

Looking at Jacopo Ligozzi's *Daphne laureola* in Three Ways

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Abstract

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Jacopo Ligozzi produced an extremely diverse body of work over the course of his life, but he is best known for the botanical and zoological illustrations he made for Francesco I de' Medici between 1577 and 1587. This paper will consider one of these botanical works, his image of *Daphne laureola*, as it relates to three artistic genres: scientific illustration, still life, and miniature painting. I argue that Ligozzi's work brings the visual qualities and cultural associations of still life and miniature painting into the service of the budding science of natural history. The appeal of works like Ligozzi's played an important role in both the establishment of scholarly social networks through the exchange of images, and in the cultivation of courtly support for scientific research due to the desirability of nature studies as collectable objects. The emerging natural sciences benefitted from this desirability, which resulted in part from the artistic knowledge deployed in the making of such nature studies. The attractiveness of these images helped viewers to reframe their relationship to non-human organisms, enabling the viewer to see previously overlooked creatures as newly fascinating objects of wonder.

Jacopo Ligozzi produced an extremely diverse body of work over the course of his lifetime, but he is best known for the botanical and zoological illustrations he made for Francesco I de' Medici between 1577 and 1587. The period in which he worked coincided with both the rise of still life as a genre in Europe and an increasing emphasis on the role of images in science. Ligozzi's work was prized by his patron, Francesco I de' Medici, and was sought out by Bolognese naturalist Ulisse Aldrovandi. The esteem of politically, culturally, and intellectually important figures of the time makes Ligozzi an attractive research subject. As Michael Baxandall has suggested, an artist's work can be usefully related to the scientific thought of the period if there are visible connections to those ideas in the image, and also if there is "some indication that it was conceivable, in the period, for the two universes to be brought into this sort of relation."¹ Ligozzi's work, by these criteria, is an excellent subject for a study that considers the ways in which an image is related to both art and science. He worked at the interface of not just two, but three or four such "universes:" political, scientific, artistic, and religious. The court of Francesco I was what Pamela Long has termed a "trading zone," where artisans, scholars, and patrons were together engaged in activities that overlapped and built one upon another in the production of new forms of knowledge.²

This essay will explore the multiple influences and possible readings of one of Ligozzi's botanical works: his *Daphne laureola* (inv 1955 O, 67 x 46 cm, Gabinetto dei Disegni e delle Stampe degli Uffizi) (Figure 1). Considering how this work is related to scientific illustration, still life, and miniature painting, I will explore the ways these varied artistic genres are enmeshed in Ligozzi's *Daphne laureola*. Ligozzi used visual and conceptual strategies gleaned from these genres to create images that are both

powerful and appealing—qualities that would have been useful in attracting prestigious patrons to the sciences. I will argue that nature studies like the *Daphne laureola* re-frame the relationship between the viewer and the organism depicted, opening up new ways of perceiving non-human organisms. First, however, it will be useful to conduct a brief survey of Ligozzi's career, as the diversity of his artistic practice contributed to the varied influences seen in the *Daphne laureola*.

Jacopo Ligozzi was born in Verona in the mid-sixteenth century.³ He was part of a family of renowned decorators and embroiderers who worked for prestigious clients, including the Habsburg Court.⁴ Although this paper will focus primarily on botanical works, it is important to note that Ligozzi's oeuvre is characterized by its diversity with respect to both genres and materials. During his career, he produced religious paintings (including altarpieces and frescoes in the cloister at the church of Ognissanti in Florence), vanitas paintings, designs for objects (including candle holders and cups), decorations on a telescope for Galileo Galilei,⁵ designs for works executed in pietra dura, illustrations for literature (including drawings from Dante's *Inferno* and *Purgatorio*)⁶, drawings recording specific places (landscape and interior, including views of La Verna, and a view of Elba to decorate the interior of Giambologna's *Appennino*),⁷ allegorical paintings and drawings, history paintings (for example, 1592, *Pope Boniface VIII receiving the Florentine Ambassadors* in the Palazzo Vecchio), heraldic designs for the Medici (such as the genealogical allegory of Prince Cosimo de' Medici⁸), ephemeral decorations (including trompe l'oeil painted decorations for the arrival in Florence of Maria Maddalena of Austria in 1608⁹), painted floor tiles for the Luxembourg Palace commissioned by Maria de' Medici,¹⁰ and a large number of sketches (including copies

after northern prints, and works from his imagination, such as macabre cartouches).¹¹

As part of a family of decorative artists working for European courts, the young Ligozzi was in Trent at the time of the Council of Trent,¹² where his father worked for the Prince Bishop Cristoforo Madruzzo over the duration of the entire Council.¹³ Two of his earliest known works are paintings he made in 1566 and 1567, a few years after the Council, in the churches of Bivedo and Vigo Lomaso, respectively.¹⁴ Sergio Marinelli suggests that the atmosphere of the Council of Trent impacted Ligozzi's own spirituality, as he was known to be a religious man.¹⁵

Some scholars have suggested that after Trent Ligozzi may have spent time at the Habsburg court in Vienna, as the Habsburg collection included works by Ligozzi.¹⁶ Because members of his family worked for the Habsburgs, it has also been suggested¹⁷ that the Habsburgs were a likely point of introduction for Ligozzi into the Medici court. Recent scholarship, however, has determined that Ligozzi most likely spent the early part of his career in Venice, and that the works in the Habsburg collection were probably not acquired via direct patronage of the artist.¹⁸

Ligozzi likely worked on plant and animal studies before arriving in Florence, whether in Verona or Venice, or both. Some have suggested that he could have had links to the apothecary and scholar Francesco Calzolari (1522-1609) in Verona.¹⁹ Ligozzi has been proposed as the unknown painter that Calzolari recommended to Bolognese scholar Ulisse Aldrovandi:

“he finished my book to the amazement of everyone, and he made some fish and birds that surpass live ones ... I would like your Excellency to have him near you, because in this profession he is certainly a great man.”²⁰

Calzolari also noted that this mystery painter worked for the Tuscan-Venetian herbalist Leone Tartaglini, which would also be consistent with Ligozzi's presence in Venice.²¹

In Florence, Ligozzi was a much-valued member of the court of Francesco I de' Medici, with a monthly income of 25 scudi, which made him the second-highest paid Medici court artist of the time after Giambologna.²² His studio was in the Casino di San Marco, where Francesco I had his alchemical workshop and kept a garden of rare and medicinal plants.²³ Though criticized by some for neglecting his duties as Grand Duke in favor of his studies,²⁴ Francesco I's tenure as ruler of Florence seems to have instead focused on the accumulation of intellectual capital in the form of scientific knowledge and technical expertise. His success with producing the first European soft-paste porcelain is one example of his research. Francesco's approach is consistent with the reign of his parents, Eleonora di Toledo (1522-1562) and Cosimo I de Medici (1519-1574), who promoted the development of the silk industry in Florence, and who were patrons of the *Orto Botanico* in Pisa — one of the first botanical gardens in Europe.²⁵

Another example of Francesco's interest in the acquisition of knowledge is his collaboration with Bolognese naturalist, author, and professor at the University of Bologna Ulisse Aldrovandi (1522-1605). Aldrovandi's dedication to research mirrored Francesco's own interests, so it is no surprise that in 1577—months after Ligozzi's arrival—Aldrovandi visited Florence.²⁶ Long concerned with the way that visual representation could aid scientific understanding, Aldrovandi was enthusiastic about Ligozzi's talents.²⁷ After this visit, Aldrovandi wrote to Francesco I (and later to his brother Ferdinando) to request copies of specific works by Ligozzi, with the goal of translating them into woodblock prints for publication in his books.²⁸

During his time at the court of Francesco I, Ligozzi worked primarily on nature studies of plants and animals painted on paper, though he did take on other projects as well. For example, he worked on textile design and decoration on behalf of Bianca Cappello, the second wife of Francesco I. After the death of Francesco I in 1587, Ligozzi produced few botanical works. When Francesco I's brother, Ferdinando I de' Medici, succeeded him as Grand Duke of Tuscany, he put Ligozzi to work on other projects. Despite Aldrovandi's attempts to interest Ferdinando in continuing the scientific collaboration he had carried out with Francesco, Ferdinando focused his energy primarily on his own research interests.²⁹

Twentieth-century work on Ligozzi focuses primarily on details of his biography and questions of attribution. For example, in Mina Bacci's 1963 article on Ligozzi, she works to establish the facts of Ligozzi's life in Florence. This article paints a picture of Ligozzi as an artist of difficult character whose creativity was hampered by the demands of the court context, noting the relative lack of attention given to Ligozzi by art writers of the period, including Baldinucci, who only mentions him briefly in his life of Donato Mascagni.³⁰ Over the last few decades scholarship on Ligozzi has built on this foundation and begun to consider Ligozzi's oeuvre as a whole—a body of work that may seem fractured to our thinking, given its diversity of media, genres, and influences. It also focuses on relating Ligozzi to his social context in more specific ways than some of the earlier work. For example, contributions by Lucia Tongiorgi Tomasi make use of her broad-based knowledge of botanical and scientific works of the period, clearly placing Ligozzi into that context.

