BJHS Themes (2025), 1–23
doi:10.1017/bjt.2025.10019

RESEARCH ARTICLE

Medical alchemy and quintessence in renaissance florence: the Alchemist's laboratory painting of Johannes Stradanus (1570)

Georgiana D. Hedesan

History Faculty, University of Oxford, UK
Email: georgiana.hedesan@history.ox.ac.uk

Abstract

In 1570, Johannes Stradanus (1523–1605), a Flemish-born artist settled in Florence, produced two paintings meant to adorn the new Studiolo of Prince Francesco I de' Medici (1541–87). The best-known painting is *The Alchemist's Laboratory*, a depiction of the laboratory then existing at the Palazzo Vecchio. The laboratory was set up by Cosimo I (1519–74), the first grand duke of Tuscany. His son Francesco was also enthusiastic about it: Stradanus's painting portrays the prince working on the premises amongst other artisans. This paper will present the laboratory, instruments and practices by linking them with a specific form of alchemy popular in the period, quintessence alchemy. I will also discuss the extent to which Stradanus's depiction may be deemed 'realistic', relating it to its underlying ideology as well as other contemporary representations.

Sometime in 1570, a Flemish painter by the name of Jan van der Straet (1523–1605), latinized to Johannes Stradanus, was commissioned for two paintings for the projected Studiolo of Prince Francesco de' Medici (1541–1587), the son of the grand duke of Tuscany, Cosimo I (1519–74). Stradanus, a member of a prominent family in Bruges, first moved to Antwerp to study drawing and painting.[1] Like many Flemish artists of his age, he undertook an extended visit to Italy to get accustomed to Renaissance Italian art. He was, however, one of the few who chose to stay, sometime around 1550. First charged with designs for the Medicean tapestry in Florence, he became an associate of Giorgio Vasari (1511–74), the well-known writer of the *Lives of the Artists*, and himself a famed artist. When Cosimo I undertook the redesign of the Palazzo Vecchio in Florence, Vasari was set in charge of it, and he brought in a number of artists to work there, including Stradanus. Stradanus's close relationship with Vasari brought him not only several important commissions, but also membership of the newly founded Accademia delle Arte del Disegno, the first art academy in Europe.

Today, Stradanus is mostly remembered for his suite of engravings called *Nova Reperta*, in which he depicted a series of new inventions and discoveries.[2] Yet the roots of this work

[1] On Stradanus see Alessandra Baroni and Manfred Sellink (eds.), *Stradanus 1523–1605: Court Artist of the Medici*, Turnhout: Brepols, 2012; Alessandra Baroni Vannucci, *Jan van der Straet detto Giovanni Stradano, Flandrus Pictor et Inventor*, Milan: Jandi Sapi, 1997; Alice Bonner McGinty, 'Stradanus (Jan van der Straet): his role in the visual communication of renaissance discoveries, technologies, and values' (PhD dissertation, Tufts University, 1974).

[2] On Stradanus's *Nova Reperta* see Alessandra Baroni (ed.), *Giovanni Stradano: Le più strane e belle invenzioni del mondo*, Florence: Edizioni Polistampa, 2023; Lia Markey (ed.), *Renaissance Invention: Stradanus's Nova Reperta*,

© The Author(s), 2025. Published by Cambridge University Press on behalf of British Society for the History of Science. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (http://creativecommons.org/licenses/by/4.0), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.



Figure 1. Stradanus, *The Alchemist's Laboratory* (1570). Public domain.

lay in the paintings and frescoes he made in the Palazzo Vecchio in the 1560s and 1570s, and particularly in the work for the Studiolo. It is not hard to see the connection between *Nova Reperta* and the Studiolo, particularly between Plate No. 7 called *Distillatio* and the source of it, the 1570 painting *The Alchemist's Laboratory* (Figure 1).[3]

Evanston, IL: Northwestern University Press, 2020; Markey, *Imagining the Americas in Medici Florence*, University Park: Pennsylvania State University Press, 2016.

[3] The economy of this paper does not allow a comparison between the painting and the later engraving; for a recent treatment of *Distillatio* see Olivia Dill, 'Invented processes: Stradanus's "Distillatio" and "Lapis polaris magnes"', in Markey, *Renaissance Invention*, op. cit. (2), pp. 91–100.

My attention to *The Alchemist's Laboratory* was fostered by an attempt to understand early modern alchemical laboratories. Recent research suggests that such laboratories were ubiquitous in the early modern world, although they ranged widely in size. At the lowest scale, the laboratory could be indistinguishable from one's kitchen and house. At the highest, there were large-scale laboratories sponsored by princes or wealthy individuals or groups.[4]

The curious alchemical instruments, vessels and processes linked with laboratories made them ripe as subjects of visual representation. However, the realistic nature of these depictions is not always clear, particularly when representations were part of genre painting, as is the case with the seventeenth-century Netherlandish tradition of alchemical portrayal.[5] Genre painting, as defined by Wayne E. Franits, appears realistic but is not so in a modern sense, rendering scenes of everyday life in the form of 'clever fictions'.[6] As Ivo Purš and Vladimir Karpenko perceptively showed, an artist like Flemish painter David Teniers the Younger (1610–90) could provide a similar setting for the alchemical laboratory as well as for the witches' sabbath.[7] In this sense, it is difficult to take seemingly realistic paintings like those of Teniers or Thomas Wijck as reproducing existing laboratories.[8]

In comparison with Netherlandish genre painting, Stradanus's work stands out as a representation of a real laboratory, that existing in the Palazzo Vecchio in Florence in 1570,

[4] On the early modern laboratory see Ivo Purš and Vladimir Karpenko, *The Alchemical Laboratory in Visual and Written Sources*, Prague: Academia, 2024; Mar Rey Bueno, 'La mayson pour distiller des eaües at El Escorial: alchemy and medicine at the court of Philip II, 1556–1598', *Medical History* (2009) 53, pp. 26–39; Ursula Klein, 'The laboratory challenge: some revisions of the standard view of early modern experimentation', *Isis* (2008) 99, pp. 769–82; Marcos Martinon-Torres, 'The tools of the chymist: archeological and scientific analyses of early modern laboratories', in Lawrence M. Principe (ed.), *Chymists and Chymistry: Studies in the History of Alchemy and Early Modern Chemistry*, Sagamore Beach, MA: Science History Publications, 2007, pp. 149–63; Tara Nummedal, *Alchemy and Authority in the Holy Roman Empire*, Chicago: University of Chicago Press, 2007, pp. 119–46; Pamela Smith, 'Laboratories', in Lorraine Daston and Katharine Park (eds), *The Cambridge History of Science*, vol. 3: *Early Modern Europe*, Cambridge: Cambridge University Press, 2006, pp. 290–305; William Newman, 'Alchemical symbolism and concealment: the Chemical House of Libavius', in Peter Galison and Emily Thompson (eds.), *The Architecture of Science*, Cambridge, MA: MIT, 1999, pp. 59–78; Jost Weyer, *Graf Wolfgang II von Hohenlohe und die Alchemie: Alchemistische Studien in Schloss Weikersheim, 1587–1610*, Sigmaringen: Jan Thorbecke, 1992.

[5] Lawrence M. Principe, 'Spaces of wonder and ruin: alchemical laboratories in early modern painting', in Sven Dupré, Dedo von Kerssenbrock-Krosigk and Beat Wismer (eds.), *Art and Alchemy: The Mystery of Transformation*, Munich: Hirmer, 2014, pp. 60–83. As he points out (p. 64), there is often a moralistic undertone to the Netherlandish painting of alchemists and alchemical spaces. See also Lawrence M. Principe and Lloyd DeWitt, *Transmutations. Alchemy in Art: Selected Works from the Eddleman and Fisher collections at the Chemical Heritage Foundation*, Philadelphia: Chemical Heritage Foundation, 2002. Elizabeth Berry Drago has recently shown that these depictions are not necessarily negative, as some scholars have thought; 'Art and representation: skepticism and curiosity for the alchemist at work', in Bruce T. Moran (ed.), *A Cultural History of Chemistry in the Early Modern Age*, London: Bloomsbury, 2023, pp. 199–229. However, ascertaining the realism of these depictions is difficult, as artists borrowed elements and tropes from earlier works in memetic fashion. Purš and Karpenko observe that the famous Pieter Brueghel the Elder painting of the alchemist (1558), which is known for its satirical narrative, features a wide range of realistic equipment that is precise and authentic. Purš and Karpenko, op. cit. (4), p. 428. On genre painting, including that of alchemical subjects, see Wayne E. Franits, *Dutch Seventeenth-Century Genre Painting: Its Stylistic and Thematic Evolution*, New Haven, CT: Yale University Press, 2004; Franits (ed.), *Looking at Seventeenth-Century Dutch Art: Realism Reconsidered*, Cambridge: Cambridge University Press, 1997.

[6] Franits, *Dutch Seventeenth-Century Genre Painting*, op. cit. (5), p. 1.

[7] Purš and Karpenko, op. cit. (4), pp. 431–4.

