Historians have long recognized the close connections among artists and humanists in Renaissance Bologna. Perhaps the most celebrated example involves the painter and goldsmith Francesco Francia (c. 1447–1517), who earned praise from Bologna’s leading literary figures, many of whom singled out his works as products of divine artifice. This affinity between the verbal and visual arts and, by extension, the important intersection between scholarly and artisanal forms of knowledge in Bologna feature prominently in Niccolò Burzio’s 1494 panegyric Bononia illustrata. Through the voice of the city, the narrative describes how the liberal arts and sciences prospered under Bologna’s nurturing umbrella, with individuals who excelled in the trivium and quadrivium. Among the fabri, Francia surfaces as the pinnacle of artistic achievement, surpassing the ancients and setting an unparalleled example for his contemporaries with his ingenuity and charming character, but the true star of the Bononia illustrata is the city itself, which, under the helm of the ruling Bentivoglio family, evolved as a nourishing parent. The concentration of such extensive talent engendered the minting of a gold coin (aureus nummus) stamped with the words Bononia docet (Bologna instructs) – the motto of the city’s university, founded in 1088.

Burzio’s acclamation of Bologna’s groundbreaking industry in the arts and sciences leads us to reconsider a fascinating early work by the engraver Marcantonio Raimondi (c. 1480 – c. 1534),
Marcantonio Raimondi, a pupil of Francia who also enjoyed humanist accolades while working in his native city; he later relocated to Rome, where he partnered with Raphael. Seldom discussed in the literature, in part because its imagery is so bizarre, this print measures 27.9 by 20.5 centimeters and goes by various conflicting titles [Fig. 1]. Based on stylistic evidence, most scholars date the work to the initial years of the sixteenth century, produced when Raimondi maintained strong ties with Francia and adapted some of the painter’s designs into prints. Raimondi proved himself an independent artist even at this early stage, composing novel engraved inventions that frequently incorporate mythological, allegorical, and symbolic imagery. The overall scene of the present work takes place before an idyllic watery landscape that borders the defensive walls and clearly recognizable skyline of Bologna, with its two iconic leaning towers – Garisenda and degli Asinelli – standing out in the background, enabling viewers to link the foreground cast of characters to Bologna’s civic environment [Fig. 2]. Such an implied relationship between figures and cityscape anticipates Francia’s votive fresco of the Madonna del terremoto of 1505, commissioned by the Comune for the Palazzo Comunale as a prayer to the Virgin to protect Bologna from earthquakes [Fig. 3]. In the center of Raimondi’s composition, a woman wears a classical robe that exposes one of her breasts, and her head is adorned with a diadem that displays

a set of three arrows raining down on a flower. As she gathers the folds of her robe in one hand, she raises an ivy crown and turns her attention towards an elderly man who leans on his staff and returns her gaze. With a tiny patch of enclosed garden at his feet, this figure is reminiscent of a shepherd. Opposite, a nude man seen from behind holds up a miniature dragon, offering the creature to the woman like a tribute. The two men seem to represent complementary poles with respect to age and bodily health, or natural and mystical realms. A putto reclines on the ground beneath the figures, adjacent to Raimondi’s prominent monogram: MAF [Fig. 4].

The instruments the putto holds have previously avoided definitive identification, but they are the key to understanding the assembly of other symbols within composition and their shared meaning.

As will be outlined more fully below, these instruments are two parts associated with an alembic: a retort, or a spherical vessel with a downward-pointing neck used to heat liquids and other substances; and a curved receiving tube, used to cool and condense vapors issuing from the retort and subsequently channel them into a receiving vessel. The retort and tube appear to be made of glass, although copper and ceramic were also common at the time, and it is significant that the putto casually tries to fit these pieces together as if playing with toys. Alembics were vital to the process of distillation, which in the Renaissance facilitated a multitude of chemical and transformative operations, including the secret alchemical processes thought to be key to finding the elixir of life and the philosopher’s stone: magical agents capable of increasing one’s lifespan and turning base metals into gold, a process known as chrysopoeia. Because of its ability to separate matter from spirit, distillation carried with it a philosophical dimension and was the subject of numerous learned treatises in the Renaissance, many of which boasted handsome illustrations. A later example, a page from Donato d’Eremita’s Dell’Elixir Vitae (1624), shows an impressive assembly of alembic equipment, including a serpentine tube in the upper margin [Fig. 5].

The identification of the putto’s apparatus helps resolve the meaning of the other motifs in Raimondi’s composition and further opens up a host of associations with Bologna’s humanist culture and scientific pursuits, both inside and outside the university. A recent paradigm shift in Renaissance studies on alchemy usefully frames the interpretation of Raimondi’s print. Far from being a dubious and clandestine activity, the practice of alchemy permeated Renaissance culture and embraced various forms of knowledge. By the sixteenth century, humanists could consult a host of authoritative treatises that deemed alchemy an art instilled with ‘divine power’ and the alchemist a dignified artisan and sage. The physician Michael Maier (1568–1622) designated knowledge of poetry, grammar, rhetoric, and logic as a prerequisite to reading alchemical texts properly, aiding in the ability to unlock nature’s secrets. Alchemy’s twin goals of healing and metallic transmutation opened pathways for its entry into publications on everything from medicine to natural philosophy. Likewise, the progressive curriculum of Bologna’s university around 1500 embraced what we might now designate as more peripheral sciences but were then of the utmost importance for understanding the natural world to its fullest. The potential medicinal benefits of distillation brought together diverse communities, with religious houses doubling as apothecary research centers, opening their doors to scholars to assist in their experiments and publish their findings. Alchemy was not at odds with the Catholic church, and the winding paths in the background of Raimondi’s print lead to numerous ecclesiastical structures. Princes even dedicated spaces to support state-sanctioned chemical-alchemical operations. While the ability to assay precious metals was paramount to safeguard economic interests, possessing a seeming command over nature, even if it was only an exalted aura of manipulation, meant power. The theory and practice of alchemy also extended to and in part germinated from the fine arts; laboratory techniques and raw materials, many of which were garnered from apothecary shops, not to mention the acute observation of nature, fell in the domain of artists. Simultaneously, a proliferation of alchemical imagery emerged in the sixteenth century. Whether technical or allegorical, these images for the most part came in the form of woodcuts accompanying alchemical treatises, issued by printing houses in northern Europe.
5. Distillation equipment, from Donato d’Eremita, Dell’Elixir Vitae, Naples: Secondino Roncagliolo, 1624, unnumbered page. Photo: Internet Archive Open Library
Raimondi’s engraving, almost without parallel, is a particularly early and sophisticated Italian example of an independent work of art celebrating alchemical wisdom.\textsuperscript{18} From the existing impressions in major collections today, one can surmise that multiples were made for profit and dissemination in Bologna, targeting the city’s international group of scholars.\textsuperscript{19} Previous interpretations, all quite brief, suggesting either an allegorical triumph over Time’s destructive power, or even a Herculean choice, cast a rather narrow compass around the print’s spectacular composition, based as they are on moralized medieval underpinnings.\textsuperscript{20} Henri Delaborde flirted with an appropriate reading by labeling the figures Eloquence, Philosophy (or Logic), and Science, representative of the scholarly pursuits occurring in Bologna, but neglected to develop this idea to any extent.\textsuperscript{21} Alternatively, one should not be tempted to seek a specific alchemical recipe for success. Instead, a poetic resonance governs Raimondi’s eloquent visual language, one that adheres to Giovanni Boccaccio’s definition of poetry as ‘a sort of fervid and exquisite invention \textit{[inventio]}, with fervid expression’.\textsuperscript{22} From this standpoint, the print extrapolates what proved to be the most enthralling aspects of alchemy for Bolognese humanists: an interdisciplinary process of discovery, veiled in secrecy, that could bring forth sublime effects.

