- and early seventeenth-century European academic medicine', *Isis* 108 (2017), no. 3, 503-528.

Rice 1987

P. Rice, *Amber. The golden gem of the ages*, New York 1987 (rev. 2nd ed.).

Riddle 1964

J. Riddle, 'Pomum ambrae. Amber and ambergris in plague remedies', *Sudhoff's Archiv für Geschichte der Medizin und der Naturwissenschaften* 48 (1964), no. 2, 111-122.

Riddle 1974

J. Riddle, 'Theory and practice in medieval medicine', *Viator. Medieval and Renaissance Studies* 5 (1974), 157-184.

Rinaldi 1995

S. Rinaldi, *Theodor Turquet de Mayerne. Pittura, scultura e delle arti minori, 1620-1646*, Ms. Sloane 2052 del British Museum di Londra, Anzio 1995.

Rublack 2016

U. Rublack, 'Renaissance dress, cultures of making, and the period eye', *West 86th. A Journal of Decorative Arts, Design History, and Material Culture* 23 (2016), no. 1, 6-34.

Rublack et al. 2015

U. Rublack, M. Hayward & J. Tiramani, *The first book of fashion. The book of clothes of Matthaeus and Veit Konrad Schwarz of Augsburg*, London 2015.

Scott 2002

D. Scott, *Copper and bronze in art. Corrosion, colorants, conservation*, Los Angeles 2002.

Shapin 1989

S. Shapin, 'The invisible technician', *American Scientist* 77 (1989), 554-563.

Siraisi 1987

N.G. Siraisi, *Avicenna in Renaissance Italy. The canon and medical teaching in Italian universities after 1500*, Princeton 1987.

Siraisi 2007

N.G. Siraisi, *History, medicine, and the traditions of Renaissance learning (Cultures of Knowledge in the Early Modern World)*, Ann Arbor 2007.

Sirat 2006

C. Sirat, *Writing as handwork. A history of handwriting in Mediterranean and Western culture*, Turnhout 2006.

Smith 2004

P. Smith, *The body of the artisan. Art and experience in the scientific revolution*, Chicago 2004.

Smith 2016

P. Smith & The Making and Knowing Project, 'Historians in the laboratory. Reconstruction of Renaissance art and technology in the Making and Knowing Project', *Art History* 39 (April 2016), no. 2, 210-233.

Smith & Beentjes 2010

P. Smith & T. Beentjes, 'Nature and art, making and knowing. Reconstructing sixteenth-century life-casting techniques', *Renaissance Quarterly* 63 (2010), no. 1, 128–179.

Stevenson 1990

M. Stevenson, 'A seventeenth-century manual for the restoration of prints', *Print Quarterly* 7 (1990), no. 4, 420–424.

Stock 2012

A. Stock, 'Does the Mayerne Manuscript reflect contemporary studio practice?', in: L. Wrapson (ed.), *In artists' footsteps. The reconstruction of pigments and paintings. Studies in honour of Renate Woudhuysen-Keller*, London 2012, 109–115.

Stols-Witlox 2001

M. Stols-Witlox, 'Final varnishes for oil paintings in Holland, 1600–1900. Evidence from written sources', *Zeitschrift für Kunstechnologie und Konservierung* 19 (2001), no. 1, 241–285.

Stoner & Rushfield 2012

J. Stoner, & R. Rushfield (eds.), *The conservation of easel paintings*, London 2012.

Thick 2010

M. Thick, *Sir Hugh Plat. The search for useful knowledge in early-modern London*, Totnes 2010.

Tibi 2006

S. Tibi, 'Al-Razi and Islamic medicine in the 9th century', *Journal of the Royal Society of Medicine* 99 (2006), no. 4, 206–207.

Trevor-Roper 1993

H. Trevor-Roper, 'De Mayerne and his manuscript', in: O. Millar & D. Armine Howarth (eds.), *Art and patronage in the Caroline Court. Essays in honour of Sir Oliver Millar*, Cambridge & New York 1993, 264–293.

Trevor-Roper 2006

H. Trevor-Roper, *Europe's physician. The various life of Sir Theodore de Mayerne*, New Haven & London 2006.

Uden 2015

J. Uden, *The invisible satirist. Juvenal and second-century Rome*, Oxford & New York 2014.

Versini & Faidutti 1973

C. Versini & M. Faidutti (eds.), *Le manuscrit de Turquet de Mayerne* [1620], Lyon 1973.

De Vos 2010

P. de Vos, 'European *materia medica* in historical texts. Longevity of a tradition and implications for future use', *Journal of Ethnopharmacology* 132 (2010), no. 1, 28–47.

De Vos 2013

P. de Vos, 'The "Prince of medicine". *Yūḥannā* Ibn Māsawayh and the foundations of the Western pharmaceutical tradition', *Isis* 104 (2013), no. 4, 667–712.

Van der Wetering 1991

E. van der Wetering, 'Verdwenen tekeningen en het gebruik van afwisselbare tekenplankjes "tafeletten"', *Oud Holland* 105 (1991), no. 4, 210–227.

White & Kirby 1994

R. White & J. Kirby, 'Rembrandt and his circle. Seventeenth-century Dutch paint media re-examined', *The National Gallery Technical Bulletin* 15 (1994), 64–78.

Wiseman 2013

B. Wiseman, 'The materiality of color', *The Senses and Society* 8 (2013), no. 2, 223–231.

Yeo 2014

R. Yeo, *Notebooks, English virtuosi, and early modern science*, Chicago & London 2014.

Zaki 2011

M. Zaki, 'Early Arabic bookmaking techniques as described by Al-Rāzī in his recently rediscovered *Zinat Al-Katabah*', *Journal of Islamic Manuscripts* 2, no. 2 (2011), 223–234.

Zindel 2010

C. Zindel, *Guldene Kunst-Pforte. Quellen zur Kunstechnologie*, Bern, 2010.

The author is a member of the ARTECHNE project and has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 648718).

Detail fig. 2c



Saffran Blingel Licht ogen Bruin ogen

82

Saffran Blingel Licht ogen Bruin ogen

Saffran Blingel Licht ogen Bruin ogen