[8] Teniers and Wijck are recognized as being two painters who seemed sympathetic to alchemy and appear to have some knowledge of the processes involved; however, as Purš and Karpenko, op. cit. (4), p. 444, point out, the dividing line between 'positive' and 'negative' portrayals in these paintings may be oversimplifying.

when the painting was finished.[9] In this sense, it could be deemed a true depiction of scientific space. This article will discuss the extent to which this is likely to be true, and also offer a potential interpretation of it as presenting a coherent alchemical programme, that of 'quintessence' alchemy.[10]

The Studiolo

Any understanding of *The Alchemist's Laboratory* should first take account of its spatial context, the Studiolo or cabinet of curiosities of Francesco.[11] The Studiolo is a rectangular vaulted room in the Palazzo Vecchio in Florence, built between 1569 and 1575 at the command of Francesco (Figure 2). Francesco, the son of the bellicose Cosimo I, was particularly interested in natural philosophy and the arts.[12] According to reliable sources, he was often seen in the artisanal workshops set up by Cosimo or by himself, working alongside other craftsmen or inspecting products.[13] He was praised as an inventor, and claimed to be the creator of the first type of porcelain made in Europe, the so-called Medici porcelain.[14]

In addition to being an artisan, Francesco was also a keen collector. Following a visit to southern Germany and Austria in 1565, when he visited a number of famous princely

[9] As mentioned in the painting itself, on the central furnace in the foreground. On the sixteenth- and early seventeenth-century Medici *fonderie* see Fanny Kieffer, 'The laboratories of art and alchemy at the Uffizi Gallery in Renaissance Florence: some material aspects', in Sven Dupré (ed.), *Laboratories of Art: Alchemy and Art Technology from Antiquity to the 18th Century*, Cham: Springer, 2014, pp. 105–28; Marco Beretta, 'Material and temporal powers at the Casino di San Marco (1574–1621)', in Dupré, op. cit., pp. 129–56; and Giovanni Piccardi, 'La Fonderia Medicea di Firenze,' in Luigi Cerruti and Francesca Turco (eds.), *Atti del xi Convegno Nazionale di Storia e Fondamenti della Chimica*, Rome: Accademia delle Scienze detta dei xl, 2005, pp. 197–210.

[10] The article also draws on work I have done as part of my involvement with the University of Oxford's *Cabinet* online visual platform, based at www.cabinet.ox.ac.uk (accessed 11 March 2025).

[11] On the Studiolo see Valentina Conticelli, '*Guardaroba di Cose Rare et Preziose': Lo Studiolo di Francesco I de' Medici – Arte, Storia e Significati*, Lugano: Agorà, 2007; Karen Victoria Edwards, 'Rethinking the Installation of the Studiolo of Francesco I de' Medici in the Palazzo Vecchio (PhD dissertation, Case Western Reserve University, 2007); Philippe Morel, 'Le Studiolo de Francesco I de' Medici et l'économie symbolique du pouvoir au Palazzo Vecchio', in Frederick Hartt, Michelangelo Muraro and Aby Moritz Warburg (eds.), *Symboles de la Renaissance*, vol. 2, Paris: Éditions Rue d'Ulm, 1982, pp. 187–205, 254–6; Larry Feinberg, 'The Studiolo of Francesco I reconsidered', in Cristina Acidini Luchinat *et al.* (eds.), *The Medici, Michelangelo, and the Art of Late Renaissance Florence*, New Haven, CT: Yale University Press, 2002, pp. 47-66; Michael Rinehart, 'A document for the Studiolo of Francesco I', in Moshe Barasche and Lucy Freeman Sandler (eds.), *Art the Ape of Nature: Studies in Honor of H.W. Janson*, New York: Harry Abrams, 1981, pp. 275–89; Scott Schaefer, 'The Studiolo of Francesco I de' Medici in the Palazzo Vecchio in Florence' (PhD dissertation, Bryn Mawr College, 1976).

[12] The main monograph on Francesco I remains Luciano Berti, *Il Principe dello Studiolo: Francesco I dei Medici e la fine del Rinascimento fiorentino*, Florence: Edam, 1967.

[13] As recorded, for instance, in Giovanni Targioni-Tozzetti, *Selve di notizie, spettanti all'origine de' progressi e miglioramenti delle scienze fisiche in Toscani*, 17 vols., Florence: Biblioteca Palatina , vol. 8, 18, 112–20; Suzanne B. Butters, *The Triumph of Vulcan: Sculptors' Tools, Porphyry and the Prince in Ducal Florence*, vol. 2, Florence: Olschki, 1996, pp. 473–4, 496; Butters, '"Una pietra eppure non una pietra": Pietre dure e botteghe medicee nelle Firenze del Cinquecento', in F. Franceschi and G. Fossi (eds.), *La grande storia dell'artigianato: Il Cinquecento*, Florence: Giunti, 2000, pp. 172–5; Arnoldo Segarizzi (ed.), *Relazioni degli ambasciatori veneti al senato*, vol. 3, part II, Bari: Laterza e Figli, 1916, pp. 226–7.

[14] On Francesco's passion for porcelain see Marco Spallanzani, *Ceramiche alla corte dei Medici nel Cinquecento*, Modena: F.C. Panini, 1994, 59–87. Medici porcelain is now very rare; it is not true porcelain of the Chinese type as it lacked the key ingredient of kaolin.



Figure 2. The Studiolo of Francesco de' Medici. Web Gallery of Art, public domain.

collections, Francesco set himself to making his own cabinet of curiosities.[15] For this purpose he commissioned the architect of the Palazzo Vecchio, Vasari and counsellor Vincenzo Borghini (1515–80) to create a room that would host his ever-growing collection. The Studiolo is one of the finest examples of a sixteenth-century *Wunderkammer*, or cabinet of curiosities, even though we don't have any objects clearly surviving from it.

The Studiolo is small and elongated, with a barrel-shaped vault. Today you can see it with electric lights, but back in the day it would have been in almost complete darkness. It was conceived as a study for Francesco, being mainly accessible from his bedroom. The only furniture that may have been there was a wooden cabinet that doubled as a desk, where Francesco would have sat and looked at some of his treasures. This was a place dedicated to Francesco's *vita contemplativa*, quite in contrast with his active participation in scientific work.

While the Studiolo was small, it was also spectacular, being covered with paintings and adorned with sculptures especially commissioned for it. It also featured a coherent programme designed by Borghini, who, as lieutenant of Cosimo I at the Accademia dell Arte del Disegno, effectively ran the institution.[16]

[15] On cabinets of curiosities see Horst Bredekamp, *The Lure of Antiquity and the Cult of the Machine: The Kunstkammer and the Evolution of Nature, Art, and Technology*; tr. Allison Brown, Princeton, NJ: Princeton University Press, 1995; Paula Findlen, *Possessing Nature: Museums, Collecting and Scientific Culture in Early Modern Italy*, Berkeley and Los Angeles: University of California Press, 1994; T.D. Kaufmann, *The Mastery of Nature: Aspects of Art, Science and Humanism in the Renaissance*, Princeton, NJ: Princeton University Press, 1993.

[16] Borghini's designs on the Studiolo are revealed in his letters to Vasari, which were transcribed in C. Frey, *Der literarische Nachlass Giorgio Vasaris*, 3 vols. (Munich, 1923–1930), vol. 2. On his *invenzione* see Rinehart, op. cit. (11), p. 276; Conticelli, op. cit. (11), Chapter 3. On Borghini in general see also G. Belloni and R. Drusi (eds.), *Vincenzio Borghini: Filologia e invenzione nelle Firenze di Cosimo I*, Florence: Olschki, 2002.

Borghini proposed the overall theme of the Studiolo to be art's relationship with nature and suggested exploring this, beginning from the ceiling downwards. The key to the vault is a fresco by Giovanni Morandini, portraying Nature as a woman and art as an unchained Prometheus.[17] This painting suggests a quest for harmony between nature and art, and brings together the four walls of the Studiolo, each assigned to an element in accordance with the traditional Aristotelian perspective prevalent at this time. The rectangular shape of the room did not permit Borghini to give equal weight to each of the four elements; fire and water are represented by the longer walls and earth and air by the smaller ones. This choice, as we will further see, may reflect a heightened importance of the fire and water elements in the world view portrayed by the Studiolo.

Each of the walls was divided into two registers. On the upper one there are rectangular paintings, set between two sculptures representing rulers of the respective element. The paintings are on slate, suggesting the influence or even command of Vasari, who thought painting on stone was superior to that on canvas.[18] On the lower register there are oval paintings, which were actually doors that covered cupboards containing Francesco's collected objects.

Due to the fact that the Studiolo was gradually dismantled and fell into oblivion until the early twentieth century, the exact look of it can never be restored. The current set-up is a 1910 reconstruction, which has been criticized by scholars but has not been changed ever since.[19] It is difficult to decide what rectangular painting in the upper register belonged with what oval one in the lower register, and the contents of the cupboards behind the doors may never be established with certainty. On the upside, all the paintings and the sculptures survive.