The production and reception of Raimondi’s print coincides with the publication of the \textit{Septisegmentatum opus}, issued from the Bolognese press of Benedictus Hector on 26 October 1501 [Fig. 6]. The first of the seven treatises in this volume is an unabridged version of the tremendously popular Pseudo-Aristotelian \textit{Secretum secretorum} (\textit{Secret of Secrets}), whose ‘treasure of wisdom and golden rules’ have been edited into three main sections: on the rule of princes; on the conservation of health (including the alchemical sciences); and on physiognomy, together with supplementary material on transmutation, talismans, and magic stones derived from a Hebrew version of the treatise.\textsuperscript{23} This text is followed by one on weather signs and another on minerals, both thought to be by Aristotle.\textsuperscript{24} Although its origins are medieval Arabic as opposed to ancient Greek, the \textit{Secretum secretorum} supposedly imparted Aristotle’s secret knowledge of the universe to Alexander the Great, informing him of all things essential for a prosperous life. As William Eamon has demonstrated, the \textit{Secretum secretorum} had an almost immeasurable impact on European intellectual history – literary, philosophical, and scientific culture – beginning, to a certain extent, with Roger Bacon (c. 1220 – c. 1292), who was filled with wonder at its contents. Bacon believed the text explicated the ‘true sciences’, alchemy among them, which work ‘by art assisting nature’.\textsuperscript{25}

With the inclusion of the \textit{Emerald Tablet} ascribed to Hermes Trismegistus as part of the \textit{Secretum secretorum}, the 1501 Bolognese volume connected ancient hermetic sciences with the more fascinating strains of natural philosophy, promoting a divine-like knowledge of nature. Although ostensibly didactic, the lessons of the \textit{Secretum secretorum} are cloaked throughout with enigmas and signs (\textit{exemplis enigmaticis atque signis}), not to mention Pseudo-Aristotle’s ubiquitous call for secrecy to preserve the information and keep its revelation hidden from ordinary people.\textsuperscript{26} Such furtive language accords well with the esoteric nature of Raimondi’s print, the varied symbolism of which tests the beholder’s faculties of perception, upholding Pseudo-Aristotle’s conviction that the many mysteries and secrets of this world, large and small, are often overlooked.\textsuperscript{27} Correspondingly, Bolognese humanists delved into ancient authors who employed rare vocabulary and arcane expressions, with Apuleius being chief among them.\textsuperscript{28} Filippo Beroaldo the Elder’s \textit{Annotationes centum} (1488) and Symbola Pythagorae
moraliter explicata (1503) constitute a specialized antiquarian zeal for studying such literary curiosities. Always self-assured, Beroaldo compared the philologist’s inquiry into ancient texts to the unwrapping of packages, a process of discovery that illuminates obscurities and provides a copia of learning.29 Given that the Secretum secretorum is as endlessly enticing as it is opaque, the text would have fit comfortably within Bologna’s literary culture sustained under the Bentivoglio at the dawn of the sixteenth century.30

What is especially important for appreciating the humanist context of Raimondi’s engraving is that the editor of the Septisegmentatum opus was Alessandro Achillini (1463–1512), the renowned Bolognese physician and Aristotelian philosopher who taught for many years at the University of Bologna, and briefly at the University of Padua.31 Achillini published on a wide variety of subjects, including on the intellect, on the nature of celestial bodies and planetary motions, and on universals, the last of which appears in the 1501 Septisegmentatum opus.32 His profound investment in natural philosophy extended to the wonders of the natural world, matter, and metaphysics, and he even produced a treatise on chiroancy and physiognomy, promoting divining as a valid form of scientific knowledge.33 Achillini’s editorial advancement of the Secretum secretorum, with its section on fortune-telling as it relates to the bodily health, solidified the purported Aristotelian foundation of his scientific pursuits in Bologna. Amico Aspertini (c. 1474–1552), Raimondi’s Bolognese contemporary, painted a portrait of the scholar (most likely posthumously, c. 1515–1521), which once adorned Paolo Giovio’s gallery in Como on famous individuals, testifying to Achillini’s widespread fame [Fig. 7].34 Without question Raimondi would have known the professor because he was familiar with his brother Giovanni (Filoteo) Achillini (1466–1538), the poet and antiquarian who founded a literary academy in Bologna. Filoteo socialized with the leading Bolognese artists and humanists, celebrating them in his vernacular epic poem Viridario, completed in 1504 and published in 1513. Augmenting Burzio’s text, Filoteo counts painting as the eighth liberal art prevailing in Bologna, with Francia’s pictorial opulence contributing to the city’s innovative industry (industria).35 He also praises Raimondi for his skills with the burin and as a draftsman, together with his zeal for imitating antiquity.36 Moreover, Filoteo specifies that at the time he was writing the Viridario, the artist composed a portrait of him on copper – an image that he said rivaled nature [Fig. 8].37 The lyrical engraving of the poet shows him singing while playing on a stringed instrument and sitting next to a winding stream. From this textual and visual evidence, it is plain that Raimondi knew both Achillini brothers and, like Francia, engaged directly with humanists.38
Raimondi’s engraving points to a nexus of activities in Bologna that clustered around university lecture halls, intellectual circles, and artists’ workshops, whereby scientific inquiry into nature’s secrets embraced artisanal forms of knowledge. Because alchemy was prized more for its esoteric value than its potential monetary rewards in Bologna, the engraving provides new evidence for Raimondi’s professional networks early in his career in addition to his training under Francia and his initial vocation as a goldsmith, about which we have precious little documentation. Since the late thirteenth century, goldsmiths had enjoyed increasing prestige within Bologna, distinguishing themselves from the Arte dei Fabbri, the metallurgical guild, and providing luxury swag for the many young and wealthy students coming to the studium from throughout Europe and wanting to make an impression.\(^39\) Considering the dynamic interactions one can date Raimondi’s print more firmly to c. 1501–1502, almost as a visual companion to Achillini’s publication of the Septisegmentatum opus. Moreover, interpreting the engraving within this context of the lively pursuit of nature’s secrets enables a more coherent reading of the imagery and the assignment of a more appropriate title: Allegory of Alchemy.

Undoubtedly, the most irresistible detail of Raimondi’s composition is the fiery, open-mouthed dragon turning on itself to bite its tail (see Fig. 2). Known as the ouroboros, this is a canonical image for alchemy denoting chryospoeia, and one that begins with an impression.\(^39\) Considering the dynamic interactions one can date Raimondi’s print more firmly to c. 1501–1502, almost as a visual companion to Achillini’s publication of the Septisegmentatum opus. Moreover, interpreting the engraving within this context of the lively pursuit of nature’s secrets enables a more coherent reading of the imagery and the assignment of a more appropriate title: Allegory of Alchemy.