The 2014 catalog for the exhibition of Ligozzi's works held at the Palazzo Pitti, *Jacopo Ligozzi, "pittore universalissimo,"* brings together the many facets of Ligozzi's art. This exhibition inspired a dedicated volume of *Mitteilungen des Kunsthistorisches Institut in Florenz, "Jacopo Ligozzi 2015."* The authors of the introduction to this volume credit seeing these diverse works together with having changed their understanding of Ligozzi.³¹ Of the works in this volume, the one most pertinent to this paper is an article by Corinna Gallori and Gerhard Wolf, who discuss two Ligozzi paintings of serpents: one in the Medici collection and another in that of Aldrovandi. They explore the difficulties Aldrovandi faced when trying to have animals translated into paintings, and finally into prints, and the challenges of naturalistic representation without recourse to color.³²

The work of Lucilla Conigliello, who was a curator of the 2014 exhibition, has been central to recent scholarship on Ligozzi. Conigliello's research has focused on establishing firm data points in the trajectory of Ligozzi's life, searching for dates, places, and evidence for strong attributions. Another important feature of her work is her insistence on paying attention to what have been considered by many to be minor works in Ligozzi's oeuvre, including his religious paintings and his sketches.³³ Recent scholarship has sought to characterize a coherence in his oeuvre. Conigliello, for example, sees a thread of unity connecting Ligozzi's seemingly disparate works in the form of his superb draftsmanship.³⁴ Tomasi finds consistency in Ligozzi's naturalistic representation of plants, animals, and objects throughout his works.³⁵ Faietti, Nova, and Wolf, citing a tendency among some art historians to isolate and value his illustrations without reference to his other works,³⁶ also note a degree of continuity: "Certainly one of the most noteworthy results of the exposition . . . consists in having identified the subtle

thread which links the religious paintings and moral allegories of Jacopo Ligozzi to his naturalistic works.”³⁷

Angelica Groom proposes that Aldrovandi’s scientific publishing agenda drove the outcome of Ligozzi’s work, which, she proposes, should be understood as being valued not for its originality, but rather for Ligozzi’s ability to take direction and produce a visual image that is appropriate for copying.³⁸ This attention to the impacts of an image’s function, and the effects of scientific publishing practices on the genre of zoological illustrations is an important contribution to the literature and resonates with some of the conclusions in this essay.³⁹

Scholars writing on Ligozzi have emphasized not only the diversity of his works, but also the multiplicity of cultural influences to which he was exposed. For example, Conigliello writes: “We see that our artist belongs to late International Mannerism in its most complex, defined and controversial productions, its manifold manifestations. He also belongs to the Counter-Reformation, anxious and bigoted, obsessed by the dimension of sin and the thought of death.”⁴⁰ This multiplicity of influences may have fostered his flexibility with regard to graphic styles: his *Allegories of the Seven Deadly Sins* (1590)⁴¹ are beautifully drawn depictions of vice, with a dual nature that is both a warning and a seduction. They are, in Conigliello’s words, “poised between the pretext of representing scenes of open eroticism and the most menacing obsession of damnation.”⁴² His movement between genres and ability to draw lucidly were not distinct from his engagement with the artistic tendencies that are identified with mannerism—these tendencies were integral parts of his draftsmanship. Indeed, tendencies related to mannerism, including a fascination with the aesthetic possibilities of the grotesque and

novel forms, would have helped Ligozzi to see the vast visual potential in the seemingly humble organisms he was called upon to paint. Ligozzi's role at court allowed him to work both from his imagination and from empirical observation, in varied media and to varied ends,⁴³ and this ability to switch visual registers may have helped him become uncommonly attuned to subtle differences in representational style. His ability to practice different styles of draftsmanship may have helped him to step out of his familiar practices, and develop others. This ability to work in many different ways undoubtedly aided him as he developed his particular approach to botanical and animal illustration.

Scholars have attributed Ligozzi's ability to depict animals and plants with apparent verisimilitude to his having been trained in a northern Italian tradition of representation, a tradition that has been linked to both painting from life and early still life.⁴⁴ His Veronese heritage alone has prompted commentators to suggest his familiarity with the work of Pisanello and the miniature works of Gerolamo dai Libri and Giorgio Liberale.⁴⁵ In addition, his influences included Northern European prints, which he copied on multiple occasions,⁴⁶ and it has been suggested that he may have seen Northern Italian herbals in his youth.⁴⁷

The Botanical Image in Sixteenth-Century Science

In the sixteenth century drawings took on new importance in scientific texts due to their ability to convey and record visual information. This was a change from previous eras, when the utility of images in herbals was questioned. During the sixteenth century, there were still arguments about the utility of images in herbals,⁴⁸ and much of the original botanical research that was done at the time focused on "rediscovering" plants mentioned by classical sources such as Dioscorides. Leonhart Fuchs, author of

Remarkable Commentaries on the History of Plants (published 1542) was a strong advocate for the image's role in the transmission of knowledge.⁴⁹ Sachiko Kusukawa has shown that this herbal was one of the first to rigorously coordinate text and images, as many other works from the time period reused plates, not always matching them with the plant described in the text.⁵⁰ Fuchs argued strongly in favor of images, writing:

“Who, I ask, in their right mind would condemn a picture which, it is clear, expresses things much more clearly than they can be described with any words of the most eloquent men? Indeed nature was fashioned in such a way that everything may be grasped by us in a picture: in fact, those which are explained and depicted to the eyes on panels or paper adhere to the mind more deeply than those described by bare words.”⁵¹

Scholarly opinions of the botanical image were changing during the mid-sixteenth century. Another author of an influential herbal, Pietro Andrea Mattioli (1501-1577) did not include images in the early editions of his herbal, explicitly writing in his 1550 edition against the use of images in herbals.⁵² However, for some reason – whether the commercial success of illustrated herbals, with their great aesthetic appeal and utility, or perhaps because of a pirated edition of his own work that appeared with images, Mattioli's Latin edition of 1554 was illustrated.⁵³

Herbals, and the research that went into them, became the focal point for an international and highly collaborative (and competitive) project of shared botanical knowledge.⁵⁴ Beginning in 1544, Mattioli published multiple revised editions of his version of Dioscorides' *De Materia Medica*. The updating of this first-century C.E. herbal was not an individual project. Mattioli used the popularity of his herbal (he estimated that over thirty thousand copies were printed in Italian alone), and his ability to credit other researchers in his text, in order to encourage a large number of scholars – including Aldrovandi—to submit information for publication.⁵⁵ As a result, an

intellectual community formed around Mattioli's text, which became a point of reference for the growing science of natural history.⁵⁶

The social aspect of botanical study, which continued to build long afterward,⁵⁷ was already important in the sixteenth century. The circumstances of Ligozzi's works, including their role in the relationship between Francesco I and Aldrovandi, demonstrate as much. Produced in the context of scientific and artistic inquiry in Francesco I's Casino di San Marco, these works were, from their commissioning, part of an atmosphere of intellectual exchange. Aldrovandi's interest in Ligozzi's works was related to his larger commitment to the use of images in science. He was among those scientific thinkers at the time who believed that visual knowledge was an important factor in the struggle to understand the natural world, and who were seeking to develop systems of classification.⁵⁸ Aldrovandi was a key advocate for the importance of images in the search for knowledge. He realized that it was not possible to articulate important aspects of an organism's appearance using only text, and in his desire to discover order among the plants and animals of the world, he embraced drawing as an essential component of his project. To obtain appropriate drawings, Aldrovandi hired artists to work in his workshop in Bologna, where they produced drawings from actual specimens when possible. He also obtained works sent to him from others who were able to draw and paint specimens, including works by Ligozzi.