With regard to the history of knowledge and science, the most important wall is the Fire Wall, which contains paintings that depict the experimental and artisanal culture of the Medici workshops. Figure 3 is a plan of the wall that I made for Oxford's visual platform *Cabinet*.[20]

The upper register, with the exception of the statues, depicts workshops and sites associated with contemporary activities, mostly in and around the Palazzo Vecchio. The Fire Wall depicts the glassworks, the goldsmiths' or jewellery workshop, the alchemical laboratory, and the bronze foundry of the Medici family. With the exception of the last painting, Francesco is depicted actively involved in artisanal workings, either inspecting or actually participating in them.[21] Remarkably, all the activities Francesco is involved in are related to alchemy.

[17] On this topic see Valentina Conticelli, 'Prometeo, Natura e il Genio sulla volta dello Stanzino di Francesco I: fonti letterarie, iconografiche e alchemiche', *Mitteilungen des Kunsthistorischen Institutes in Florenz* (2002) 46(2–3), pp. 321–56.

[18] Giorgio Vasari, *Lives of Painters, Sculptors and Architects*, tr. Gaston de Vere, New York: Everyman's Library, 1996, Chapter 24; on stone painting in Renaissance Italy see Piers Baker-Bates and Elena Calvillo (eds.), *Almost Eternal: Painting on Stone and Material Innovation in Early Modern Europe*, Leiden: Brill, 2018. Painting on stone involved complex chemical knowledge of oils and pigments and could be related to alchemy in a wide sense.

[19] The current set-up was done by Giovanni Poggi and Alfredo Lensi in 1910. Giovanni Poggi, 'Lo studiolo di Francesco I nel Palazzo Vecchio di Firenze', *Il Marzocco* (1910) 15, p. 1; amongst the critics are Schaefer, Rinehart, Morel, Feinberg and Edwards.

[20] The image is available on *Cabinet* at www.cabinet.ox.ac.uk/studiolo-francesco-i-fire-wall (accessed 2 April 2024).

[21] Scholars generally agree that the person depicted in these paintings is Francesco, with the exception of Morel, op. cit. (11).

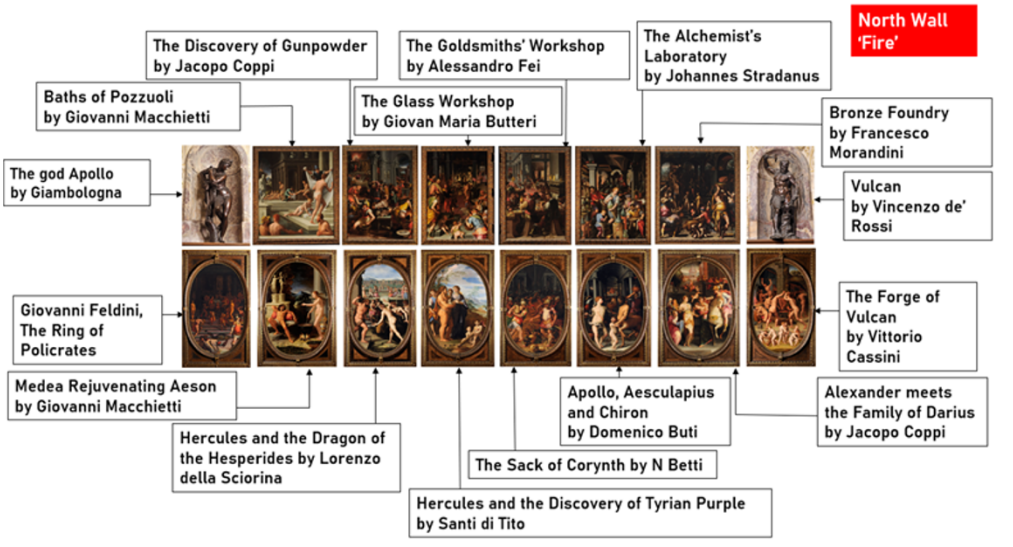

Figure 3. The Studiolo's Fire Wall. *Cabinet*, © Georgiana Hedesan CC-BY-SA 4.0.

Early modern alchemy is difficult to define and categorize.[22] In a narrow sense, it was the art of metallic transmutation, with the making of gold being the best-known goal. In a wider sense, it was a wide set of techniques, approaches and technologies directed at improving or bettering the human condition. It often included theory and practice, although the weight of each could vary. At one end, it could be a highly abstruse philosophy with no apparent practical component; at the other, a purely craft-driven practice with little apparent theory. The remit of alchemy in a broad sense is difficult to capture, as its techniques spilled over into related fields like medicine, arts and crafts. Arguably the most important writer on early modern alchemy, Theophrastus von Hohenheim, called Paracelsus (1493–1541), attempted to encompass all arts involving the use of 'fire' as alchemy. Yet, as I have shown elsewhere, his understanding of fire went beyond what we think of fire, involving different active agents that had various degrees of materiality.[23] Paracelsus was typically daring in his attempt to subsume most, if not all, (mechanical) arts under the alchemy umbrella.

In Florence, the term 'alchemy' (*archimia*) suffered from a bad reputation, or so Cosimo I's courtier Benedetto Varchi (*c.*1503–65) tells us. He sought to rescue it by separating the false alchemy from the true.[24] Although Varchi believed that alchemy was fundamentally metallic transmutation, he added that it was also responsible for creating glass, salts and

[22] Older scholars used to separate between 'alchemy' and 'chemistry'; however, this view has been challenged by William Newman and Lawrence Principe, 'Alchemy vs chemistry: the etymological origins of a historiographic mistake', *Early Science and Medicine* (1998) 3(1), pp. 32–65. The consensus now is that alchemy and chemistry cannot be separated in the early modern period.

[23] Georgiana D. Hedesan, 'Fire, Vulcanus, Archeus and alchemy: a hybrid reading of Paracelsus's thought on active agents', *Ambix* (2024) 71(3), pp. 271–300.

[24] Benedetto Varchi, *Questione sul'Alchimia di Benedetto Varchi*, Florence: Magheri, 1827. On this text see Lionel Devlieger, 'Benedetto Varchi on the birth of artefacts: architecture, alchemy and power in late-Renaissance Florence' (PhD dissertation, Gent University, 2005); William Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature*, Chicago: Chicago University Press, 2004, pp. 132–45; and Alfredo Perifano, 'Benedetto Varchi et l'alchimie: Une analyse de la *Questione sull'alchimia*', *Chyrsopoeia*, 1987, pp. 181–208.

gunpowder; he further stated that the practice of alchemy 'finally makes thousands of various waters, thousands of oils and diverse liquors, and other infinite things without which one could not live in comfort, nor even live at all'.[25] Thus Varchi inclined toward a wide interpretation of alchemy, though he did not go as far as Paracelsus. Yet his intention was to criticize Vanuccio Biringuccio (1480–1538/9), the popular author of *De la Pirotechnia* (1640); he provided a restrictive definition of alchemy and subsumed it under a domain of knowledge that he called 'the art of the fire' (*pirotechnia*).[26] Biringuccio was generally critical of alchemy, though not consistently so.[27] Later on, others adopted this term, or variants of it, to refer to alchemical processes.[28] The designers of the Studiolo, Borghini and Vasari, seemed to draw on Biringuccio's view as they conceived the Fire Wall, but did not seek to separate the arts of distillation from alchemy as Biringuccio did. In this sense, they seemed to resonate with Varchi's view. Their approach may have also been practical: for instance, the glass and goldsmithing workshops were clearly separate from the main *fonderia*, and consequently represented in separate paintings. Yet there is no doubt that they saw a close kinship between the making of glass, jewelry, bronze and gunpowder and the arts of alchemy and distillation; most of these are also connected through the presence of a depiction of Francesco in them.

As I will show, the image of alchemy portrayed in Stradanus's painting tends toward the wider rather than the narrower definition of alchemy. At the same time, the activity he portrayed in this masterwork is much more goal-oriented than what might at first appear to be a smorgasbord of technologies, instruments and techniques related to alchemical practice.

The laboratory

Scholars agree that the painting of *The Alchemist's Laboratory* references the Palazzo Vecchio *fonderia*.[29] This had been set up inside the palace by Cosimo I in 1556 (the fact that it was referred to as the *fonderia nuova* suggests that there had been an earlier, older foundry there). Yet it soon encountered the opposition of Vasari, who, irritated by its noise and the danger it posed to his newly painted frescoes, complained about it to Cosimo.[30] The grand duke did not take any immediate action, but in 1570 his son Francesco did. The now mature

[25] Varchi, op. cit. (24), p. 4: 'fa finalmente mille varie acque, mille olii, e diversi liquori, et altre cose infinite, senza le quali non si portrebbe non che vivere comodamente, ma nè vivere ancoråa'. The translation is provided by Devlieger.

[26] Vanuccio Biringuccio, *De la Pirotechnia*, Venice: Venturino Roffinello, 1640. Biringuccio published in Venice, but worked in Florence, being famous for having cast a huge cannon used for Florentine defence. On his views of alchemy see Andrea Bernardoni, 'Artisanal processes and epistemological debate in the works of Leonardo da Vinci and Vannoccio Biringuccio', in Dupré, op. cit. (9), pp. 53–78.