Hieroglyphs captivated the Renaissance imagination and entered into the studies of the leading artistic and humanist personalities of the era, who interpreted the pictographs and enigmatic signs as a sacred script devised by the Egyptians that contained the mysteries of divine wisdom.\(^42\) The symbolic language of hieroglyphs ensured an appropriate level of secrecy, preserving ‘noble matters’ for the initiated few. By extension, Renaissance philologists aligned hieroglyphs with a host of other symbolic expressions, not exclusively Egyptian but more universal, including Pythagorean symbols, which Beroaldo called *aenigmata*.\(^43\) In Bologna, in the last years of the fifteenth century, Beroaldo and his colleague Giovanni Battista Pio stressed the importance of the metaphorical meaning of hieroglyphic signs as it pertained to the natural quality of the object or thing depicted.\(^44\) The image of the left hand, for example, symbolizes ‘equity’ because of its inherent sluggishness compared to the craftiness and dexterity of the right.\(^45\) In his landmark commentary on Apuleius’s *Asinus aureus* (*Golden Ass*), published in 1500, Beroaldo advances his knowledge on hieroglyphs. In *The Golden Ass* (11.22), Apuleius describes an elaborate and fascinating scene in which a priest opens a book filled with hieroglyphs that are ‘knotted and twisted’ together like vines. For Beroaldo, this scene contained veiled, almost syntactical instructions for the protagonist Lucius’s initiation into the sacred cult of Isis.\(^46\) Filippo Fasanini, a younger colleague of Beroaldo and Pio who is celebrated in Filoteo’s *Viridario*, published *Declaratio sacrarum literarum*, an extensive treatise on hieroglyphs, in 1517.\(^47\) The treatise reinforced the idea that Aristotle’s works could help one understand the underlying analogy between the essence of the hieroglyphic image and its meaning. The text further commended hieroglyphs for a multitude of purposes, excellent to use as ornaments to adorn homes or objects of art, allowing individuals to ‘wrap their secret thoughts in veils’.\(^48\) It follows that Raimondi’s engraving responds to the strong visual currency hieroglyphs enjoyed in Bologna.

But the image of the dragon (or serpent) had a much broader array of meanings. For example, *The Golden Ass* (11.3–4) describes a vision by Lucius of Isis, who appears to him as a radiant goddess with abundant, gently curling hair that cascades over her neck and shoulders. Crowned with a floral diadem that contains a moonlike disk flanked by vipers, Isis wears an elaborate dress and holds symbols in both hands. In her left hand is a golden vessel ornamented with a handle that takes the form of a rampant asp. Beroaldo, in glossing this passage with reference to the mystic associations of serpents and dragons, mentions the fourth-century *Praeparatio Evangelica* (*Preparation for the Gospel*; 1.10) by the church father Eusebius of Caesarea, who adds to the theological of the Phoenicians and Egyptians to reveal that dragons are full of breath and fiery by nature, swift and shape-shifting, in addition to being long-lived because of their ability to shed their old skin, rejuvenate, and increase in size and age only to self-consume.\(^49\) For such reasons the dragon was revered as divine and adopted in mystic rites. Accordingly, the nude holding the dragon in Raimondi’s engraving seems to be ceremoniously offering this divine creature to the woman as if it were a tribute or distinguishing attribute that complements the ivy crown she raises.

What is this mystic rite occurring in Raimondi’s print, so evocative of the bizarre cult ceremonies described by Apuleius, and how are viewers to ‘grasp the enigma of meaning’ (*aenigma sententiae*) of the self-devouring dragon?\(^50\) The ouroboros only makes sense when interpreted with the instruments held by the putto directly below it, following the cascading rhythms of the woman’s hair and robe. The putto attempts to fit the retort together with the curved receiving tube, two crucial pieces of equipment needed for the process of distillation. Fire was the essential starting point, whereby the material to be distilled was
heated in a bottom vessel, known as a cucurbit, condensed in an alembic (or head) on top of it (in this case, the putto’s retort combines the two), where it then cooled and dripped through a ‘beak’ or tube to be collected into a receiver. Distillation was a daily practice in artists’ workshops, mainly used to concoct coloring agents with methods mirroring those of apothecaries and physicians. As mentioned, it was also necessary to obtain the purest and most primary substance of all, that prized super elixir with healing and transformative powers known as the fifth essence, the elixir of life, *aqua vitae*, and the philosopher’s stone. For many centuries the ultimate goal of alchemical distillation was medicinal – to find that potent yet elusive spirit that could cure ailments and prolong life. In 1500, Hieronymus Brunswig published his widely read *Liber de arte distillandi de simplicibus* (*Book Concerning the Art of Distilling*), in which an alchemical approach to matter informs his pursuit of fabricated distilled waters [Fig. 9]. Brunswig states that ‘distilling is nothing other than purifying the gross from the subtle and the subtle from the gross […] with the intent that the corruptible shall be made incorruptible […] and the subtle spirit [Geist] be made more subtle so that it can better pierce and pass through the body […] [and can be] […] conveyed to the place [in the body] most needful to health and comfort’. With regard to Raimondi’s print, on one level, the dragon’s nature as an airy, fiery
creature, able to change shapes and rejuvenate itself, aligns well with the theoretical underpinnings and technical operations of distillation and its laboratory equipment, whereby heat and vapors are essential components to produce antidotes that combat disease and stall the body’s aging process. The infant who guilelessly amuses himself with the alembic is a species of putto – a spiritello of the elixir of life: a rarified pneumatic spirit (the equivalent of the German Geist) that, like the heavenly essence it personifies, takes possession of the body and produces a merry narcotic effect. Brunschwig describes this very piercing of the body by the distilled Geist to fuel bodily health, drawing from medical and philosophical thought of the period. Raimondi, too, shows the successful result of such medicinal investigations with the three ages of man surrounding the central woman: the tender child, the robust nude man, and the austere elder manifest a revivifying circle of life. The woman’s favorable gaze at the aged man who leans on his staff assures him of this healing process. Paralleling the life cycle of the dragon’s special nature, distilled elixirs allow one to shed an old skin and enjoy the bloom of youth.

Beyond medicinal remedies, the philosopher’s stone, a rarified transmuting agent consisting of the universe’s prime matter, could also theoretically ‘cure’ chemical compositions and turn base metals into silver and gold. Most alchemists started with a combination of mercury and sulfur, then added salts and other reactants to be dissolved, distilled, and sublimated. These substances, if correctly chosen, would change colors indicating different phases of purification until reaching the desired red of the stone, which, after a period of incubation and a little more treatment, would magically revert a molten base metal to pure gold when mixed with it. When Pseudo-Aristotle mentions the obtainment of ‘the stone which is not a stone’, he advises the use of a crucible and an ‘egg’, known as the ‘philosopher’s egg’, to fire up and separate matter, ultimately hatching the desired red substrate. This egg-like vessel, hermetically sealed with lute to insulate it from shattering when exposed to the flames of a distilling furnace, was well known in the practice of Renaissance alchemy. One can find depictions of it by such artists as Albrecht Dürer and Albrecht Altdorfer.