Among the reasons that this era saw a surge in scientific illustration executed from life is the need to have plants in botanical gardens illustrated for use in teaching. Indeed, early botanical gardens were set up as research and training aids in faculties of medicine. Life studies of plants from these gardens allowed students to continue studying

the “simples” during winter, when many of the plants in botanical gardens were dormant or not in flower.⁵⁹

Faith in the capacity of the visual world to reveal scientific knowledge—and by extension faith in the visual arts to record it—reached a peak at the juncture between the sixteenth and seventeenth centuries. Federico Cesi and several of his colleagues formed the *Accademia dei Lincei* in 1603 — a group whose very name, Italian for “lynxes,” refers to an animal with acute eyesight.⁶⁰ The *Lincei* engaged in ambitious efforts to collaborate on natural history research projects, most of which emphasized the role of illustration. This emphasis on visual research and records is evidenced by the fact that one of their later members, Cassiano dal Pozzo (1588–1657), is best known for assembling a “paper museum” consisting in large part of natural history illustrations. The *Lincei*, thanks to their involvement with Galileo⁶¹ also published the first known scientific illustration to use a microscope.⁶² Johannes Faber, a member of the *Lincei*, even coined the term “Microscope” in 1625.⁶³ At this time, the appearances of things were thought by some scholars to hold the key to their identities, and were the focus of efforts of classification.⁶⁴

Considering Ligozzi’s *Daphne laureola*

In Ligozzi’s study of *Daphne laureola*, or spurge laurel, (Gabinetto dei Disegni e delle Stampe degli Uffizzi, 1955 O, 67 x 46 cm) (Figure 1) the plant is depicted singly on a sheet of paper. Ligozzi placed the exposed root clump at the foot of the page, centering it. There is a minutely observed tortoiseshell butterfly to the left of the plant, and three flies to the right. The plant and the insects are depicted against an emphatically blank background, as is typical for nature studies and scientific illustration.⁶⁵ This work, like

the other botanical works by Ligozzi for the Medici, was made in tempera on a large sheet of paper. Often the dimensions of the images in these works correspond to the actual scale of the plant depicted.⁶⁶ By looking at unfinished pieces, scholars have ascertained that Ligozzi first made a very faint drawing in black chalk, then he laid in a tempera base, after which he worked in passes from the broadest forms to the smallest details, finishing with miniscule brushstrokes to depict the most minute forms on each plant.⁶⁷ The spurge laurel is lit from the left and slightly from the front, as is the butterfly. Ligozzi took care to define the contours of the long, lanceolate leaves, folded into a v-shape along their midrib. Small yellowish flowers cluster at the nodes where the leaves meet the plant's smooth—though woody—trunk. In two or three places the leaves of the plant have been chewed by an insect, creating the impression of a nature study of a particular specimen, not a generalized, idealized botanical illustration. The roots of this plant are a tangled mat, and like the insect damage on the plant's leaves, they give the impression that Ligozzi carefully articulated individual roots that he observed, rather than creating a brief notation of their visual effect. The specificity of this image is related to its status as a study from life—an important tendency in scientific documentation in this period. Ligozzi's work takes this specificity to a high level.

Some scholars have seen Ligozzi's intense observation of individual specimens as the creation of a genre-busting "portrait" of an organism that might be considered by others uninteresting, or unworthy of such treatment. Tomasi, in the aptly titled *I ritratti di piante di Jacopo Ligozzi*, mentions this portrait-like quality: "And in fact, the vegetal specimens painted by Ligozzi rise to a level of true and proper 'portraits,' connoted by a precise 'individuality,' a testimony to the fact of their being rigorously made from life."⁶⁸

Tomasi mentions that, for some of the plants depicted, Ligozzi renders drying edges of their leaves, or fungal afflictions—elements that are specific to the individual plants, rather than an ideal plant.⁶⁹ Marzia Faietti builds on this idea, arguing at length that Ligozzi crossed genres by creating “portraits” of plants and animals. She writes:

In fact, it seems to me that with his portraits of plants and animals Jacopo Ligozzi intended to extend the pictorial genre of the portrait from human beings to the world of animals and plants, rather than limit himself to counterfeiting nature, portraying from life animals and plants, as others had done before him. This was really a question of a new and courageous cultural operation, destined to assume polyvalent significances and to remain in some respects ambiguous and mysterious, even with respect to his scientist interlocutors. This was one of the challenges taken up by Jacopo, the “other Apelles,” as he was yet to be defined by Aldrovandi.⁷⁰

Accompanying the increasing investment in botanical illustration in the sixteenth century, working from specific live specimens became newly important, beginning with the botanical work of artist Hans Weiditz, translated into woodblock prints in Otto Brunfels’ *Herbarium vivae eicones*, first published in 1530.⁷¹ Weiditz’s images were made from observation of live plants—a departure from the conventions of botanical illustration at the time. Before this time, most herbals were illustrated with images of plants that were copied from other images of plants, and therefore not drawn from life. One of the reasons for this is that these older illustrations were the product of a different theory of knowledge than the ones that were executed by Weiditz. As mentioned above, earlier herbals were focused on providing useful visual notes in a symbolic fashion to communicate practical information for medical use. Images were present as aids to the text, which was copied from classical sources, such as Dioscorides. As previously mentioned, Dioscorides criticized the use of illustrations of plants as inferior to text, in terms of accuracy of information, given the mutability of plants.⁷² As working from life

became popular, the benefits of the nature study became evident. The nature study is more than just an aid to a text, it is the product of empirical observation, and is a document that both gathers knowledge through visual research, and makes it available for contemplation.⁷³ Nature studies made from life became an increasingly important aspect of intellectual inquiry in the natural sciences. Claudia Swan notes that images executed from life became so important to scholars in this era that the designation “from life” served to integrate a visual document into a larger intellectual discourse.⁷⁴

Such studies from life were an important part of the development of early modern scientific thought, and it has been argued that they are part of a wider set of artisanal practices of knowledge production, which catalyzed a new way of thinking about nature.⁷⁵ Specifically, artists working from life see nature as a source of information, and approach the object or organism they are drawing or painting with an attitude that seeks information in nature itself.⁷⁶ We see Ligozzi’s ability to learn from nature in his *Daphne laureola*, in which he reproduced specific visual phenomena, respecting their character. Consider again the two or three places where the leaves of the plant have been chewed by an insect, interrupting the visual effect of smooth, overlapping layers of gracefully arcing shapes, and drawing the viewer’s eye with their anomalous change of direction, scale, and speed. These bite-marks are clearly foreign to the plant, and have a linear character very unlike that inherent to the plant. Ligozzi, master of many visual logics, assimilates both the line quality of the plant and the line quality of the insect’s action upon the plant.

As intellectual practices transitioned away from a theory of knowledge that looks to the authority of classical authors and religious texts, empirical approaches became important. Pamela Long argues that a theory of empirical knowledge production rooted in

artisanal practices spread to intellectuals during the Renaissance, in part, as noted at the beginning of this essay, through “trading zones,” where humanists and artisans overlapped.⁷⁷ This artisanal knowledge is an embodied knowledge, learned in large part through mimesis in a workshop setting and then modified through experimentation.⁷⁸ The flexibility and creativity of the artisan’s practice may, according to Smith, provide a model for scientific experimentation. This attitude of creative flexibility, and the ability to trouble-shoot emerging problems, are both exemplified by Ligozzi’s extremely diverse oeuvre.

Smith suggests that one may observe both knowledge and ideas about knowing in the work of the artisan, and that such content can influence the viewers of the work. Ligozzi’s work exhibits a highly visual theory of knowledge, which may have influenced period viewers to calibrate their own vision accordingly, stoking their desire for ever-finer visual resolution. The extreme detail with which Ligozzi depicted the roots of *Daphne laureola*, for example, suggest new extremes of attention focused on the least showy parts of a plant. This attention to the minute details of non-human organisms positions the non-human world as worthy of intense scrutiny. For the viewer of such nature studies, pleasure derived from the intricacy and portrait-like specificity of the roots of *Daphne laureola* may have subconsciously primed them to accept that an empirical approach to nature could yield valuable and wondrous results.