[27] Varchi attacked Biringuccio as someone who 'spoke of alchemy in a very irresolute and inconclusive manner, as we see he does in his writings, where several times he praises and blames it, but finally in the beginning of the ninth book he, no better and no worse than anyone else, confesses his hopes it could actually be possible after all, and cautions the men to exercise patience and have reverence for the magnificent goals, and miraculous works of nature'. Varchi attributes this to Biringuccio's lack of philosophical knowledge, describing him as 'one who had had a great deal of experience, and not a lot of science'. Varchi, op. cit. (24), p. 63.

[28] William Davisson, *Philosophia Pyrotechnica, Willielmi d'Avissoni Scoti doctoris medici. Seu Curriculus chymiatricus nobilissima illa & exoptatissima medicinae parte pyrotechnica instructus*, Paris: Jean Bessin, 1635; J.B. van Helmont also used the term on several occasions and called himself 'philosopher by fire'. Georgiana D. Hedesan, *An Alchemical Quest for Universal Knowledge: The 'Christian Philosophy' of Jan Baptist van Helmont*, London: Routledge, 2016, pp. xii, 22, 89, 159 n. 155, 170.

[29] See, for instance, Beretta, op. cit. (9), p. 133; Purš and Karpenko, op. cit. (4), p. 421.

[30] Frey, op. cit. (16), vol. 1, pp. 502–3, 12 March 1558.

prince commissioned the architect Bernardo Buontalenti to build a house in the Giardino di San Marco that would host laboratories and workshops. Finished in 1575, the Casino di San Marco absorbed some of the work being done in the Palazzo Vecchio, with other workshops later being opened in the Uffizi.[31]

It is likely that at the time Stradanus began the commission on the laboratory, Francesco had already decided to move it from the Palazzo Vecchio. In this sense, the painting acted as a memento, a way of preserving the memory of the laboratory in time. The fact that the painting was done on stone rather than canvas advances the idea of 'immortalizing' the laboratory further. Moreover, that Francesco would preserve this in his most private cabinet and treasury is testimony to his fondness not only for alchemy but also for the moments that he himself had spent in the laboratory.

The composition of *The Alchemist's Laboratory* reveals a bustling space full of people working on different equipment. As Ivo Purš and Vladimir Karpenko point out, 'the painting depicts a well organised operation based on division of labour'.[32] Two men operate the large still at the back, one pouring coal into a tall hopper and the other a liquid into one of the distillation vessels. This complex apparatus appeared first in Hieronymus Brunschwig's landmark *Large Book of Distillation* (1512) and was then reproduced in the Italian context by Vanuccio Biringuccio.[33] The apparatus was meant to extract large quantities of distillates; we know that the Medici laboratory was producing medicines on a quasi-industrial scale.[34]

Other background scenes that suggest a realistic working laboratory include the man stirring a large cauldron to the left of the still, another apparently keeping accounts on the left, the young man fetching a distillate vessel from a shelf in the far right background, and a boy, barely visible, adding wood to a smoking furnace.[35] In the foreground, we see five people, four of whom are carrying out hands-on work. To the left, a person operates a press, which is most likely producing olive oil, due to the presence of an olive-like branch next to the instrument. The importance of olive oil production to Medici Florence and Stradanus's long-standing interest in the subject have recently been highlighted.[36] In the centre left, a blond boy, his neck twisted rather unnaturally to stare at the viewer, is using an oversized pestle and mortar, while another fair-haired young man in the centre of the painting is carrying a vessel with a golden distillate. To the right, a bearded man is mixing a liquid in a pan over a small portable furnace, while a bespectacled physician is gazing straight at the onlooker.

---

[31] On the Casino di San Marco see Stefano Mulas, 'Translating forbidden authors: new evidence on the alchemical library of Don Antonio de Medici', *Ambix* (2024) 71(2), pp. 172–90; Georgiana D. Hedesan, 'Alchemy and Paracelsianism at the Casino di San Marco in Florence: an examination of La fonderia dell'Ill.mo et Ecc.mo Signor Don Antonio de' Medici (1604)', *Nuncius* (2022) 37, pp. 119–43; Paolo Galluzzi, 'Motivi paracelsiani nella Toscana di Cosimo II e di Don Antonio dei Medici: alchimia, medicina "chimica" e riforma del sapere', in Luigi Tassinari (ed.), *Scienze, credenze occulte, livelli di cultura: Convegno internazionale di studi (Firenze, 26–30 giugno 1980)*, Florence: Olschki, 1982, pp. 31–62. For the Uffizi workshops see Kieffer, op. cit. (9).

[32] Purš and Karpenko, op. cit. (4), p. 408.

[33] On Brunschwig see Tillmann Taape, 'Hieronymus Brunschwig and the making of vernacular knowledge in early German print' (PhD dissertation, University of Cambridge, 2017).

[34] See, for instance, Kieffer, op. cit. (9); Beretta, op. cit. (9).

[35] For more detail and commentary see Purš and Karpenko, op. cit. (4), p. 418.

[36] Anca-Delia Moldovan, '*Oleum olivarum*: Stradano's engraving and the new art of olive-oil making in sixteenth-century Tuscany', *Renaissance Quarterly* (2024) 77, pp. 573–622. I agree with Moldovan about the oil being pressed, but differ on the view that Francesco is mixing olive oil in the pan; see my interpretation below.



Figure 4. Francesco (*The Alchemist's Laboratory*, detail).

The prince and the physician

The bearded man is most likely Prince Francesco himself (Figure 4). He is depicted as an artisan, the sleeves of his shirt drawn up as he is mixing an unknown substance in a pan.[37] However, the golden vest, the trousers and the silk stockings betray his noble status. The presence of Francesco further 'authenticates' the painting and places it in the context of the Palazzo Vecchio proper. Francesco grew up close to the artisan workshop and was easily drawn into this strange world.

[37] A similar process of slow cooking seems to be depicted in an image in Thomas Norton's *The Ordinal of Alchemy*, British Museum, MS Add. 10302, fol 32v; see Purš and Karpenko, op. cit. (4), pp. 387–90. The work seems to be a process of imbibition similar to preparatory processing of ores, and is set under the emblem of the alchemist Rhazes, who wears a golden hat and is made to say: 'As often as the body is watered, so often it must be dried.'

Modern scholars have tended to criticize Francesco for supposedly neglecting the affairs of Florence and indulging in an obsession for alchemy.[38] Unsurprisingly, Francesco was associated with his relative, Emperor Rudolf II of Hapsburg (1583–1612).[39] Both were touched by a bizarre 'melancholy'.

Attempts at a more nuanced view of Francesco have yet to erase this popular image of the Medici grand duke.[40] Certainly, Francesco did not have the warlike, dominant, alpha-male profile of his father Cosimo; as scholars have determined, he was of small stature, although later imagery tended to show him as much more imposing, and scientific analysis of his skeleton suggests that he was much more physically apt and active than he was thought to be.[41] His reputation was also chequered, due to his passionate romance with a merchant's wife, Bianca Cappello (1548–87), who became his mistress while they were both married. After both their spouses died, Bianca eventually became his wife, but she was widely disliked in noble circles due to her image as a parvenue. Remarkably, Francesco and Bianca died suddenly, a day apart; many in the era thought they had been poisoned, though this may not have been the case.[42]

Yet it was Francesco's interest in alchemy that set him up as a 'melancholy prince'. Seen in modern terms, Francesco and Rudolf's fascination for alchemy seems bizarre. In reality, there was certainly nothing uncommon about princes being interested, and even dabbling, in alchemy themselves. The early modern era was replete with them; modern scholars have called these 'prince–practitioners'.[43] The best-analysed case is that of Moritz the Learned, Duke of Hesse-Kassel, by Bruce Moran.[44] But there were many others, including Philip II of Spain, François I of France, Elizabeth I of England, and many princes of the German lands. Alchemy was reportedly practised by Church officials too. Archbishop of Florence Antonio Altoviti was renowned as an alchemist,[45] and even some popes, like Clement VII (a Medici) were supposed to have practised the art. Last but not least, Cosimo I himself worked in the Palazzo Vecchio laboratory.[46]

Just how competent these princes were at their craft is not clear. Some medicines circulated in the name of princes, such as the *oleum Clementis*, supposedly invented by Clement

[38] See Lindsay Alberts, 'From Studiolo to the Uffizi: sites of Collecting and Display under Francesco I de' Medici' (PhD dissertation, Boston University, 2016), pp. 79–82.

[39] The landmark monograph presenting Rudolf II as a melancholy monarch is Robert John Weston Evans, *Rudolf II and His World*, Oxford: Oxford University Press, 1973.

[40] For a better view of Francesco see Alberts, op. cit. (38), pp. 64–70.

[41] Alberts, op. cit. (38), pp. 85–107, G. Fornaciari *et al.*, 'The Medici Project: first anthropological and paleopathological results of the exploration of the Medici tombs in Florence', *Med Secoli* (2007) 19(2), pp. 521–43.