It is clear that the distillation instruments in Raimondi’s print refer to metallic transmutation in alchemy because of the playful nature of the putto. The expression ludus puerorum (children’s play) was ubiquitous in alchemical treatises, signifying that after the primitive materials of the philosopher’s stone have been resolved the rest of the transmuting process is mere child’s play, only requiring the regulation of heat. The expression is often found in combination with another: mulierum labor et ludus puerorum (women’s work and children’s play), whereby the activities of cooking and washing refer to alchemical duties and the purification of substances. An illuminating example comes from...
the Margarita philosophica (Philosophical Pearl) by the German monk Gregor Reisch, published in 1503. The Margarita philosophica constitutes an encyclopedia of general knowledge. In the chapter on metallic transmutation (9.25), the text succinctly summarizes the highlights of alchemical theory and lists its eminent authorities. Reisch employs the expression mulierum labor et ludus puerorum as a metaphor for the absence of true labor and the secret knowledge required to find the philosopher’s stone. The accompanying woodcut shows a neatly dressed alchemist in the act of distilling substances [Fig. 10]. He stands next to an alembic-equipped still and receiver in his modest, clean laboratory chamber while casually stoking a furnace with a bellows to heat up material in his crucible. Infants sometimes appear as technicians in the alchemical process, as seen in an exquisite illumination for the Splendor Solis (The Splendor of the Sun), produced in Germany in 1582, and written in the German vernacular, itself a version of a slightly older alchemical text attributed to the legendary Salomon Trismosin. Under the chariot of Saturn, cast inside a sealed glass vessel resting on a garland, a child pumps a bellows into the body of a heat-producing dragon while pouring golden liquid from a phial down its mouth [Fig. 11]. The text accompanying this allegorical illustration speaks of the effectiveness of heat to release a forceful spirit (Geist), able to penetrate and transform matter, aiding in the quest for the philosopher’s stone. Raimondi has ingeniously represented the expression ludus puerorum and turned it into a type of hieroglyph: it is the visualization of an idea, an image that stands for the phenomenon of alchemy, a noble yet secret pursuit.

To return to the image of the dragon biting its tail, it can be taken together with the motif of the playful child and read as one of the most canonical alchemical symbols standing for chrysopoetic transmutation. Like the expression ludus puerorum, the symbol of the ouroboros appears frequently in alchemical treatises. A lively example comes from a fifteenth-century manuscript copy (now in Zürich) of the allegorical work Aurora consurgens (The Rising Dawn), spuriously attributed to Thomas Aquinas, in which one finds an illustration of a glass vessel being heated on an open flame and displaying a fiery dragon consuming its tail [Fig. 12]. In addition, Emblem XIV (Hic est Draco caudam suam devorans) of Maier’s treatise Atalanta fugiens (1617; 2nd edn 1618) displays the symbol of the ouroboros and offers a lengthy discussion on dragons invoked in mythology and alchemical texts as metaphors for chemical subjects [Fig. 13]. The creature’s origins as a symbol within alchemy can be traced to a medieval alchemical treatise that consists
of a single manuscript page containing designs and inscriptions; it is ascribed to Cleopatra the Alchemist, who was active in Alexandria in the third or fourth century CE. As Lawrence Principe explains, the Greek inscription of ‘one the all’ accompanying the image of a serpent swallowing its tail on the page relates to monism or the unity of matter, ‘ancient Greek philosophical notions about a single material [i.e. prime matter] that serves as the underlying substrate for all substances. Clearly, this principle undergirds the idea of alchemical transmutation: one thing can be turned into another because at the deepest level they are really the same thing […]’. Thus, the serpent ouroboros, like the sum total of material substances, continuously consumes itself and produces itself from itself, remaining constant even while perpetually destroying and regenerating itself.62 Studying the self-consuming dragon in Raimondi’s print, a Bolognese audience would have appreciated how the creature’s natural qualities align metaphorically with the transmutative process of chrysopoeia. Raimondi’s ouroboros reads as a multivalent hieroglyphic symbol, and the clever visual alignments governing the composition allow viewers to unpack its layers of meaning.

What emerges from the connection of the putto’s instruments with the ouroboros is an interpretation of the engraving as an allegory of alchemy. Its message features more as an encomium on alchemical wisdom than a presentation of a specific experimental formula, implying a wealth of beneficial rewards from expounding divine secrets.63 Through this lens, the cast of characters, at least in terms of what they represent, and the meaning of other details in the composition become clearer. It is possible to read the central figure in several complementary ways. On the one hand, she can represent Cleopatra the Alchemist, the legendary inventor of the alembic and founder of distillation, whose manuscript, as noted above, is considered the first alchemical work to display the ouroboros.64 On the other hand, Raimondi’s woman more readily stands as a crowned personification of alchemy, one that foreshadows the woodcut illustration found in Leonhardt Thurneysser’s alchemical poem Quinta essentia (1570; 2nd edn 1574) [Fig. 14]. Thurneysser champions the fundamental connection between the arts of medicine and alchemy, whereby the discovery of the elixir of life or philosopher’s stone serves to achieve perfection not solely in the nature of metals, but also in humankind.65 Ornamenting the beginning of the second chapter of his first book in the 1574 edition, a female personification of ‘Alchimia’ is crowned with a diadem and leafy-floral crown, holding crucible tongs in one hand and a glass cucurbit labeled ‘Essentia’ in the other. She stands before an open-air laboratory, under the signs of the sun and moon (symbols of gold and silver respectively) and surrounded by a multitude of alchemical equipment. When compared to the figure in this woodcut, Raimondi’s woman appears as a highly precocious image in the development of an iconography that would soon enter into the alchemical canon.

The flower (possibly a rose or lily) on the diadem crowning Raimondi’s figure (see Fig. 2) was a popular alchemical symbol, an emblem of regeneration, of consummate achievement and perfection in alchemy, as well as the metaphoric focus of such treatises as the Roman de la Rose, Rosarius Philosophorum, and Flos Florum. Flowers, in particular roses and lilies (red and white), came to symbolize precious metals like gold and silver, or the chemical pairings and progressive color stages of the elixir as it matures throughout the transmutation process, examples of which populate the illustrations for Hieronymus Reusner’s
alchemical treatise *Pandora, Das ist, Die Edleste Gab Gottes* (1582) [Fig. 15]. The accompanying arrows raining down on the flower ornamenting the diadem can either represent an elemental sign or a potent reactant that produces an enriched chemical transformation with the flower. Nudity also permeated alchemical imagery, with sexual union metaphorically related to the generation matter in the quest for the stone. Canonical examples of alchemical coition appear in the woodcuts to Reusner’s *Pandora* and in the 1550 edition of *Rosarius Philosophorum*; while a highly provocative image of nursing features in the Zürich manuscript of the *Aurora consurgens* [Fig. 16]. Raimondi specialized in the development of erotic imagery early in his career, and the stark nudity of the young man holding a dragon in the present engraving features as a cleansed body ready to be transformed. Reminiscent of Apuleius’s main character Lucius, who, bathed and purified, stands before the goddess Isis awaiting sacred instructions (*The Golden Ass*, 11.23), Raimondi’s shining nude presents himself to the regal woman and makes a chrysopoetic offering. With her classic beauty and exposed breast, she exudes sensuality and a sense of nurture.

Just as the bold assembly of enigmatic symbols and scientific motifs attests to the prestige that the secrets of alchemy held in Bologna, there also is a highly poetic character to Raimondi’s imagery. In combination with the ivy crown, Renaissance viewers would have seen the elder as taking on the appearance of a shepherd, lending the work a pastoral dimension. One can invoke numerous paintings of the *Adoration of the Shepherds* decorating Bologna’s churches to draw analogies, but Raimondi’s image shares its closest affinity with Luca Signorelli’s *Realm of Pan*, a large-scale painting most likely produced for Lorenzo de’ Medici of Florence around 1490 but now destroyed [Fig. 17].