Another of Ligozzi’s nature studies in the Uffizi collection depicts three African vipers (*Cerasti cornuti in lotta e vipera della sabbia*, 1577, inv. 1973 O, Gabinetto dei Disegni e Stampe degli Uffizi) (Figure 2).⁷⁹ There is a related work by Ligozzi, depicting two African vipers, in Aldrovandi’s collection (*Ceraste cornuto e vipera della sabbia*,

1577/1580, Bologna, Biblioteca Universitaria, ms. Aldrovandi, *Tavole di Animali*, vol IV, c. 132) (Figure 3).⁸⁰ Gallori and Wolf call our attention to Ligozzi's use of shadow in the serpent piece sent to Aldrovandi.⁸¹ They highlight the differences between these two works, the most salient of which is the fact that, while the Uffizi folio depicts snakes on a blank background, the work executed for Aldrovandi included shadow. They write:

Thanks to this, the Bolognese serpents seem to stand up from the paper, and not float in an indefinite space, thereby acquiring volume. The descriptive elegance of the Florentine folio is therefore transformed in a complex and menacing spatial and perceptual dynamic, created by the two serpents, which involve the spectator of the plate, even without engaging frontally.⁸²

This firmness and three-dimensionality adds to their sense that Ligozzi was exercising his artistic ingenuity,⁸³ not wanting to merely repeat his previous work, and creating an emphatically life-like representation to replace a snake which in this case had died.⁸⁴ The appearance of three-dimensionality produced by the shadows, Gallori and Wolf suggest, made this version an ideal replacement for the dead snake itself, given the viewer's sense that the snake shared their space.⁸⁵ Significantly, they note that when the horned viper was translated by Aldrovandi's artists into a wood block for printing, the snakes were separated for individual presentation and Ligozzi's shadow was removed. They speculate that Aldrovandi may have found it excessively artistic.⁸⁶ Among the reasons Ligozzi might have had for doing this, according to Gallori and Wolf, was his desire to make the snake more life-like and three-dimensional.⁸⁷ This would have improved the snake's "substitutional value," to borrow a term from Claudia Swan. Works that were made from life were understood to have a certain authority, or, as Swan suggests, a "substitutional value," which allowed them to stand in for absent specimens and be studied.

If Ligozzi used cast shadow to occasionally reinforce the substitutional value of his works, he ran up against an emerging convention of botanical illustration, echoed in the words of Leonhart Fuchs, who wrote critically that “shading and other less crucial things, with which painters sometimes strive for artistic glory, should not obliterate the basic form of the plants; and we have not allowed the artists thus to indulge their whims, in such a way as to make the pictures correspond less to the truth.”⁸⁸ This idea that shadows are related to “artistic glory” may explain some other aspects of Ligozzi’s work, and the ways in which it stands out among botanical works of its time.

With that in mind, I want to return to Ligozzi’s *Daphne laureola*, exploring ways that it relates to the emerging genre of still life. Consider, for example, the care with which Ligozzi placed the plant on the page, with the root clump at the bottom, quite close to the margin, leaving a buffer of space above the plant and, to a lesser degree, on each side. The specimen depicted has a main trunk and a side-branch that shoots off to the right. As if to balance this asymmetry, Ligozzi painted a tortoiseshell butterfly to the left of the plant—a careful compositional move that suggests an attention to the appeal of the image, and not an exclusive desire to create a visual transcription of reality. This supports Gallori and Wolf’s observation that Ligozzi may have made decisions in these images based not only on scientific requirements, but also on artistic criteria.

The background behind the plant and the butterfly is blank. Ligozzi painted the backgrounds of these sheets with lead white, although on some occasions he also added pigment to the lead white to produce a lightly tinted ground.⁸⁹ Such a subtly tinted ground would have mimicked the color of the paper’s surface more accurately than stark white paint, and would have provided an advantage to Ligozzi as he modeled these organisms,

giving him access to pure white paint as the brightest value, rather than letting the white of the page be brighter than the highlights on white petals.

Ligozzi's insistence on an emphatically blank background is part of the visual magic of this work. The background of Ligozzi's work deserves attention as an element of the composition and not just a default, "non-background" of scientific illustration. Indeed, the space of the page in scientific illustration in general has distinct formal qualities that lend themselves to certain readings and produce a strong visual impact. The clean page emphasizes his virtuosity by foregrounding the artificiality of the image. It is a visual manifestation of the control of information, which is bounded by the context of the scientific page. The result is an island of visual observations, excised from its context and preserved for future study.⁹⁰ The creature or plant is not just decontextualized, it is moved into a new context: that of the scholarly page. The hand of the artist, though obscured by Ligozzi's minute technique, is revealed through the presentation of creatures and plants on a paper-colored ground—a page that reminds us of its own materiality. Ligozzi makes this feat look easy by downplaying brush strokes, lines, and other reminders of the artist's hand. At the clean juncture between page and plant, the contour seems to move more like a plant than the hand of a draftsman. There is an illusion of the removal of the presence of the artist, which is itself a carefully choreographed artistic strategy.

In addition to the Tortoiseshell butterfly depicted to the left of the plant, Ligozzi painted tiny flies on the right side of the composition. Three of them hover just below the leaves of the spurge laurel, in the same fictive space as the plant. Tomasi gives this small cluster of flies as an example when she suggests that the insects and birds Ligozzi included in some botanical works create a sense in the image of a "micro-universe,"

which she relates to the development of still life as a genre.⁹¹ She writes: “In some cases Ligozzi associates a plant with a bird, creating erudite compositions that, through elements of accentuated corporeality and focus on particulars, constitute nearly a ‘fragment of reality’, participating in the nascent taste for still life.”⁹²

Ligozzi did, in fact, paint still life for the Medici, but these are now lost.⁹³ One way that the relationship between Ligozzi and still life has been discussed is through potential connections to Caravaggio. Numerous scholars have suggested a relationship between Ligozzi and Caravaggio, most successfully through comparisons to Caravaggio’s *Basket of Fruit*. Bacci suggested, tentatively, that Ligozzi might have been aware of work by Caravaggio.⁹⁴ Battisti saw Ligozzi as a precedent for Caravaggio and he is among those who believe that Caravaggio encountered the work of Ligozzi somewhere, either in Bologna or Florence.⁹⁵ John Variano has suggested a relationship between Caravaggio’s *Medusa* and Ligozzi’s *vipers*.⁹⁶ More recently, Faietti, Nova and Wolf have called for caution on speculative work linking Ligozzi to Caravaggio. They emphasize that earlier ideas about a direct link between Caravaggio and Ligozzi, though interesting, are without evidence, and visible similarities could be due to the influence of the intellectual atmosphere of the period.⁹⁷ However, they also note that Caravaggio’s insistence on a blank background behind his *Basket of Fruit* remains evocative of some relationship (as it echoes the lead white priming of Ligozzi’s page), and that there may have been a link between the two artists via the common patronage of Cardinal Del Monte.⁹⁸

Beyond the shared plain background of Ligozzi’s nature studies (and nature studies in general) and Caravaggio’s *Basket of Fruit*, these works share a highly-detailed,

particular, and observational approach to depicting plants, insects, and objects. The visual appeal of a plant, animal, or everyday object painted in exquisite detail is a feature shared by both still life and nature study. Ligozzi's work saturates the viewer's eye with the artist's minute observations, including his ideas about the textures and colors present on the plants and animals he depicts. In giving so much information to the viewer, Ligozzi asks the viewer to participate through intense scrutiny of the work. Ligozzi's minute moves are there for the viewer to follow. He asks the viewer to become aware of the marvelous nature of a plant or animal, painting each one as though it were a miracle. These works encourage the viewer, through a sort of mimesis, to re-perform the intensity of the artist's own observations, recorded in these nature studies. The image on the page can be seen as a map of what Ligozzi has learned, and what he proposes to the viewer about these organisms. What is more, the intensity of this observational experience is heightened by an emphatically blank background, with the resulting visual contrast amplifying the force of the artist's visual statements.

These works should not be understood as unalloyed naturalism, but rather, as artifacts of a specific sort of visual research and visual culture. Ligozzi's works are almost like a map of the surface of the thing, rather than a portrait. For example, in his studies of animals, Ligozzi, if he did indeed work on them from live specimens—as is suggested by Adrovandi's request for a copy of a drawing due to the death of the original snake—then he would have had to deal with moving animals. In this case, his work would have been a record of what he learned about the animal's surface, made up of multiple, discrete observations—not a retinal impression of the animal observed as a whole. Does Ligozzi's approach produce a work approximating the visual experience of

reality? Or does it carefully record notes about the observed reality? I would suggest that it does some of both. Groom points out that it is worth paying attention to the style of these images, noting that they constitute more than an attempt to create a facsimile of the visual field.⁹⁹ Ligozzi's approach reveals a style of depiction that, in some cases, actually includes more detail than what one might easily observe firsthand.¹⁰⁰ He noticed things about these organisms, such as the particular rate of taper of a stem, which even a naturalist might have missed. In this way, Ligozzi teaches the viewer new ways to see, to observe, and to pay attention to non-human organisms.¹⁰¹ This careful visual attention was related to scientific developments of the era and reflected the vast desire for mastery of knowledge among people like Francesco I, or Aldrovandi.