[42] In 2006, forensic experts claimed to have found evidence of arsenic poisoning in the remains of Francesco and perhaps Bianca as well; Francesco Mari *et al.*, 'The mysterious death of Francesco I de' Medici and Bianca Cappello: an arsenic murder?', *BMJ* (clinical research edition) (2006) 333(7582), pp. 1299–1301. A 2010 study, on the contrary, found evidence of the malaria bacterium in Francesco's remains. Gino Fornaciari *et al.*, 'Plasmodium falciparum immunodetection in bone remains of members of the Renaissance Medici family', *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2010) 104(9), pp. 583–7.

[43] Bruce T. Moran, 'German prince–practitioners: aspects in the development of courtly science, technology, and procedures in the Renaissance,' *Technology and Culture* (1981) 22(2), pp. 253–74.

[44] Bruce Moran, *The Alchemical World of the German Court*, Stuttgart: Franz Steiner, 1991.

[45] Valentina Conticelli, 'Lo Studiolo di Francesco I e l'alchimia: nuovi contributi storici e iconologici, con un carteggio in appendice (1563–1581)', in Philippe Morel (ed.), *L'art de la Renaissance entre science et magie*, Rome: Collection de l'Academie de France à Rome, 2006, pp. 207–68, 214.

[46] On the subject of Cosimo I's involvement with alchemy see Alfredo Perifano, *L'alchimie à la cour de Come Ier de Médicis: Savoirs, culture et politique*, Paris: Honoré Champion, 1997.

VII. Yet Alisha Rankin has shown how closely this medicine resembled Caravita's oil, an artisanal product formerly endorsed by the Pope.[47] Hence we may suspect that at least on some occasions the princely products were really prepared by other people. The problem was, of course, even more complicated in the case of a large laboratory such as the one owned by the Medici: we can presume that they owned the rights over anything that was produced inside it.

In Stradanus's image, Francesco does not seem to play an essential part in the operation of the laboratory. He is not placed in the centre of the painting, which is dominated by the anonymous figure of an artisan. Yet everyone else in the picture seems to be working independently, except for Francesco, who is under the guidance of a physician. This doctor, donning a cap identifying him as university-trained, seems to be teaching Francesco about the substance that is being produced in the vessel in front of him. Francesco's eyes are pinned on it.

Attempts have been made to identify the physician portrayed. Back in 1976, Scott Schaefer tentatively proposed the name of Giuseppe Benincasa, a botanist at the court of the Medici during the period.[48] He did so without ever having seen Benincasa's portrait. We now know what Benincasa – his real Flemish name was Joseph Goedenhuyse – looked like, and it is clear that the person in the image is not him. Valentina Conticelli has proposed another candidate: Sisto di Bonsisti of Norcia, an alchemist who dedicated a work to Cosimo I.[49] This person seems a more likely candidate. Nevertheless, at least insofar as we know, Sisto was not a university-trained physician.

Identification aside, we may reflect for a moment on the meaning of this coupling. The clothing of the physician in this image, as well as the glasses, clearly show that this person is a scholar, not an artisan. His appearance, with his hat and ermine robe, seems inappropriate in this busy, steamy laboratory, where almost everyone has rolled up their sleeves. I would argue, however, that we are dealing with a statement about the importance and seriousness of the work taking place in the laboratory. This is not trivial work, the physician seems to tell us, but an enterprise that has meaning not only in practical terms but also in theoretical terms. It is as if he is telling us, 'what we do here is science'. We are dealing with real knowledge, real *scientia*.[50]

This programmatic tone to Stradanus's painting is important. To understand it better, it is worth delving into the preliminary drawing of this work, which can now be found in the Royal Collection in Windsor Castle in England (Figure 5). There are fundamental discrepancies between this drawing and the finished painting, which can be perceived with the help with an animated gif available on *Cabinet*.[51]

The most glaring one is that in the drawing neither Francesco nor the physician are portrayed. Instead of Francesco, a generic artisan is mixing the ingredients in the pan, while

[47] Alisha Rankin, *The Poison Trials: Wonder Drugs, Experiment and the Battle for Authority in Renaissance Science*, Chicago: University of Chicago Press, 2021.

[48] Schaefer, op. cit. (11), p. 415.

[49] Conticelli, op. cit. (45), p. 214.

[50] As noted by Purš and Karpenko, op. cit. (4), pp. 380–1, the image of the scholar instructing a hands-on worker was already present in alchemical representation in the fourteenth century. This was, of course, part of the medieval view of philosophy as being separate from mechanical work. The division still survived in the time of Stradanus and can still be found depicted in a painting of Teniers the Younger, where the alchemist is depicted as an old scholar sitting on a chair and reading books, quite removed from the practical work of the laboratory. Stradanus himself undermined this image in the reversal of roles he operated in the *Distillatio* engraving; there it is the artisan who is pointing to the book held by the scholar, literally towering over him.

[51] These can be examined in the gif image I created for *Cabinet* and is available at www.cabinet.ox.ac.uk/jan-van-der-straet-alchemists-laboratory-1570#/media=11295 (accessed 12 March 2025).



Figure 5. Stradanus, drawing for *The Alchemist's Laboratory*. © Royal Collection Enterprises Limited 2025 | Royal Collection Trust.

the physician is missing completely. Behind the artisan, another man seems to be extracting a heated object, probably a metal, from what looks like an assaying furnace, using a screen to protect his eyes. This person, like others in the drawing, disappears completely in the finished painting, together with their apparatus.

What are we to make of these changes? They cast doubt on the realistic nature of the painting. In particular, the fact that the physician was not even conceived in the preparatory drawing suggests that this detail may have simply been made up.

Stradanus must have been ordered to make the change from drawing to painting. Borghini, who has been identified as the main author of the Studiolo programme, is the most likely candidate. Eager to please his patron, Francesco, he must have ordered the prince's image to be present in all the three Studiolo paintings I mentioned above.

Still, the presence of the physician is harder to explain, and seems linked with a deeper intention, probably Borghini's, to elevate the stakes of the work being done in the laboratory. Clearly, in the presence of the prince and, especially, the scholar, the laboratory acquires more importance. What we are witnessing is not simple craftsmanship and preparation of products, but the practical application of philosophy. This concept is further

emphasized by another element that did not exist in the original drawing: the open book lying behind the physician.

Distillation and alchemical quintessence

To understand the underlying philosophical conceit of the painting, we must delve deeper into the most evident process being depicted in the laboratory: distillation. The early sixteenth century witnessed an explosion of interest in distillation – as recent scholarship has shown, this was practised everywhere during this period, from apothecaries to private homes and large-scale laboratories such as that of the Palazzo Vecchio.[52] Although the popularity of the method in the period needs more documentation, it was probably related to other technological improvements, such as the availability of good and heat-resistant glass, and the design of better furnaces. It also had to do with the appearance of 'how-to' manuals on distillation, the most famous of which were the 'small' and 'large' books of distillation by Brunschwig (1500, 1512), quickly followed by several similar works by Philip Ulstad, Biringuccio and Pietro-Andrea Mattioli. Some of the vessels and equipment portrayed in these distillation books are readily visible in Stradanus's painting: two conical Rosenhut alembics, a vessel in the shape of a urinal, miscellaneous ceramic vessels, a filtration apparatus and two glass vessels with alembics and recipients.[53]

In the period, distillation was primarily seen in terms of its medical outcomes. It was known from the Middle Ages, if not earlier, that distillation purified materials of pollutants and transformed them into products deemed superior for the human body.[54] In Italy, the monks at the monastery of Salerno distilled purified alcohol and advertised it as a medicinal product.

However, Salernitan alcohol was given an extraordinary import in the writing of the Franciscan friar Johannes de Rupescissa (*c.*1310–*c.*1366), *De consideratione quintae essentiae*.[55] Not only did he praise distillation as the key to a universal medicine, but he also provided an entire philosophical background to understand it. He proposed that a substance similar to the unattainable fifth essence of Aristotelian speculation could be extracted on earth by means of distillation.[56] This refined, pure substance Rupescissa called the *quinta essentia*, but also *aqua ardens*, water of life (*aqua vitae*), or human heaven (*caelum humanum*). The Franciscan friar argued that the quintessence could be extracted out of many things, being found in the mineral, vegetable and animal kingdoms. However, not all quintessences were of the same strength. Above all there was one quintessence, which was obtained out of spirit of wine (*aqua ardens*) distilled no less than a thousand times; this was the true panacea.

Rupescissa's *De consideratione quintae essentiae* was later incorporated into the alchemical corpus attributed to the Majorcan philosopher Raymond Llull (1232–1316). Here

[52] On the practice of distillation medicine by noblewomen see Alisha Rankin, *Panaceia's Daughters: Noblewomen in Early Modern Germany*, Chicago: University of Chicago Press, 2013; Meredith K. Ray, *Daughters of Alchemy: Women and Scientific Culture in Early Modern Italy*, Cambridge, MA: Harvard University Press, 2015; Elaine Leong, 'Making medicines in the early modern household', *Bulletin of the History of Medicine* (2008) 82(1), pp. 145–68; on the vogue of distillation manuals see Taape, op. cit. (33).