The original location of this painting may have been Lorenzo’s villa Spadaletto near Volterra. Eleonore Jebens first advanced Raimondi’s stylistic reliance on this painting (or a preliminary
drawing for it) in 1912, but others vetoed this astute observation primarily because of its speculation that Raimondi visited Florence or its territories years before conventionally presumed, that is around 1508. Raimondi’s itinerary outside of Bologna at this early stage of his career is, however, completely plausible, and strong relationships between Florence and Bologna existed on many levels.

What is significant about Signorelli’s painting with regard to Raimondi’s engraving is the pioneering visualization of the pastoral theme related to Nature’s mysterious generative powers centered around the Arcadian god Pan. Figure-forming clouds and naturally occurring triumphal arches ornament the landscape. Raimondi conceivably had direct knowledge of the painting, imitating the overall arrangement of Signorelli’s central cast of characters based on Virgil’s Eclogues and Servius’s commentary and cleverly revising it for his own purposes. Echoing the motif of the reflexive gaze between Pan and the elderly shepherd who welcomes him, Raimondi’s woman gazes sympathetically at the aged figure who leans on his staff, a virtual twin of the shepherd on the right in Signorelli’s painting. Raimondi also adapted Pan’s entourage of nude, ivy-garlanded nymphs and fauns playing music, preserving many of their standing and reclining postures but transforming those minor divinities into hermetic embodiments with accompanying attributes. A contemporary audience would have appreciated how the engraver adorned his alchemical subjects with poetic motifs and classically inspired mythological forms current in the Renaissance. Alchemy takes on the appearance of the marvelous and the divine. Looking at the engraving through the perspective of poetry, one can see the central woman as a type of alchemical muse, interacting with representatives of the transmutative process.

A rich tradition of alchemical poetry thrived in the Middle Ages and the Renaissance, beginning with the supplementary verses added to the Roman de la Rose. In Italy, the Veronese antiquarian and scribe Felice Feliciano (1433–1479), who resided in Bologna for some years, obtained a treatise by Pseudo-Geber and was bitten by the alchemical bug. He wrote a number of ironic verses on alchemy, exploring its hazards and virtues, adding technical details that validate his status as an ardent practitioner. The most renowned Italian alchemist-poet of the period was Giovanni Aurelio Augurelli (c. 1456–1524), who originated from Treviso. Augurelli’s famous Neo-Latin poem Chrysopoeia, published in 1515 from the Venetian press of Simon da Lovere, is composed in hexameters and imitates the style of Virgil’s Georgics – in other words, it was written as a classical didactic poem to celebrate alchemy. Augurelli sees alchemy as both a science and an art, and his polished verses, dedicated
to Pope Leo X, elevate the chemical pursuit to the level of the liberal arts.\textsuperscript{79}

Filled with learned literary allusions, the poem invokes a series of myths, including Jason and the Argonauts’ quest for the Golden Fleece, which stand as allegories for the search for transmutation.\textsuperscript{80} Augurelli provides lengthy passages on distillation and alludes not only to the search for the philosopher’s stone, but to the development of certain pigments with gemlike properties. Such colors in the hands of a skilled artist, like the alchemist, could be combined to create marvelous simulations (\textit{simulata}) of ever-changing nature.\textsuperscript{81} Alchemy, taking artifice one step further, sought to reproduce the most brilliant workings of nature, or create a second nature, through the engendering of gold. Historians have not failed to cite Augurelli’s passages in the \textit{Chrysopoeia} (3.310–3.322) praising the Venetian painter and printmaker Giulio Campagnola (c. 1482 – c. 1515) for his ability to produce splendid landscapes populated by nymphs, satyrs, and other fantastical creatures that seem true to life.\textsuperscript{82} Throughout his career Augurelli displayed a keen interest in the visual arts and admired the ambiguity of allegorical imagery, as the poem he sent to Bernardo Bembo, in which he describes Sandro Botticelli’s joust banner for Giuliano de’ Medici, verifies.\textsuperscript{83}

In two earlier poems Augurelli broadcasts his passion for alchemy, invoking symbolism that correlates with Raimondi’s composition. One poem, dedicated to the Venetian scholar Vincenzo Quirini and entitled \textit{Vellus Aureum}, was composed in the early 1490s; the other, dedicated to the lawyer Alberto Onigo from Treviso and entitled \textit{Chrysopoeia} in Greek characters, was composed in 1495. Both appeared in the 1505 collection of Augurelli’s works published by the Aldine press in Venice.\textsuperscript{84} In the \textit{Vellus Aureum}, which is most relevant for our discussion, a shepherd named Alcon (a conventional name in pastoral poetry) selects a ewe from his flock and cares for it in a grotto, keeping the animal closed tight in a pen and nourishing it with fresh grasses and water. The ewe’s fleece subsequently goes through a series of color transformations evoking the chemical stages in the quest for the philosopher’s stone. Finally, much to the amazement of those living next to the Sile river near Treviso, the entire ewe sparkles gold, and the noble animal (\textit{pecus nobilis}) expires, issuing one last auriferous breath. Alcon, whom Augurelli refers to as \textit{pastor aurifex} (the gold-making shepherd), thanks the gods and stands figuratively for alchemy or the alchemist.\textsuperscript{85} The aged man in Raimondi’s engraving appears to embody Augurelli’s poetic conceit of the \textit{pastor aurifex}. Even
though Augurelli tells Quirini to avoid searching for a hidden meaning to his composition, he draws attention to a divinely inspired poetic frenzy for his alchemical imagination: ‘They say that certain things dawned upon the ancient poets when they were taken by sacred frenzy (furore), and that they were known only to a few, for indeed they remain hidden unless someone brings them out from their secret recesses and explains them to posterity.’ In his other alchemical poems, Augurelli invokes Apollo and the Muses to enthuse him and adorn his subject – the secrets to the art of making gold – in noble rhythm.

These passages help elucidate the meaning of the ivy crown held by Raimondi’s woman. Ivy carried connotations of learning and fictive invention associated with the pastoral and lyric poet. Horace (Odes 1.1.29–30) proclaimed that ivy-crowned poets communed with the gods, while Servius (glossing Virgil’s Eclogues 7.25), on account of the plant’s association with Bacchus, saw the ivy garland as denoting the frenzied poet. Beyond poetic achievement, the ivy garland was associated with successful industry (e.g. winemaking). The woodcut of the handsomely dressed sage-distiller that decorates the opening chapter of Brunswig’s Liber de arte distillandi de simplicibus shows him consulting treatises in his studio and sporting an ivy crown (see Fig. 9). It follows that Raimondi’s engraving casts a light on alchemy as a poetic process of discovery adhering to Boccaccio’s conception of poesis or fabula: a divinely inspired veiled discourse, elegantly arranged and adorned, that brings forth unheard-of creations of exquisite splendor. Poised between the mystic nude and the pastor aurifex, Raimondi’s woman raises the ivy crown of glory for chrysopoeia. This fascinating scene takes place before a panorama of Bologna, identifying the city as a locus of alchemical achievement.