Scholars have noted tensions between artists and the scientists who employed them, noting that scientists often had trouble getting artists to depict things in an appropriate way, whether because the artists were sub-par, or because the artists wanted to include artistic content in their images. Giuseppe Olmi, describing opposing motivations of artists and scientists, notes:

But that an artist, above all a good artist, would accept to subjugate and depersonalize themselves totally, allowing their hand to become nothing more than a mere organ of graphic reproduction of what the scientist saw, was an event that was not often realized during the course of the modern age... Often, in sum, it was not easy to find common ground between the scientist, who wanted an image of the "truth", and their painter who was naturally oriented, according to the by now traditional canon of the profession, to represent the "beautiful," to furnish a product that was aesthetically pleasurable: while the first wanted to have at their service a cold "photographer," the second only in part knew how to renounce the effort to prove their [artistic] valor.¹⁰²

In a similar vein, Groom suggests that Aldrovandi directed Ligozzi to produce images appropriate for the needs of scientific publishing, and that Ligozzi's nature studies reflect

his ability to conform to Aldrovandi's vision.¹⁰³ These ideas articulate a posture that regards "naturalism" or "empiricism" as the realm of the scientist, who is required to teach the artist. But to return to the work of Smith, she proposes that empiricism and "naturalism" were borrowed by scientists from artists and craftspeople, arguing that "naturalism" in visual representation is aligned with "moments of most intense artisanal self-assertion," and that through "naturalism" artisans demonstrate their expertise to the world.¹⁰⁴ "Naturalism," for Smith, denotes an impulse to create representations that resemble visual phenomena in the world, and also an attitude toward nature that sees nature itself as "an authority" to learn from.¹⁰⁵ She writes:

In fact, we can find in their [artisans'] works both epistemological claims – what I call the artisanal epistemology – as well as a vernacular "science" of matter. The articulation of this epistemology through naturalistic objects and paintings in turn influenced patrons and scholars in their attitudes toward nature.¹⁰⁶

The work of both Smith and Long has gone a long way toward explaining the ways in which the arts may have shaped scientific theories of knowledge in this period. It is possible, however, to delve further into ways that the arts served the "new sciences" by considering marginal, or non-scientific aspects of these works. In the twenty-first century, art and science are commonly considered separate entities, so it is easy to overlook the ways in which science is part of a larger social and emotional world. The artistic and aesthetic aspects of science help science relate to that social world. We can see the roots of this tendency in Ligozzi's work.

This is not to downplay the assertion that there was tension between scientists and artists, who had different objectives regarding nature studies and scientific illustrations. Rather, I mean to challenge the claim that scientists sought nothing more than a faithful

transcription of reality. Scientists and artists weren't collaborating in order to transcribe reality, rather, they were developing a genre with particular goals and also unique aesthetic properties. In period display practices we find an analogous example; collections of natural objects were arranged in decorative ways and some objects were modified from their natural state, such as shells, which were sometimes polished to expose their iridescent inner layers.¹⁰⁷ Heather Merla describes the deliberate and artful manner in which shells and other natural objects were displayed by collectors, giving as an example the collection of the apothecary Ferrante Imperato (c. 1525-1615?) whose collection was depicted as including specimens affixed to the ceiling in patterns. She writes of Imperato's collection: "The artful arrangement of nature allowed for its aesthetic appreciation and encouraged its contemplation."¹⁰⁸ She notes that in Francesco I's Studiolo, shells and other specimens would have been concealed and displayed by cabinets, creating a spatial and aesthetic effect.¹⁰⁹

Just as collectors carefully choreographed the display of their objects, so artists producing nature studies and botanical illustrations composed their images. The aesthetic appeal of botanical images helped to popularize scientific publications, and enhanced the market among collectors for nature studies. Elements of these works by Ligozzi, even when not consciously designed to do so, related the nature study to other artistic genres, with their own emotional and social appeal. The visual concerns of the emerging genre of still life, and the way in which still life presents everyday objects as worthy of extended contemplation, are related to the way that Ligozzi presents non-human organisms as aesthetic objects. Another genre to which this work owes a debt is that of miniature painting and illumination.

Here it may be useful to return to Ligozzi's *Daphne laureola*, to consider it in relation to miniature painting. His attention to texture results in a contrast between the silky surface of the leaves and the wiry, hair-like feeder roots of the plant. Small yellowish flowers cluster at the nodes where the leaves meet the plant's trunk. An observer familiar with the plant would be able to conjure the sweet fragrance of the flowers, which appear in late winter,¹¹⁰ when signs of fruitfulness and nature's abundance are most welcomed by those who yearn for spring. The butterfly and the plant are both lit from the left, yet only the butterfly is depicted as though casting a shadow onto the surface of the page. This trompe-l'oeil effect puts the butterfly in a different visual plane than the plant. In other words, the plant is "in" the page, while the butterfly is depicted as though it is sitting on the surface of the page.

The use of shadows cast by insects, so that they appear to crawl along the page is a familiar trompe-l'oeil strategy that crops up occasionally in nature studies from this period. The use of trompe-l'oeil by Ligozzi has been discussed primarily in relation to stories of artistic prowess of Greek artists, for example, when Aldrovandi compared him to Parrhasius at least two times: in a letter to Francesco I on Sept 27, 1577, and again in his notes on pictures to Cardinal Paleotti on August 21, 1581.¹¹¹ His use of trompe-l'oeil can, however, also be related to precedents in miniature painting. Ligozzi's relationship to miniature painting, while widely acknowledged, has been of less interest to scholars than the scientific and still life elements of his work. But Ligozzi viewed himself as a miniaturist, signing a large-scale painting depicting *Pope Boniface VIII receiving the Florentine Ambassadors* in the Salone dei Cinquecento as "Jacopo Ligozzi miniator."¹¹²

Joris Hoefnagel (1542-1601) used trompe-l'oeil extensively in his miniatures. Hoefnagel was a court painter to Rudolf II and a contemporary of Ligozzi. Similarities between their miniature works have been noted by scholars, and Bacci and Forlani speculate that Ligozzi and Hoefnagel might have met during Hoefnagel's trip to Italy.¹¹³ Works by Ligozzi and Hoefnagel share the ambiguous status of works that fall between genres.¹¹⁴ Their works are also notable for their minutely detailed execution, giving them a visual richness that sets them apart as precious objects, worthy of being collected by the rich and powerful. Exceptional examples of nature studies were collected by Holy Roman Emperor Rudolf II, including works by Jacques de Gheyn II and Hoefnagel,¹¹⁵ arguably constituting a sub-category of luxury nature studies. These works also often include cast shadows. Such luxury nature studies, made for wealthy and powerful audiences, fall somewhere between the categories of botanical illustration and the emerging genre of still life, while also sharing characteristics with miniatures from books of hours—particularly an interest in trompe-l'oeil.¹¹⁶

Hoefnagel's commitment to trompe-l'oeil effects exceeds Ligozzi's (see Figure 4 for an example of trompe-l'oeil in Hoefnagel's work). In some works, Hoefnagel even continued a painted illusion on the reverse of a page, as if a stem had pierced the page and protruded on the other side.¹¹⁷ Thomas DaCosta Kaufmann, in a chapter on Hoefnagel's use of trompe-l'oeil, situates Hoefnagel at the final point on the trajectory of that tendency in miniature painting, and also at the beginning of the genre of still life. Kaufmann, focusing on Hoefnagel's trompe-l'oeil work, looks to the so-called Ghent-Bruges books of hours as a source. These books are notable for their trompe-l'oeil marginalia, which often appear as a scattering of flowers, insects, or other objects,

painted as though they were sitting on the surface of the page. In the case of many of these objects, the painter represented them at life size, increasing the sense that these things were present in the reader's space, rather than in the fictive space of the page.¹¹⁸ Many of Ligozzi's miniatures were also painted at life size,¹¹⁹ which may have helped to create an impression of the organism's presence in front of the viewer, in addition to being a useful way of recording the organism's dimensions for research purposes. This feeling of "presence" fits well with the suggestion by Galori and Wolf that the use of the shadow under the African vipers depicted by Ligozzi for Aldrovandi was meant to improve the feeling of real presence of the departed snake.¹²⁰

Bernhardt Siegert, examining the relationship between Ghent-Bruges books of hours and still life, posits a relationship between the trompe-l'oeil objects painted in these books of hours, and the body of the reader, as the objects appear to enter the reader's space.¹²¹ This is useful when considering how Ligozzi's works functioned, and the way in which their carefully-modeled representations of plants and animals also sought a feeling of presence in real space. In the example of *Daphne laureola*, we see this in the butterfly depicted as though perched on the page, sharing the space of the viewer. This bodily relationship to the viewer is also reflected in Ligozzi's careful attention to textures—for example, in his paintings of animals whose pelts are represented by minute differentiation of their hairs, as in his *Marmot with a branch of plums*, (inv. 2007.111.121, National Gallery of Art, Washington) (Figure 5) and *Jerboa* (*Jaculus jaculus*, 1577-1587, inv. 1959 O Firenze, Gabinetto dei Disegni e Stampe degli Uffizi) (Figure 6). Rather than using a shorthand textural notation, Ligozzi paints the individual hairs of these animals. In his depiction of *Daphne laureola*, he pays similar attention to the texture of the plant's

fibrous roots and smooth leaves. Such carefully articulated textures go beyond the visual experience of a furry animal—an experience characterized by some areas receding from focus, the animal moving, and the fur massing rather than being perceived hair-by-hair—evoking a tactile sense of the softness of the creature. Again, this tactic promotes a feeling of proximity of the organism to the viewer, and of access for the viewer to the creature depicted.