[53] Conticelli, op. cit. (45), p. 211, identified these as reproducing a Greek *kerotakis*, but Purš and Karpenko, op. cit. (4), p. 418 n. 1367, disagree.

[54] The classical study on the history of distillation is R.J. Forbes, *Short History of the Art of Distillation*, Leiden: Brill, 1948.

[55] On Rupescissa see Leah DeVun, *Prophecy, Alchemy, and the End of Time: John of Rupescissa in the Late Middle Ages*, New York: Columbia University Press, 2009.

[56] On the notion of quintessence see F. Sherwood Taylor, 'The idea of the quintessence', in E. Ashworth Underwood (ed.), *Science, Medicine and History*, 2 vols., London: Oxford University Press, 1953, vol. 1, pp. 247–65.

Rupescissa's quintessence became closely associated with the elixir, or the philosophers' stone, which itself had medical properties.[57]

The importance of the concept of quintessence for understanding the distillation vogue cannot be understated. Fourteenth- and fifteenth-century Italian physicians were quick to assimilate it, and none more so than the famous Florentine philosopher, priest and physician Marsilio Ficino (1433–99).[58] He managed to give the doctrine a polished Platonic veneer by associating the *quinta essentia* with the *spiritus mundi*, itself an active component of the world soul. Ficino, in turn, influenced other writers, such as Giovanni Aurelio Augurello (1441–1524), who wrote an influential poem called *Chrysopoeia* (1515), or Antonio Alegretti (b. *c.*1512).[59] These were writings that inscribed the quintessence and its distillation in a grand cosmological framework. By comparison, 'how-to' manuals toned down theory in favour of practice, though the theoretical world view was never quite abandoned. As Tillmann Taape has pointed out, Brunschwig drew on Rupescissa's quintessence theory quite heavily in his *Large Book on Distillation*.[60] Ulstad sought to emphasize the notion of the quintessence (also called heaven, *coelum*) in his *The Heaven of Philosophers* (*Coelum Philosophorum*, 1525). On the Italian side, Vanuccio Biringuccio (*Pirotechnia*) also mentioned the quintessence, remarking that 'they say that this has a divine power both in increasing and in preserving things and that it is of permanent and incorruptible virtue'.[61]

In turn, Stradanus's painting of the Palazzo Vecchio laboratory revolves around the quintessence. This is particularly evident in the foreground placement of a specific type of still, which Gustav Friedrich Hartlaub has identified as being invented by thirteenth-century Florentine physician Taddeo Alderotti (1215–95).[62] Alderotti was the first Italian to report on the use of the serpentine tube for cooling the vapour of wine.[63] For his feat, Dante placed him in Paradise;[64] the only fitting place to be given the 'heavenly' nature of the waters thus extracted.

This apparatus was first visually depicted in Biringuccio's *Pirotechnia* (Figure 6).[65] Stradanus reproduced it in the drawing, but may not have initially thought of it as significant enough to warrant foregrounding. An analysis of the Windsor drawing revealed that he had initially set it in the background.[66] This first position was then altered in the drawing itself to give the instrument more prominence, and one may suspect the intervention of Borghini in the matter.[67]

---

[57] Michela Pereira, 'Teorie dell'Elixir nell'alchimia latina medievale', *Micrologus* (1995) 3, pp. 103–48; and Pereira, 'L'alchimista come medico perfetto nel "Testamentum" pseudo-Lulliano', in Chiara Crisciani and Agostino Paravicini Bagliani (eds.), *Alchimia e medicina nel medioevo*, Florence: Sismel, 2003, pp. 77–109.

[58] Sylvain Matton, 'Marsile Ficin et l'alchimie', in Jean-Claude Margolin and Sylvain Matton (eds.), *Alchimie et philosophie à la Renaissance*, Paris: Vrin, 1993, pp. 124–90.

[59] On Augurello see Matteo Soranzo, *Giovanni Aurelio Augurello (1441–1524) and Renaissance Alchemy*, Leiden: Brill, 2020. Allegretti wrote a manuscript dedicated to Cosimo I de' Medici, *De la Transmutatione de' Metalli*. Perifano, op. cit. (46), pp. 126–31.

[60] Taape, op. cit. (33), pp. 110–12.

[61] Vannoccio Biringuccio, *The Pirotechnia of Vannoccio Biringuccio: The Classic Sixteenth-Century Treatise on Metals and Metallurgy*, trans. and ed. Cyril Stanley Smith and Martha Teach Gnudi, Mineola, NY: Dover, 1990, 341; Biringuccio, op. cit. (26), 125r.

[62] Gustav Friedrich Hartlaub, 'Distillieren und sublimieren in alten Florenz', *Die BASF (Arbeit der Badischen Anilin und Sofa Fabrik)* (1953) 3(1), pp. 8–12. On Alderotti see Nancy Siraisi, *Taddeo Alderotti and His Pupils: Two Generations of Italian Medical Learning*, Princeton, NJ: Princeton University Press, 1981.

[63] C.A. Wilson, *Philosophers, Iosis and the Water of Life*, Leeds: Leeds Philosophical and Literary Society, 1984, p. 61.

[64] Dante, *Paradiso*, 13:88, as noted by Conticelli, op. cit. (45), p. 211.

[65] Biringuccio, op. cit. (26), 128v.

[66] On this fascinating find see Alessandra Baroni, 'The alchemist's laboratory', in Baroni Vannucci, op. cit. (1), pp. 235–6.

[67] As noted by Conticelli, op. cit. (45), p. 255 n. 27, Borghini owned a copy of Biringuccio's *De la Pirotechnia*.

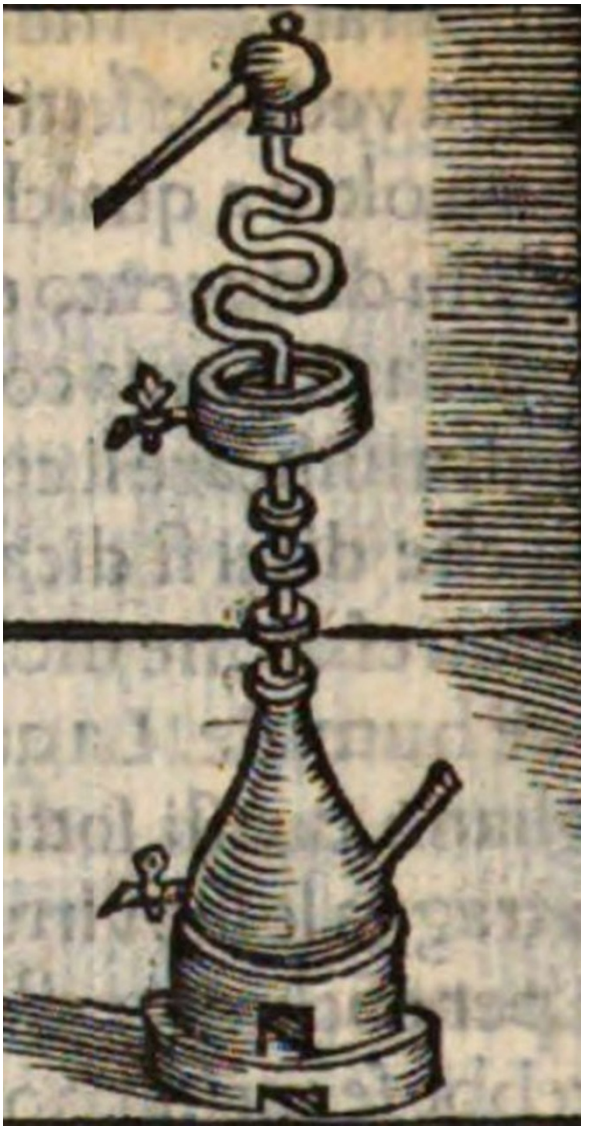

Figure 6. Alderotti's still in Biringuccio, *Pirotechnia*. Deutsches Museum, NoC-NC 1.0.

Foregrounding was still not enough. The painting added Francesco peering intently at Alderotti's instrument, and the physician apparently lecturing on it. This elevated the still even further, making it the most important instrument in the laboratory. It was the piece that produced the precious and heavenly *aqua vitae*, the quintessence of wine.

The emblematic status of the Alderotti still recalls the similar depiction of an oversized still on the cover of Brunschwig's *Large Book of Distillation* (Figure 7). The foregrounding of the small Alderotti still seems to reflect an awareness of Brunschwig's engraving, suggesting a muted dialogue between Florentine and German alchemy. The emphasis here, however, is on the small and the precious; a contrast is made between this finely crafted still and the

large apparatus at the back of the vaults. It seems to suggest that, although the Medici laboratory produced large amounts of ordinary distillates, it was also in pursuit of the supreme quintessence.

The quintessence of gold

The quintessence of wine is essential in Stradanus's scheme, yet its production may not be the central element of the painting. It has been assumed that the central figure, the anonymous fair-haired artisan, is carrying a vessel with the same wine quintessence that is drawn in the Alderotti still.[68] However, the representation of the two substances is glaringly different: the liquid in the Alderotti still is dark, and contrasts with the light one in the artisan's hands.