Although it is unclear if Augurelli had any direct connections with Bologna, relationships among literary figures throughout the north Italian city states were strong, and Raimondi’s print rivals the poet’s verses in its elegant compositional arrangement. Closer to home, the engraving trades with the literary and philosophical context Raimondi’s aged man can be seen as harnessing the rhythms and secrets of nature. From this philosophical context Raimondi’s aged man can be seen as harnessing a type of natural philosophy, one in tune with a natural process of generation and that represents the accrual of wisdom culminating in the advanced stages of life. Notably, the damaged young tree within the minute patch of enclosed garden at his feet is in need of attention [Fig. 19], whereas a tall robust tree grows just behind him. These details suggest that the elder oversees the care of nature, complementing the nude holding the dragon, who embodies mystic and divine inspiration, both necessary for the alchemical magnum opus.

From these literary models one can better appreciate how alchemy was institutionalized in Bologna for its medicinal and other benefits. Medical and philosophical research thrived in the city for centuries, advancing hand in hand with chemical-alchemical pursuits. The Florentine Taddeo Alderotti (c. 1210–1295), for instance, a professor of medicine who incorporated Galen and Aristotelian natural philosophy into his teaching at the University of Bologna, developed a technique for redistilling alcohol from wine using a coiled condensing tube. At the time of Raimondi’s print, the central figure for the promotion of alchemy was the aforementioned Alessandro Achillini. A beloved teacher, Achillini lectured in the halls, published regularly, and took part in numerous student disputations on topics ranging from matter to the nature of celestial bodies. The contents of Achillini’s 1501 Septisegmentatum opus align alchemy and Aristotelian knowledge of nature’s secrets with his own scholarship. Additionally, as a type of mirror of princes, with advice on everything from bodily health to administering justice, the Secretum secretorum would have appealed to the Bentivoglio family of Bologna. Included in Achillini’s edition of the Secretum secretorum are passages that endorse alchemy as a divine-like science with its secret formulas for producing silver and gold, impossible to achieve for the uninitiated. While the Emerald Tablet imparted hermetic arcana related to monism and the production of the philosopher’s stone, the Secretum secretorum, as noted above, also contains instructions on the use of appropriate laboratory equipment for manufacturing precious metals, including the fashioning of a historiated talisman – a ring of silver and gold – that brings honor and obedience to the hand it adorns.

The connection between alchemy and artisanal metalwork also features on the title page of the Septisegmentatum opus, where one finds an anonymous woodcut of the great brazen horn (of Themistius) produced for Alexander the Great in his role as general (see Fig. 6). This horn, an instrument of miraculous fabrication, could supposedly terrify troops and summon armies from miles away with its awesome sound. By highlighting this complex metallic marvel at the opening of his compilation, Achillini called attention to the amazing technical possibilities and the
added military benefits associated with the Secretum secretorum. Little wonder contemporary documents reveal Achillini was held in the highest esteem by his colleagues, and moreover, in December 1501, just two months after the publication of Septisegmentatum opus, the Comune increased his professorial salary from 300 to 400 lire per year.101

It would be a stretch to imagine Bolognese humanists running to the laboratory to concoct elixirs or try their hands at metallic transmutation. Rather, it is the presentation of alchemy as a secret form of knowledge that undoubtedly captivated Raimondi’s contemporaries the most.102 Secrecy, according to nearly every alchemical writer, was paramount in order to maintain the prestige of chrysopoeia.103 When Pseudo-Aristotle tells Alexander that he will impart to him a secretum maximum secretum that he must zealously guard, any learned reader able to penetrate the meaning of the pages must have felt like the sole possessor of heavenly wisdom.104 At the same time, as Karma Lochrie explains, secrecy is never as solitary an activity as it purports to be. Instead, it operates in distinct social contexts, configuring power relations and cementing relationships through the preservation and revelation of knowledge.105 Raimondi’s print, with its careful orchestration of enigmatic symbols, plays off the dual nature of secrecy: that it implies its own revelation and structures identity through a specialized body of knowledge. Although an independent work of art, this engraving most likely circulated as a visual complement to the 1501 Septisegmentatum opus edited by Achillini, binding the scholarly and artistic communities together in Bologna with an image that broadcasts their shared passion for alchemy.

The secretive community of alchemical knowledge was, paradoxically, ever-increasing in the Renaissance. Goldsmithing and alchemy practically went hand in hand. A well-cited example is Vannoccio Biringuccio’s La Pirotechnica of 1540, which stressed the relationship between metalworking and the practice of alchemy and distillation, not only because they all exploit the creative powers of fire, but because the art of the goldsmith requires certain alchemical secrets and ‘often makes a thing appear what is not’.106 In other words, both alchemist and goldsmith improve upon nature by manipulating metals and their surface colors, making objects dazzle. In Bologna, Francia signed numerous paintings throughout his career with the epithet ‘aurifex’ or ‘auriferer’, sometimes using gold-colored pigment, perhaps implying something more than just a trade.107 The city was a crossroads for trade secrets and specialized materials in the fine arts.108 As Raffaella Pini has demonstrated, the largely familial structure of artisan workshops in medieval and early Renaissance Bologna ensured the preservation of certain technical skills.109 Francia’s bottega is a shining example of the protection and transmission of a coveted expertise in the fields of painting and goldsmithing. His sons Giacomo and Giulio took over the workshop at his death – a workshop built on a tight-knit family unit closely aligned with humanists and the leaders of the Comune. Giorgio Vasari states that because Raimondi remained for so many years with Francia and was so cherished by him, the engraver adopted the surname ‘de Franci’.110 Significantly, a notarial document from 1504 identifies Raimondi as a ‘goldsmith’ along with his role as a patron of a benefice of San Giovanni Battista in the church of San Pietro in Bologna.111 Benvenuto Cellini also counts Raimondi as a goldsmith.112 And Vasari praised Raimondi as an expert in niello, producing, among other decorative works, fashionable waist-buckles that were in high demand among university students.113

Nothing in the field of metalwork is ascribed to Raimondi beyond engraving, and even Francia’s production as a goldsmith is rare, although more attributions have been put forward in recent years.114 Nonetheless, a small cluster of niello paxes attributed to Francia or his circle are compelling for their very chemical nature. Niello is a matte black metallic alloy used as an inlay to ornament metalwork. Biringuccio and Cellini’s descriptions of niello’s fiery production as it is mixed and melted are highly evocative of the inner workings of a volatile alchemical laboratory.115 Additionally, in his Speculum lapidum of 1502, the physician and astrologer Camillo Leonardi gushed over the intricacies of Francia’s niello silver plates, populated with minute figures and details of nature.116 Drawing from ancient and medieval authorities, Leonardi’s treatise surveys the virtuous properties of hundreds of precious stones. In his third book, just prior to discussing artists of his day, the author proclaims that the Israelites were the first to incise amulets with signs, the true understanding of which demands knowledge of astronomy, magic, and necromancy.117 Leonardi’s admiration of Francia thereby associates his artifice with scientific study (scientia) and talismanic powers.