The trompe-l'oeil tactics which create a sense of the organism's nearness to the viewer, combined with the way that Ligozzi's carefully articulated textures allude to the sense of touch, produce a sense of closeness to these organisms. These works propose a particular way of understanding and relating to non-human creatures, both intellectually and emotionally. The attentive depiction of texture, recalling touch, is among the characteristics that give these works an affective impact. As noted earlier, Ligozzi has been remarked to have elevated humble organisms by creating "portraits" of individual specimens.¹²² Some considered such creatures to be ill-proportioned and ugly, including fish and bats, for example, which were listed by the sculptor Vincenzo Danti (1530-1576) as unworthy of artistic attention in his *Trattato delle perfette proporzioni*.¹²³ Artists at this time also used plants and animals in images as a way to convey allegorical meanings.¹²⁴ But here Ligozzi presents such creatures in ways that make them objects of beauty and fascination in their own right. Catherine Wilson has argued that later in the seventeenth century the microscope worked in tandem with a period visual interest in intricacy and geometry to drive an aesthetic response to scientific imagery. She notes that one finds scientists writing about the beauty of formerly unaesthetic things, such as spiders eggs or the "feathers" on a fly, as seen under a microscope.¹²⁵ But the aesthetic

potential of plants and animals was being explored long before the invention of the microscope. We find it in the margins of prayer books, in still life elements and animals present in larger compositions, and in artist's nature studies, such as those by Leonardo and Albrecht Dürer. Ligozzi's work draws from those precedents, bringing their knowledge of visual communication to bear in the service of science. The result of this was something different: not a magnified image, but an image painted at scale using such minute observations and notations that the viewers themselves might feel closer to these organisms and able, for example, to discern the fuzz on the back of a butterfly.

In a small painting by Jan Brueghel the Elder (1568-1625) for Cardinal Federico Borromeo (1564-1631), a mouse is depicted alongside a stem of roses, which supports a butterfly and a caterpillar (*Mouse with roses*, inventory #72, Pinacoteca Ambrosiana, Milan) (Figure 7). Beatrijs Brenninkmeijer-de Rooij has suggested that a print by Jacob Hoefnagel after the work of his father Joris Hoefnagel was a visual source for this work.¹²⁶ It is interesting that Brueghel may have been studying a print of a work by Joris Hoefnagel (or a similar work), indicating Brueghel's interest in the visual possibilities of such luxury nature studies. Brueghel's painting mimics such work in more than just its level of detail, as the background is painted the color of parchment, with the rose and mouse casting shadows into its papery void. The subject matter—plant, animal, and insect—also relates this work to the nature studies of Hoefnagel and Ligozzi. Even the way Brueghel used oil paint in this work resembles the water-based paint used by Hoefnagel—suggesting that Brueghel may have, in fact, been looking at a miniature work when he painted it rather than a print. Though the work is painted on copper, so convincing is the impression of it being a miniature on parchment that Borromeo

described it as such in his *Musaeum* (1625).¹²⁷ He wrote: “But to show that a contest can be waged even between miniature paintings, I note that Brueghel painted on parchment a mouse with some stems of roses and insects. I wanted to call particular attention to this parchment and make it known that its value can rest on the fact that even the mice in it are enjoyable to look at.”¹²⁸ At the very least, this painting demonstrates an engagement with miniature art and nature studies through Brueghel’s use of an imitated plain parchment background. The crossover between book arts, botanical studies, and early floral still life indicates how intimately wrapped up all of these genres were in this period. Another example of artistic exchange across the boundaries of genres is the use of botanical images in the decoration of a seventeenth-century *Munich Prayer Book*, which includes images of plants copied after botanical studies by Jacques de Gheyn II.¹²⁹

Brueghel’s decision to make a mock miniature nature study demonstrates his artistic interest in the genre and its visual possibilities. Indeed, there is more evidence that the nature study was compelling to seventeenth-century artists and viewers in the work of seventeenth-century painter Girolamo Pini, who is believed to have been Tuscan,¹³⁰ and in the continuation of the production of miniatures from life for the Medici by Giovanna Garzoni. Furthermore, Borromeo’s comment about Brueghel’s mouse summarizes the way in which these works re-orient the viewer’s perspective on the organisms depicted. In a world in which a mouse can be seen as pleasant to look at, a Grand Duke collecting images of jerboas and marmots makes sense.

The visual elements of Ligozzi’s work that link it to non-scientific artistic genres were not, I think, incidental in their relationship to the culture of early-seventeenth-century science and to the impulses that drove its development. Works like Ligozzi’s

were not mere scientific records of an organism. Rather, they suggested new ways of seeing such organisms, implying new affective possibilities to viewers. Ligozzi's engagement with other genres may have unintentionally produced these visual resonances, but given the high-profile patronage of these works, and their kinship with Hoefnagel's work for the Habsburgs, I would argue that these "extra" aspects of the work are integral to its function. Indeed, these works provided a visually and emotionally compelling connection between powerful collectors and the scholars who depended upon them. In the case of botanical images, their importance to the success of scientific texts in this period is supported by the fact that illustrated books cost far more to produce than unillustrated volumes, and yet authors sought to include images in their books, despite this economic handicap.¹³¹ The artistic and cultural residue of other genres would have served to support the nascent sciences in a manner similar to that through which spolia conferred a valence of antiquity and meaning to an object or edifice.

In this paper I have considered Ligozzi's image of *Daphne laureola* with relationship to scientific visual imagery, the emerging genre of still life, and miniature work. The specificity of the image, stemming from the status of these images as nature studies from life, establishes humble organisms as worthy of scrutiny, and acknowledges the fact that there is something interesting to be learned from them. The aesthetic consideration of Ligozzi's work, stemming in part from the image's relationship to still life, and its ability to transform everyday objects into pleasing images, demonstrates the visual beauty of non-human organisms. Finally, the trompe-l'oeil tactics used in some of Ligozzi's works, in a way reminiscent of those found in Ghent-Bruges books of hours, create a sense of physical closeness to the organism depicted. All of these qualities,

combined, serve to orient the observer in relation to the organisms depicted, creating a sense of value, meaning, and enjoyment in the pursuit of natural science. These visual qualities, and their emotional and cultural associations with other genres, would have enhanced the viewer's experience of these works, and contributed to their reception by collectors and scientists. Smith and Long have written persuasively about practical contributions made by artisans to science, including the transmission of an empirical approach to understanding the world. But the "soft" aspects of scientific practice, such as affective impact, sense of meaning, and participation in a community, have been and continue to be essential, though often unacknowledged, companions to the widely-recognized "hard science" aspects of scientific disciplines. I would argue that artists also contributed to nascent scientific disciplines by bolstering the desirability and sense of meaning associated with the activity of scientific research, in part by reframing non-human organisms and their relationship to viewers through the nature study.



Figure 1. *Daphne laureola* (inv 1955 O, 67 x 46 cm, Gabinetto dei Disegni e delle Stampe degli Uffizi).



Figure 2. *Cerasti cornuti in lotta e vipera della sabbia*, 1577, inv. 1973 O, Gabinetto dei Disegni e Stampe degli Uffizi.