To further understand the central substance, one should delve deeper into the central figure, and into the differences between the painting and the original drawing (Figure 8). In both cases, the same figure appeared in the centre, holding a vessel with a liquid inside it. In the drawing, this person is less individualized, wearing a cap, with his head tilted sideways. In the final version the figure is bigger and more emphasized; he is no longer wearing a head covering and his face is more prominent; he too seems to be looking at Alderotti's still.

His position and features strangely recall some of the drawings of Leonardo da Vinci of the Virgin or similar idealized female figures.[69] It has been suggested, somewhat tongue-in-cheek, that the figure may have actually depicted Bianca Cappello in disguise. This is highly unlikely, but the suggestion does play on the fair hair and feminine features of the artisan.[70] By contrast, the artisan's hands and visible foot are muscular and masculine.[71]

The combination of feminine and masculine traits suggests that Stradanus was drawing on Renaissance depictions of androgynes for his portrayal. Several Italian artists, including Donatello, Leonardo, Raphael and Parmigianino had created striking images of androgynous figures.[72] The origins of these portrayals were found in both classical and religious sources, and often related to otherworldly figures.[73] Besides this Renaissance pictorial tradition, the Flemish painter could have also been influenced by the alchemical tradition of portraying the elixir as a composite of mercury and sulphur, or often described in a

[68] Conticelli, op. cit. (45), p. 211.

[69] Leonardo, like other artists of his era, followed a Petrarchian canon of beauty. See, for instance, Mary Rogers, 'The decorum of women's beauty: Trissino, Firenzuola, Luigini and the representation of women in sixteenth-century painting', *Renaissance Studies* (1988) 2(1), pp. 47–88.

[70] Blond hair was another ideal of female beauty that traced back to Petrarch. On achieving such standards in dark-haired Renaissance Italy see Janet Stephens, 'Becoming a blond in Renaissance Italy', *Journal of the Walters Art Museum*, 74, https://journal.thewalters.org/volume/74/note/becoming-a-blond-in-late-fifteenth-century-venice-a-new-look-at-w-748 (accessed 1 December 2024); and Jacqueline Spicer, '"*A Fare Bella*": The visual and material culture of cosmetics in Renaissance Italy (1450–1540)' (PhD dissertation, University of Edinburgh, 2014).

[71] I thank Prof Ernst Homburg for pointing this detail out.

[72] Jordi Redondo, 'On the representation of androgynous figures in the Renaissance Art', *Littera Aperta* (2019–20) 7–8, pp. 5–22.

[73] The *locus classicus* was the myth of the Androgyne in Plato's *Symposium*, which had been subjected to a popular commentary by Marsilio Ficino and explained in a Judaeo-Christian fashion by Leone Ebreo. Eleanor Webb, 'Femmina masculo e masculo femmina: androgynous beauty and ambiguous sexualities in the Italian Renaissance', *Comitatus: A Journal of Medieval and Renaissance Studies* (2018) 49, pp. 103–35. See also Wind's comment on French humanists as conceiving of 'the supernatural as composite', in reference to the hermaphroditic painting of Francois I by Niccolo Bellin da Modena: Edgar Wind, *Pagan Mysteries in the Renaissance*, New York: Norton, 1968, p. 214.



Figure 7. Cover of Brunschwig's *Liber de arte distillandi de Compositis* (1512). Science History Institute, public domain.



Figure 8. Stradanus, *The Alchemist's Laboratory*, detail.

metaphorical sense as female and male. This view led to a representation of alchemical hermaphrodites, most famously in *Das Buch der heiligen Dreifaltigkeit* (*The Book of the Holy Trinity*, early fifteenth century).[74] This manner of portrayal merged male and female faces into one single head in a Janus-like manner. Such an image was, however, more suitable for emblematic or allegorical painting, and an example of it would have been close at hand to

[74] On this topic see most recently Leah DeVun, *The Shape of Sex*, New York: Columbia University Press, 2021, pp. 163–99.

Stradanus in a painting by Agnolo Bronzino, *The Allegory of Happiness*. This painting was also made for Francesco I and features a male–female Janus figure, which has been associated with the androgyne motif.[75] 'However, Stradanus's commitment to realism in this painting prevented him from portraying a creature with fantastic traits.

There is, of course, something subversive about portraying an artisan as an androgyne, a creature denoting otherworldliness or simply perfection. Stradanus was fond of glorifying artisans and art, as is particularly evident in his later *Nova Reperta* (1600).[76] In the painting, the artisan, not the prince or the physician, is the carrier of the precious liquid that can easily be seen as the loftiest product of the Medicean laboratory. In the preliminary drawing, the liquid is not visible in the retort; however, in the painting it is not just distinguishable but also coloured in a yellowish hue. Strikingly, the yellow colour matches that of the artisan's hair, even though it may not be the same pigment. It is thus possible that the artisan can be seen as an embodiment of the substance he carries in his arms.

The citrine colour carried several meanings in alchemy,[77] but here Stradanus seems to aim at its most obvious, as alluding to gold. The angelic quality of the artisan's face in the painting, his hair and his centrality seem to hint at solar symbolism, itself connected back to gold. The liquid in his recipient can then be deemed to contain gold in liquid form, probably potable gold.[78]

That the ultimate goal of the alchemical enterprise in the laboratory is a gold-based substance is subtly hinted at by the portrayal of Francesco. The prince is wearing a golden vest, the substance that Francesco is mixing in the pan has a yellowish tint, and a golden substance is found in the urinal cucurbit at the bottom of the small furnace.[79] It is likely that the liquid in the pan and in the urinal (the latter not found in the drawing) is related to that held by the artisan, making Francesco an important actor in the process of achieving the golden substance.[80]

In the Renaissance, the achievement of potable gold had become the desired goal of quintessence alchemy. According to Ficino's influential interpretation, the quintessence, or the *spiritus mundi*, as he called it, was a certain spirit drawn from gold.[81] This view was repeated by his followers Augurello and Allegretti. The Ficinian perspective played on an ambiguity already existing in Rupescissa's text; the medieval alchemist believed that the

[75] Webb, op. cit. (73), p. 109 n. 24.

[76] The *Nova Reperta*'s view is well rendered in Katharine Park and Lorraine Daston, 'Introduction: the age of the new', in Park and Daston (eds.), *The Cambridge History of Science*, vol. 3: *Early Modern Science*, Cambridge: Cambridge University Press, 2006, pp. 1–20 . On the importance of art and artisans, and the artisanal epistemology, see Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution*, Chicago: University of Chicago Press, 2004; and Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400–1600*, Corvallis: Oregon State University Press, 2014.

[77] Jennifer M. Rampling, 'Citrination and its discontents: yellow as a sign of alchemical change', *Ambix* (2024) 71(1), pp. 1–25.

[78] On potable gold see Chiara Crisciani, 'Il farmaco d'oro: Alcuni testi tra i secoli XIV e XV', in Crisciani (ed.), *Alchimia e medicina nel Medioevo*, Florence: SISMEL, 2003, pp. 223–6; Chiara Crisciani and Michela Pereira, 'Black Death and golden remedies', in Agostino Paravicini-Bagliani (ed.), *The Regulation of Evil*, Florence: SISMEL, 1998, pp. 189–222 .

[79] The connection between Francesco's vest and alchemical gold was first highlighted by Butters, *The Triumph of Vulcan*, op. cit. (13), p. 251.

[80] An alternative view, offered by an anonymous reviewer, is that the substance in the artisan's hands is an intermediate product, but the so-called Green Lion or immature gold, which Francesco will then refine in the pan in view of later distilling in the furnace before him. While this is a valid interpretation, I believe that the colour contrast between the liquid being distilled in the Alderotti apparatus and the centrality of the golden substance in the artisan's recipient suggest that the latter may be the finished product.

[81] Ficino, *Opera omnia*, vol. 1 (Basel, 1576), pp. 534–5.

quintessence of wine could be used to yield a form of potable gold. He maintains that gold can 'augment the influence of the quintessence' ('ad augendum influentiam Quintae Essentiae').[82] As the healing properties of gold became extolled and sought after in the later Middle Ages, the Ficinian version became more popular or at least better represented in Florentine sixteenth-century alchemy.[83] In this reversal of perspectives, the quintessence of wine became the instrument of achieving the gold quintessence.[84] If we read the image in this key, Alderotti's still is supposed to yield the refined *aqua vitae* that would be used to extract the quintessence of gold. The proximity of the two is, then, not coincidental, and suggests a coherent research programme.

The quintessence of gold in turn is the universal medicine, the supreme panacea, which seems to be the ultimate goal of the Medici distillation enterprise. This panacea is to be achieved step by step in a process of accumulation of knowledge. At the basic level, common quintessences were obtained, as they are shown being produced in the background of the painting. At the superior level of knowledge, the Medicean laboratory could yield the quintessence of wine by using an apparatus such as that of Alderotti.