Under Francia’s tutelage Raimondi may have had his first exposure to alchemy, leading him to cultivate his own knowledge and be well-equipped to conceive his brilliant Allegory of Alchemy. Although this print rarely surfaces in Renaissance studies, it offers compelling testimony to the increased status of alchemy and its profound intersection with humanist culture. Taken on their own, many of the details of the composition appear disparate in their classical or medieval pedigrees, but the whole point of alchemist enterprise is to probe deeper and combine what others have overlooked. As a hieroglyph, the ouroboros speaks to the inherent nature of the mystical dragon, whose fiery nature and transformative powers parallel the alchemical process. The three ages on display are less a moralized comment on life’s transience than a promise of the eternal return of youth achieved through curative distilled spirits. Just like the special ability of self-consuming dragon to rejuvenate, so too do the fruits of alchemy promise revitalization. An ivy crown denotes poetic achievement, and alchemists counted their craft as an art meritting a victorious garland. Moreover, in Raimondi’s artistic imagination, the embodiment of alchemy reached a new visual
refinement in the central figure of his alluring woman. The entire image emanates an elegance and bizarreness akin to the style of Apuleius’s *Golden Ass*.\(^{118}\)

While the print builds on intertextual references, the impetus behind its genesis may well have been the publication of the *Septisegmentatum opus*, the contents of which bridge the artisanal and intellectual.\(^{119}\) With its portrayal of a winding stream (or path) that leads to an expansive backdrop of Bologna, a city that has received scarce attention in recent studies on Renaissance alchemy, the work adds another disciplinary layer to the designation *Bononia docet*. The production of this engraving all but confirms Raimondi’s direct engagement with the scholar Alessandro Achillini, a relationship which was previously unknown. As one of his earliest works, *Allegory of Alchemy* certifies Raimondi’s status as an independent artist, full of inventive powers, able to assimilate deftly a broad visual vocabulary. It follows that the putto expressing the idea of *ludus puerorum* stands as much for chrysopoeia as for Raimondi’s artistic wit, and by extension for his own claim to alchemical expertise. Above all, this captivating engraving serves as a hallmark of alchemy’s prominence in the Renaissance, championing the secret enterprise as poetic and universal. With such an eloquent image before them, Bolognese viewers might even be persuaded to rank alchemy alongside the liberal arts.

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2. Nicolò Burzio (Nicolaus Burtius), *Bononia illustrata*, Bologna: Franciscus [Plato] de Benedictis, 1494, fol. b7: ‘Hic profecto ingeniósus: Affabilis, decorus: et gravitate morum exornatus’. The humanist Bartolomeo Bianchini admitted to being overwhelmed by feelings of love for the artist and even declared that Francia was his ‘sweetie’ (*meum mel*); see the prefaces to Antonio Codro Urceo, *Opera, quae extant*, omnia, Basel: Henricus Petrus, 1540, fols a3r–a4r; and Filippo Beroaldo the Elder, *Commentationes conditae a Philippo Beroaldo in Suetonium Tranquillum*, Bologna: Benedictus Hectoris, 1506, fol. 6r.


Negro and Roio, Francesco Francia, p. 158, cat. no. 29; and Rossoni, ‘La grafica nella produzione di Francesco Francia’, pp. 73–74, who notes the connection between the two works.


9 William Eamon confirmed for me the identification of the putto’s instruments and kindly provided comparative examples. Bartsch, Le Peintre graveur, p. 301, observed that the putto holds a glass alembic in one hand and a snake in the other, and there has been ambiguity ever since.


12 See Nummedal, Alchemy and Authority, pp. 43–48, who makes reference to Pseudo-Geber’s Summa perfectionis and Petrus Bonus’s Pretiosa marganta novella.


16 Nummedal, Alchemy and Authority, pp. 119–146.


18 In terms of conceptualizing nature’s marvels, Raimondi’s print foreshadows Giulio Campagnola’s enigmatic engraving Astrologer (1509), which features a large dragon next to a seated philosopher who studies an astrological globe; a city evoking the Veneto rises prominently in the background. More conspicuous in his presentation, the Sienese artist Domenico Beccafumi produced a series of ten woodcuts, known today as the Various Operations of Alchemy (c. 1530–1535), that display distillation equipment all in heavy operation, together with allegorical imagery.

19 The impression illustrated in this article comes from the British Museum, London; other examples are housed in the Albertina, Vienna; the Pinacoteca Nazionale, Bologna; the Staatliche Museen, Berlin; the Metropolitan Museum of Art, New York; the Detroit Institute of Arts, Detroit; and the Los Angeles County Museum of Art, Los Angeles.

20 Faietti, in Bologna e l’umanesimo, pp. 94–96, outlines the various interpretations of the image.


24 De signis temperatust, ventorum, et aquarum; De mineralibus.


26 Secretum secretorum, in Septisegmentatum opus, ed. by Alessandro Achillini, Bologna: Benedictus Hector, 1501, fol. 3’. In certain instances, Latin text and English translations are adapted from Opera hactenus inedita Rogeri Bacoconi.

27 Secretum secretorum, in Septisegmentatum opus, fol. 11’; ‘de secretis occultis et de scieniis occultibus universalibus et particularibus, que pertransuerunt homines et non cognoscuntur’.


32 Quodlibita de Intelligentis (1494); De orbibus (1498); De universali-bus (1501).

et al., Cambridge, 1988, pp. 264–300, esp. 271–272; and Matsen, Alessandro Achillini.


37 Achillini, Viridario, fol. 188v: ‘Ch’en dubio de noi pendo, quale e vivo’.


46 Beroaldo considered these interconnected signs syntactical, functioning like adverbs and conjunctions, still sufficiently obscured to prevent ‘curious profane persons’ from interpreting them; see his Commentarii in asinum aureum Lucii Apuleii, Bologna: Benedictus Hector, 1500, fol. 273r. On Beroaldo’s understanding of Hieratic script and his reading hieroglyphs in a discursive manner, see Giehlow, The Humanist Interpretation of Hieroglyphs, p. 58; Curran, The Egyptian Renaissance, pp. 180–181; and Dempsey, ‘Renaissance Hieroglyphic Studies’, pp. 346–347. On Beroaldo’s commentary of Apuleius, see Gaisser, The Fortunes of Apuleius, pp. 197–242.


50 The phrase ‘aenigma sententiae’ comes from Fasanini; Draysdall, ‘Filippo Fasanini’, pp. 136–137.


52 Hieronymus Brunswig, Liber de arte distillandi de simplicibus, Strasbourg: Johann (Reinhard) Gruninger, 1500, fol. c1’r; quoted and trans. in Moran, Distilling Knowledge, p. 15; and see further Taape, ‘Distilling Reliable Remedies’.


54 The chromatic phases went from black (nigredo) to a short-lived iridescent sparkle like a peacock’s tail (cauda pavonis) to white (albedo) to yellow (citrinata) and, ultimately, red (rubedo); summaries of the process are found in Principe, The Secrets of Alchemy, pp. 123–125; and Smith, The Body of the Artisan, pp. 131–132.

55 Secretum secretorum, in Septisegmentatum opus, fol. 12r: ‘qui non est lapis, nec habet naturam lapidis’; ‘hoc est dicere, ovum philosophorum’.

56 As Smith, The Body of the Artisan, pp. 131–132, notes, ‘eggs […] held a special significance as a model for the generation of life out of inanimate matter. The “philosophical egg” of alchemical theory could both symbolize a model of the cosmos as well as denote the source of the philosopher’s stone’. See also Principe, The Secrets of Alchemy, p. 123.


59 Splendor Solis (London, British Library, Harley MS 3469), fol. 23r. For an English translation, see S. Trismosin, Splendor Solis, trans. by J. Kohn, London, 1920. For a reading of the animal and other symbolism in the

60 Zürich, Zentralbibliothek, Ms. Rh. 172. The Aurora consurgens offers alchemical allegories to biblical passages, with reference to Muhammad bin Umai’s Silvery Water, an Arabic text that had a wide currency in the Renaissance. For an English translation with commentary, see Aurora Consurgens, ed. by M.-L. von Franz, New York, 1966.