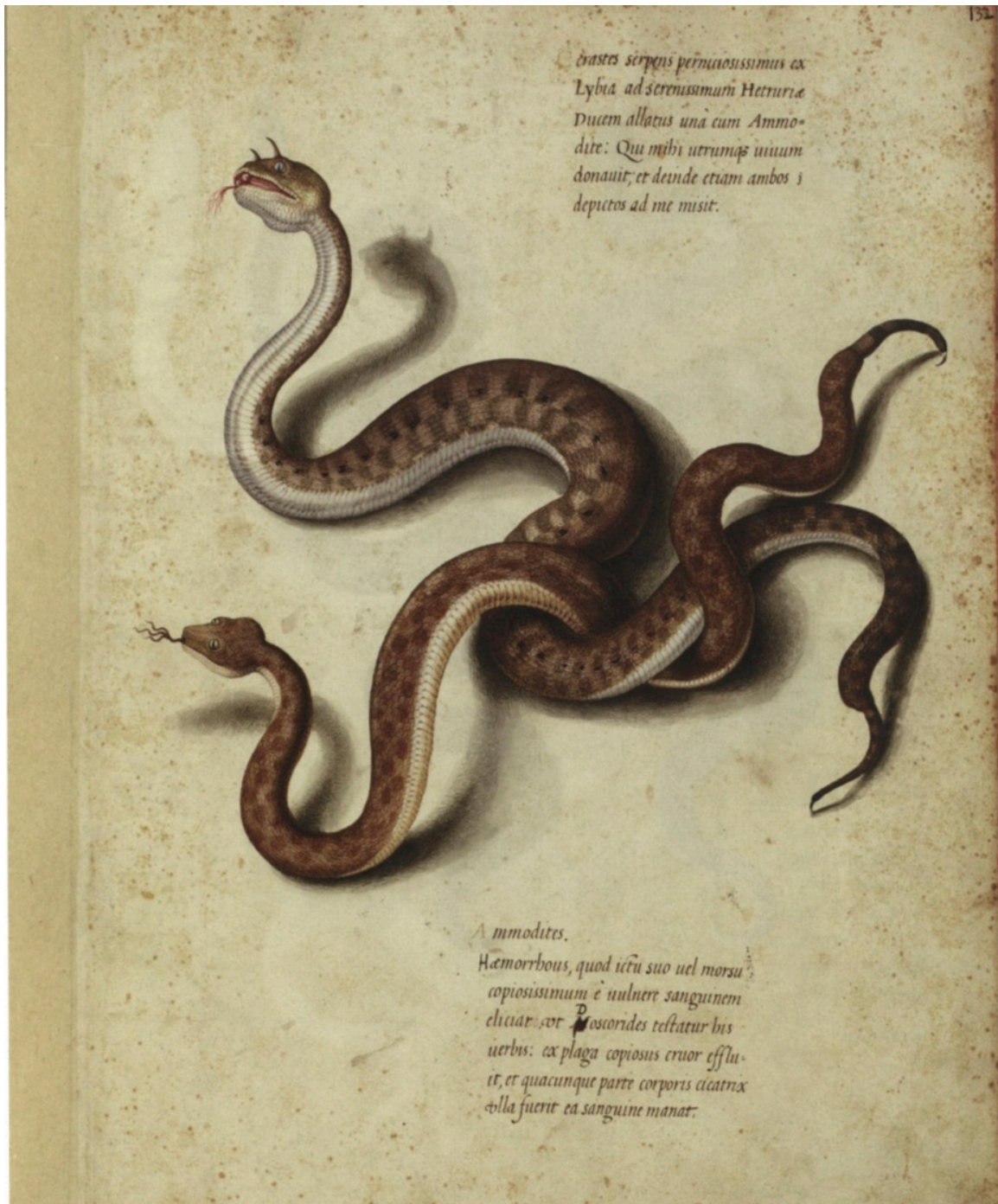


Figure 3. *Ceraste cornuto e vipera della sabbia*, 1577/1580, Bologna, Biblioteca Universitaria, ms. Aldrovandi, Tavole di Animali, vol IV, c. 132.



Figure 4. Joris Hoefnagel and Georg Bocskay, Gillyflower, Mayfly, and Snail, Bocskay's calligraphy: 1561-62, Hoefnagel's miniature work: 1591-1596, inv. Ms. 20, fol. 5, J. Paul Getty Museum, Los Angeles.



Figure 5. *Marmot with a branch of plums*, (inv. 2007.111.121, National Gallery of Art, Washington).



Figure 6. *Jerboa* (*Jaculus jaculus*, 1577-1587, inv. 1959 O Firenze, Gabinetto dei Disegni e Stampe degli Uffizi).



Figure 7. Jan Brueghel the Elder, *Mouse with roses*, 1605-11, oil on copper, 7.2 x 10.2 cm, inventory #72, Pinacoteca Ambrosiana, Milan.

¹ Michael Baxandall, "Pictures and Ideas," in *Patterns of Intention* (New Haven and London, 1989; first published 1985), 79.

² Pamela Long, *Artisan/practitioners and the Rise of the New Sciences, 1400-1600* (Corvallis, OR, 2011), 8, 94.

³ Mina Bacci and Anna Forlani Tempesti, *Mostra di Disegni di Jacopo Ligozzi: (1547-1626)* (Florence, 1961), 14; and Lucilla Conigliello, *Jacopo Ligozzi, Le vedute del Sacro Monte della Verna, i dipinti di Poppi e Bibbiena*, edited by Lucilla Conigliello (Comune di Poppi, 1992) 6, 15. Mina Bacci gives Ligozzi's birth date as 1547. Conigliello gives his birthdate as around 1550.

⁴ Conigliello, 1992, 6.

⁵ Conigliello, *Ligozzi* (Paris, 2005), 8.

⁶ *Ibid.*, 9.

⁷ Conigliello, 1992, 10. A sketch for this is in the Uffizi collection.

⁸ *Ibid.*, 12; and Fabrizio Biferali and Massimo Firpo, "Vincenzo Berdini, Jacopo Ligozzi e una stampa del 1606 teologia politica e pedagogia Cattolica," *Mitteilungen Des Kunsthistorischen Institutes in Florenz* 57 no. 2, (2015): 190-211.

⁹ Conigliello, 1992, 12.

¹⁰ Andrea di Giovanni Battista Cioli, letter to Matteo Bartolini Baldelli, May 14, 1616, Volume 4866, Folio 39, *Bia* online Medici Archive.

¹¹ On the macabre cartouches, see Mimi Cazort, "On Dissected 'putti' & Combustible Chameleons," *The Print Collector's Newsletter* 27 no. 6, (1987): 197-201. Cazort discusses the relationship between these works and the title page of Giulio Casserio's (1561-1616) 1601 anatomical study of vocal and auditory organs of the human body.

¹² Conigliello, 2005, 6.

¹³ Sergio Marinelli, "Prima e intorno a Ligozzi," in *Jacopo Ligozzi: Pittore Universalissimo*, edited by Alessandro Cecchi, Lucilla Conigliello and Marzia Faietti (Livorno, 2014), 20-25, 20.

¹⁴ Alessandro Cecchi and Lucilla Conigliello, "Cronologia/Regesto documentario," in *Jacopo Ligozzi: Pittore Universalissimo*, edited by Alessandro Cecchi, Lucilla Conigliello and Marzia Faietti (Livorno, 2014), 316-323, 317.

¹⁵ Marinelli, 2014, 20: "Ma Jacopo sarà forse anche l'artista ad assorbire per primo, e in maniera più immediata, viscerale, lo spirito del Concilio, in assoluta antitesi con gli altri artisti veneti. Di Trento, ad esempio, Jacopo conserverà per tutta la vita, inviando ancora nel 1598 offerte da Firenze, la scellerata devozione al Beato Simonino, invano apertamente contrastata dalla Repubblica Veneta e dalla Chiesa Romana stessa, pubblicamente sconfessata solo recentemente dalla Chiesa di Giovanni XXIII il più clamoroso, allora, caso di xenofobia e antisemitismo in Europa." According to Conigliello, 2005, 11-12, Ligozzi also had a predilection for depicting angels.

¹⁶ Angelica Groom, "Early modern natural science as an agent for change in naturalist painting: Jacopo Ligozzi's zoological illustrations as a case study," in *Knowing nature in early modern Europe* (London, 2015), 149; and Conigliello, 1992, 18. Conigliello mentions Ligozzi visiting a property in Baden that belonged to his uncle (also called Jacopo) who worked for the Habsburg court.

¹⁷ Lucia Tongiorgi Tomasi, *I Ritratti Di Piante Di Iacopo Ligozzi*, edited by Lucia Tongiorgi Tomasi and Sara Ferri, (Pisa, 1993), 14; Groom, 2015, 149.

¹⁸ Conigliello, 1992, 21. A dispute over payment of rent in Venice provides evidence that Ligozzi was there between his youth in Verona and Trent, and his maturity in Florence.

¹⁹ Tomasi, in Tomasi and Ferri, 1993, 12. Tomasi describes Calzolari's enterprise thus: "Nella seconda meta del XVI secolo fervono d'altra parte a Verona, importante crocevia culturale tra Lombardia, Veneto e terre germaniche, notevoli interessi naturalistici che gravitano intorno alla figura di uno dei piu rinomati speziali italiani, Francesco Calzolari, che aveva allestito, in tre locali annessi alla sua farmacia "Alla Campana d'Oro", un museo assai rinomato ed ammirato, ricco di erbe, droghe, resine, pietre, minerali, fossili e di uccelli, pesci e altri animali imbalsamati, luogo di ritrovo per numerosi scienziati e dove l'illustrazione botanica e zoologica doveva godere di ampia circolazione."