Medical alchemy and chrysopoeia

Scholars initially assumed that the overarching meaning of Stradanus's painting was linked to *chrysopoeia*, making gold. However, this view has been corrected in light of the evidence of the medical bent of the Medicean laboratory.[85] If there is a chrysopoeian implication to this painting, it is covert. The purpose of the use of gold here seems to be linked with achieving a supreme medicine.

Nevertheless, as I noted above, the boundaries between the chrysopoeian and medical goals were moot in the period. Both the Ficinian and the Pseudo-Lullian framework associated the quintessence with the elixir or the philosophers' stone, and the elixir had at least two applications, metallic transmutation and universal medicine.

Cosimo I and Francesco seemed supportive of the concept of metallic transmutation. We know that several works of transmutational alchemy were sent to the Medici court in search of ducal patronage.[86] Yet the chrysopoeian goal was fraught with controversy, if not outright forbidden. Pope John XXII's 1317 bull *Spondent quas non exhibent* forbade the practice of chrysopoeia, leading to a domino of bans on the subject across Italy and the Continent. In 1488, Venice gave its own ban; Florence did not follow suit, but as a Catholic monarchy, the Mediceans could not be seen to openly support making gold. Scholars and philosophers were also ambivalent. Varchi condemned the pursuit of artificial gold as avarice, following

[82] Johannes de Rupescissa, *De consideratione quintae essentiae* (Basel, 1561), p. 22.

[83] The change, Ficino's role in it and his influence need to be better documented. Savonarola, a contemporary of Ficino, still believed the true quintessence was that of wine; see Michele Savonarola, *De aqua ardenti*, Basel, 1561, pp. 292–3. On Savonarola see Danielle Jacquart, 'Médecine et alchimie chez Michel Savonarole (1385–1466)', in Margolin and Matton, op. cit. (58), pp. 109–22. Biringuccio, probably influenced by Ficino, also extolled potable gold as a 'divine and heavenly liquor' which 'almost returns human bodies to life when they are so weakened by powerful and malignant diseases or by great old age that they are left for dead'. Biringuccio, op. cit. (61), p. 341; Biringuccio, op. cit. (26), 125r.

[84] Ficino, *Opera omnia*, vol. 2 (Basel, 1576), p. 1603: 'Mitto quod spirant si hunc ex vino tanquam valde coelesti diligenter acceperint, eum se adhibituros auro coelesti quam maxime: quem mox aurum combibat ut cognatissimum, semperque retineat, fiatque potabile'.

[85] As in Purš and Karpenko, op. cit. (4), p. 416.

[86] As described in Perifano, op. cit. (46).

a classical trope. Health, rather than wealth, seemed a more appropriate pursuit, especially for a monarch. Other rulers, like Philip II and Elizabeth I, also supported medical version of alchemy. Moreover, the Medici portrayed themselves as healers of the nation, playing on their name as 'medics'.[87] Cosimo I, in particular, sponsored the publication of the *Ricettario Fiorentino* of 1567 and was hailed as a new Asclepius.[88]

The medical programme was also emphasized in the other painting that Stradanus made, a smaller oval one destined for the lower register. The reconstruction of the Studiolo in 1910 did not associate these two paintings and now they sit far apart. Yet most scholars now agree that the two were supposed to be displayed together, with *The Alchemist's Laboratory* rectangular painting on the upper register and the oval mythological painting of Mercury with Ulysses below.

By comparison to the painting above, this image is permeated by humanistic interests. It depicts a scene from Homer's *Odyssey*, where Ulysses and his companions land on an island ruled by the witch Circe. She turns all of Ulysses' companions into pigs; Mercury, however, rescues Ulysses by giving him a herb called moly, which prevents Circe from transforming the hero too. In the period, moly was often described as an antidote against poison, as, for instance, in an emblem of Andrea Alciati (1531) and in the writings of Pietro Andrea Mattioli (1568). There is a clear medical connection here as well and maybe even more than this. The Medici, like many Italian princely dynasties, were obsessed with poison; the correspondence of Cosimo de' Medici is replete with references to possible poisonings of monarchs.[89] Pope Clement VII, who was a Medici, promoted the antidote called Caravita's oil, and his own variant, *oleum Clementis*. Mattioli, who was Caravita's student, achieved fame with his own antidote, an oil made of scorpions.[90] We know that Mattioli was close to the Medici court, and probably inspired Cosimo and Francesco to produce their own version of scorpion oil. We know that no less than 70,000 scorpions were brought to the Casino di San Marco in 1576 to prepare this oil, so it was clearly big business for the Medici. Given the Mattioli connection, I would suggest that Ulysses's moly may obliquely hint at the Medici scorpion oil.

Conclusions

The Alchemist's Laboratory is a testimony to the Medici's interest in alchemy, particularly of the medical kind. This type of alchemy drew on a mixture of sources: Rupescissa, primarily, but also Pseudo-Lull and Ficino. It accorded pride of place to the quintessence, probably the quintessence of gold, which was seen as the supreme panacea.

The pursuit of the quintessence was portrayed in idealistic terms by Stradanus, as particularly evidenced by the portrayal of the central artisan. Furthermore, there is a sense of harmony permeating the painting: in spite of the busy nature of the composition, the laboratory never appears chaotic. In contrast with most Netherlandish genre paintings, the alchemical space is orderly: the distillates are seated on shelves, and a person is assigned to keep the documentation, presumably the expenses, the ins and outs of the laboratory and of the finished products. Each of the persons portrayed seems to know what to do and to go about their work diligently, even strenuously.[91] The only detail that seems to break

[87] Butters, op. cit. (13), *The Triumph of Vulcan*, pp. 249, 252; Devlieger, op. cit. (24), pp. 161–3.

[88] As in the funeral oration delivered by Bernardo Davanzati Bostichi and collected in Targioni Tozzetti, *Selve*, VI, fol. 178.

[89] Sheila Barker, 'Poisons and the prince: toxicology and statecraft at the Medici grand ducal court', in Philip Wexler (ed.), *Toxicology in the Middle Ages and the Renaissance*, London: Academic Press, 2017, pp. 71–81.

[90] Rankin, op. cit. (47), pp. 79–110.

[91] In comparison with the initial drawing, Stradanus has focused on rendering the effort needed to press the olives much more realistically.

the harmony is the face of the pestle-and-mortar boy, which Stradanus had to turn toward the viewer with rather grotesque consequences.[92] This detail aside, humans move about in orderly cadence; the physician's index finger, pointing the viewer to the still, also seems to have the effect of organizing and tempering the bustle, almost like a conductor's baton. The harmony is further emphasized by the trio of the physician, the prince and the artisan, who work together for the achievement of the great distillate. There is no sense of conflict between the world of the artisan and that of the university-trained physician, even as Stradanus clearly glorified the former. That matters were not actually so rosy can easily be gleaned from the antagonism of physicians against unlicenced medical practitioners like Leonardo Fioravanti or Tommaso Bovio.[93]

In turn, the programmatic and idealist views of the painting make it more difficult to argue that this is a realistic image of the Palazzo Vecchio laboratory. It is possible that Stradanus may have been set on a quasi-realistic depiction of the laboratory in the initial drawing. Even in this one, the central position of the artisan with the vessel, as well as the foregrounding of certain pieces of apparatus, suggests that the subjectivity of the artist came into play. The realism of the initial drawing was further distorted by external intervention: in the first detectable change, the Alderotti still became foregrounded. In the finished painting, realism was further undermined by the introduction of new elements like the physician and his book and the simultaneous loss of a piece of apparatus, an artisan and a process that most likely took place in the laboratory.[94] Thus the overall philosophical conceit of the laboratory, rather than accuracy, dominated the painting.

The result was undoubtedly impressive. Stradanus managed to almost seamlessly mix realism with symbolism, portraying alchemy both as a practice, a philosophy, and an ennobling pursuit that could reach as high as the universal medicine. The intertwining of realistic and symbolic elements brings Stradanus closer to Netherlandish genre painting, but the differences are also remarkable. While the latter style remains ambivalent, as Purš and Karpenko have persuasively shown, in Stradanus the tone is clearly that of praising alchemy as true *scientia*, true knowledge.

Acknowledgements. The author wishes to thank a number of scholars who have either advised, supported or assisted the publication of this article: Ivo Purš, Valentina Conticelli, Sven Dupré and Ernst Homburg. My special thanks go to Ivo Purš for providing an enhanced version of the Stradanus painting. Research related to this article has been presented at several seminars, notably a Descartes Centre seminar at the University of Utrecht.

Competing interests. The author declares none.

[92] It is most likely that Stradanus was forced to do this by external instruction, as several scholars have already noted.

[93] See, for instance, William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture*, Princeton, NJ: Princeton University Press, 1994.

[94] The paradoxical result of removing the oven and the artisan was to make any type of metallic alchemy invisible in the finished painting. Its presence can only be attested by speculating on the nature of the golden substance.

Cite this article: Georgiana D. Hedesan, 'Medical alchemy and quintessence in renaissance florence: the Alchemist's laboratory painting of Johannes Stradanus (1570)'. *BJHS Themes* (2025), pp. 1–23. https://doi.org/10.1017/bjt.2025.10019