61 Michael Maier, Atalanta Fugiens, Oppenheim: Johann Theodor de Bry, 1618, pp. 64–67.


66 Hieronymus Reusner, Pandora, Das ist, Die Edelste Gab Gottes, Basel: Samuel Apiarius, 1582. Michael Maier’s Septimana Philosophica, Frankfurt: Lucas Jennis, 1620, pp. 113–154, surveys at length the secrets (enigmas) of the vegetal world, with information on floral symbolism for alchemy.

67 Bows and arrows can be seen to signify ‘capability and strength’ in alchemical imagery; see Berlekamp, ‘Painting as Persuasion’, p. 44.


69 Long, Openness, Secrecy, Authorship, pp. 51–55, reviews the important themes of magic and secrecy in Apuleius that would have appealed to Renaissance readers.


82 On Campagnola, see Campbell, ‘Naturalism and the Venetian “Poesia”’, pp. 115–142.

83 On Botticelli’s banner and Augurelli’s response, see Dempsey, The Invention of the Renaissance Putto, pp. 162–163.
84 See Augurello-Soranzo, Giovanni Aurelio Augurello, pp. 31, 38–40, 84–88; and 106–121 for the genesis, publication history, and text and translation of these two works. The Vellus Aureum is from his Iambici Libri, 1.5; and the Greek-titled Chrysopoeia is from his Sarmones, 2.11.


87 Augurello-Soranzo, Giovanni Aurelio Augurello; Chrysopoeia (1505); line 8; pp. 110–111; and Chrysopoeia (1515), 1.10; pp. 130–131.


91 Codro, Opera omnia, fols 178–188.


93 See the section De laude agriculturae in Varia Philippi Beroaldi opuscula, Basel, 1513, fols 2r–3v, where he cites Lucretius’s De rerum natura (5.1379ff); Virgil’s Georgics (2.458; 2.485); and Horace’s Epode 2, among others. Beroaldo also edited the Scriptores rei rusticatae (Bologna: Benedictus Hector, 1494).

94 While Delaborde’s label for the elder in Raimondi’s print as either Philosophy or Logic resonates to some degree, outside the academic arena one can also consider the actions of the amateur ‘secrecy vendor’ Leonardo Fioravanti, who was born in Bologna in 1517, and who sought out farmers and shepherds to gain experience with nature’s medicinal secrets; see Eamon, Science and the Secrets of Nature, p. 169.


98 Secretum secretorum, in Septisegmentatum opus, 12v: ‘Sciendum tam quod scire producere argentum et aurum, verum est impossible: quoniam non est possibile equiparari Deo Altissimo in operibus suis propriis’.


100 See Opera hactenus inedita Rogeri Baconi, p. Iviii.

101 Matsen, Alessandro Achillini, pp. 23–25.


104 Secretum secretorum, in Septisegmentatum opus, 12v: ‘Impremis, O Alexander, tradere tibi volo secretorum maximum secretum, et divina potencia iuvet te ad peradiciendum propositum, et ad celandum archanum’.


106 Biringuccio, Pirotechnia, p. 367; as discussed by Eamon, Science and the Secrets of Nature, p. 117; and Nummedal, Alchemy and Authority, p. 33. Landau and Parshall, The Renaissance Print, p. 27, observe that handbooks like the Künstbüchlin gerechten gründlichem gebrauchs aller kunstbaren Werckleüt (1535) provided knowledge in the various arts of fire, whether metalworking or alchemy.

107 For example, Francia’s enchanting Adoration of the Child in a Rose Garden, c. 1510 (Munich, Alte Pinakothek), is signed in gold letters: ‘FRANCIA AVRIFEX Bonon.’; Negro and Roio, Francesco Francia, pp. 189–192, cat. 65. According to Vasari (Vasari–Milanesi, Le vite, vol. III, pp. 535–536), Francia was master of the Bolognese mint under both the Bentivoglio and papal rule, for which he made the stamps of all the dies for medals. This position would have also required the ability to assay gold and silver to determine their composition and purity; see also J. Warren, ‘Francesco Francia and the Art of Sculpture in Renaissance Bologna’, The Burlington Magazine, 141, 1999, pp. 216–225, esp. 217. Negro and Roio, Francesco Francia, p. 166 (19 November 1508), state that Francia only became formally involved with the mint at this date based on existing documentary evidence. In any event, he made medals independently throughout his career. See further M. Scalini, ‘Francia orafa, zecchiere e medaglista: Ipotesi e confronti’, in Scalini and Rossoni, Il genio di Francesco Francia, pp. 27–33.

108 Albrecht Dürer announced in October 1506 plans to visit Bologna ‘to learn the secrets of the art of perspective, which a man is willing to teach me’; see W. Stechow, Northern Renaissance Art 1400–1600: Sources and Documents, Englewood Cliffs, NJ, 1966, p. 91. Feliciano experimented with gold and silver inks, and in a letter of 1472 to Antonio Nogarola, he mentions a special substance (pasta congielata) he obtained while in Bologna for his alchemical experiments that he wanted to share; see Welles, ‘The Unpublished Alchemical Sonnets’, pp. 15–16. What is more, the early-fifteenth-century Bolognese manuscript...


114 See Scalini and Rossoni, Il genio di Francesco Francia; and Warren, ‘Francesco Francia and the Art of Sculpture’. Sean Roberts calls into question the status of Francia as a printmaker, as opposed to that of a goldsmith, when it comes to contemporary accounts about his expertise with a burin; ‘Salimbeni’s Epithalamium, Francia, and Maso Finiguerra’, Source: Notes in the History of Art, 35, 2016, pp. 227–234.

115 The Treatises of Benvenuto Cellini, pp. 7–9; Biringuccio, Pirotechnia, pp. 365–366.


117 Leonardi, Speculum lapidum, fols. 47v–48r.

118 Beroaldo declared Apuleius’s Golden Ass to be ‘composed and put together with such wit and refinement of style and such elegance (tanta […] elegantia) of uncommon expressions’; Beroaldo, Commentarii in asinum aureum, fol. 1v, as quoted and translated in Gaisser, The Fortunes of Apuleius, p. 202. In his Sermo primus, Codro states that he carried daily in his hands the two versions of the Golden Ass, one by Lucian (‘brief and inventive’), and the other by Apuleius (‘copious and elegant’); Codro, Opera omnia, fol. 1: ‘Praeterea ego quoque quotidie fere Luciani et Apuleii asinos in manibus habeo, unius brevitatem et inventum, alterius copiam admirans atque elegantiam’. Correspondingly, Filoteo praised the ornaments of antiquity populating the works of Amico Aspertini as both ‘bizarre’ (bizar) and ‘learned’ (dotte); Achillini, Viridario, fol. 187v.

119 The volume’s section on minerals would have also appealed to Bolognese humanists and collectors. The poet Girolamo Casio was a merchant of luxury items, including precious stones; and Filoteo possessed an almost encyclopedic knowledge of gems, witnessed in his Epistole of c. 1500 on the house museum (theatrum) of a certain painter known as Ombruno; see Claudio Franzoni, ‘Le raccolte del Theatro di Ombruno e il viaggio in Oriente del pittore: Le Epistole di Giovanni Filoteo Achillini’, Rivista di letteratura Italiana, 8, 1990, pp. 287–335.