²⁰ Ibid., "me finise il mio Libro con grande istupore de ogni uno, e ha fatto alquanti pesci, e uccelli, che passa il vivo... Desidererei che Vostra Eccellentia l'avesse presso di lei che certo in questa professione è un grand' uomo." The letter was dated December 12, 1571. Translations from Italian are mine, unless noted.

²¹ Lucia Tongiorgi Tomasi, "Tutte le pitture dipinte al vivo dal signor Jacopo Ligozzi, a quali non manca se non il spirito," in *Jacopo Ligozzi: Pittore Universalissimo*, edited by Alessandro Cecchi, Lucilla Conigliello and Marzia Faietti (Livorno, 2014), 31.

²² Conigliello, 1992, 22.

²³ For a discussion of the relationship between alchemy and the renaissance botanical garden, see Tomasi, "The origins, function and role of the botanical garden in sixteenth- and seventeenth-century Italy," *Studies in the History of Gardens & Designed Landscapes* 25, no. 2, (2005): 103-115.

²⁴ Heather Merla, "Art and Nature at the Court of Francesco I de' Medici: Coral, Rock Crystal, Lapis Lazuli, and Shells," doctoral dissertation, Queen's University, Kingstown, 2018, 15.

²⁵ This is along with the botanical garden in Padua, which was founded at around the same time.

²⁶ Tomasi, in Tomasi and Ferri, 1993, 22. He visited again in 1586.

²⁷ Ligozzi and Aldrovandi, and specifically Aldrovandi's influence on Ligozzi, have been discussed by Groom and Tomasi. Tomasi, in Tomasi and Ferri, 1993, 28, gives an excerpt from a letter written by Ulisse Aldrovandi and sent to cardinal Paleotti: "Se occorrerà al pittore dipingere le piante secondo l'eta diversa — egli afferma — si come quando ella germina et esce di terra, ovvero quando ha fiori e frutti, essendo in eta perfettissima atta a generar se stessa per mezzo del suo proprio seme, la deve vedere in simile eta et imitarla, per non commettere errore. E quello dico di tutta la pianta, la medesima considerazione si deve aver in tutte le parti delle quali, insieme poste, si fra intera la pianta, come per esempio la radice, foglie, fusto, fiori e semi, frutti et altre simili parti proporzionate." Many of Ligozzi's works follow this principle, as Tomasi notes, including the roots as a standard element of the illustration, or, in the case of the valerian (*Valeriana rubra*, now known as *Centranthus ruber*, Gabinetto Disegni e Stampe degli Uffizi, inv. 1907 O) in which multiple stages of flowering are presented sequentially, illustrating the plant in a manner that integrates time into the work.

²⁸ For more on the translation of Ligozzi's work into prints, see Gallori and Wolf, "Tre serpi, tre vedove e alcune piante i disegni 'inimitabili' di Jacopo Ligozzi e le loro copie o traduzioni tra i progetti di Ulisse Aldrovandi e le pietre dure," *Mitteilungen Des*

Kunsthistorischen Institutes in Florenz 57 no. 2 (2015): 212-251; and Groom, 2015, 139-163.

²⁹ Elena Fumagalli, "Jacopo Ligozzi al servizio dei Medici, Le trasformazioni del ruolo di pittore di corte," *Mitteilungen Des Kunsthistorischen Institutes in Florenz* 57, no. 2 (2015): 158-175. Fumagalli proposes the idea that the Medici at this time turned away from painting and toward other arts.

³⁰ Mina Bacci, "Jacopo Ligozzi e la sua posizione nella pittura Fiorentina," *Proporzioni: Studi di storia dell'arte* 4 (1963): 48-49. Bacci quotes Baldinucci, who refers to Ligozzi, in Mascagni's *Vita*, as a "pittore universalissimo, e molto stimato" (very versatile painter, and highly esteemed).

³¹ Marzia Faietti, Alessandro Nova and Gerhard Wolf, "Introduzione," *Mitteilungen Des Kunsthistorischen Institutes in Florenz* 57, no. 2 (2015): 147.

³² See Gallori and Wolf, 2015, 232.

³³ See Lucilla Conigliello, "Ligozzi delle prime idee," *Paragone* 109 (2013), 3-8.

³⁴ Conigliello, 2005, 8.

³⁵ Conigliello, 1993, 24.

³⁶ Conigliello, 2015, 147.

³⁷ Faietti, Nova, and Wolf, 2015, 148. "Certamente uno dei risultati piú ragguardevoli dell'esposizione ... consiste nell'aver individuato il filo sottile che lega i dipinti religiosi e le allegorie morali di Jacopo Ligozzi alla sua produzione naturalistica."

³⁸ Groom, 2015, 139-163.

³⁹ *Ibid.*, 146. I have reservations about Groom's discussion of work executed "from life" at this time, as she seems to find it hard to square with the prevalence of copying. I find myself agreeing with those who Groom characterizes as understanding faithful copies, in this period, of works "from life" to have been assumed to share something of the authority of the original work. In addition, Groom focuses on the influence of science on art in this context, while my focus is on the benefits conferred upon the sciences through their use of the arts, with specific reference to the nature study.

⁴⁰ Conigliello, 2005, 7.

⁴¹ See Congliello, 2005, 9-10, plates 6-9, and 68-69.

⁴² *Ibid.*, 7.

⁴³ Thomas DaCosta Kaufmann, *The school of Prague. Painting at the Court of Rudolph II* (Chicago and London, 1988), 95-96. Kaufmann also notes a stylistic and genre-crossing flexibility in artists at the Habsburg court at this time. He cites Ligozzi as an example of another court artist whose work moves across genres: "Ligozzi painted highly mannered allegories on the one hand, and, on the other, scrupulously exact nature studies. And Rudolphine Prague was connected with Medici Florence; for example, Rudolph owned some of Ligozzi's nature studies."

⁴⁴ For example, consider the works of Arcimboldo, Giovanni da Udine, and the botanical studies of Leonardo. For more on observation-based Northern Italian representation, see Andrea Bayer and Mina Gregori, *Painters of Reality: The Legacy of Leonardo and Caravaggio in Lombardy*, (New York, 2004).

⁴⁵ Tomasi, in Tomasi and Ferri, 1993, 12; Conigliello, 2005, 6; Groom, 2015, 149.

⁴⁶ Conigliello, 8, 2005: "The relationship with etching was to remain a constant aspect of Ligozzi's work, in both directions. Jacopo studied and drew inspiration from engravings,

especially northern, and in several instances exact derivations can be identified.” See also Bacci, 1963, 52; Bacci suggests a German influence on Ligozzi, noting his preferred drawing technique (toned paper, very finished drawing, lights picked out in white) was used by Dürer.

⁴⁷ Faietti, Nova and Wolf, 2015, 154. They suggest he might have seen something similar to the *Carrara Herbal*.

⁴⁸ See Sachiko Kusukawa, "Leonhart Fuchs on the importance of pictures," *Journal of the History of Ideas* 58, no. 3 (1997): 403-427, for an account of Fuchs' debate with Sebastianus Montuus on this very subject. Fuchs defended the usefulness of the image, while Montuus argued for the superiority of verbal "images" to clearly impart information.

⁴⁹ *De historia stirpium comentarii insignes*.

⁵⁰ Kusukawa, 1997, 411. For more on the re-use (and attendant confusions) of botanical plates, see Bruce T. Moran, "Preserving the Cutting Edge: Traveling Woodblocks, Material Networks, and Visualizing Plants in Early Modern Europe," in *The Structures of Practical Knowledge* (Cham, 2017), 393-419.

⁵¹ *Ibid.*, translation by Kusukawa from *De historia stirpium*, by Leonhart Fuchs: "quis quaeso sanae mentis picturam contemneret, quam constat res multo clarius exprimere, quam verbis ullis, etiam eloquentissimorum, deliniari queant. Et quidem natura sic comparatum est, ut pictura omnes capiamur: adeoque altius animo insident quae in tabulis aut charta oculis exposita sunt et depicta, quam quae nudis verbis describuntur."

⁵² Richard Palmer, "Medical botany in northern Italy in the Renaissance," *Journal of the Royal Society of Medicine* 78, no. 2 (1985):153. Mattioli's reasons for not advocating the use of images were based on Dioscorides, and include the ephemerality of plants, such as the way they change appearance from season to season and place to place.

⁵³ *Ibid.*, also see Moran, 2017, 14-15. Moran discusses Giorgio Liberale, who was one of the primary artists to work on the nature studies for this volume.

⁵⁴ See Palmer, 1985, 152; Giuseppe Olmi, "'Molti amici in varij luoghi': studio della natura e rapporti epistolari nel secolo XVI," *Nuncius. Annali di storia della scienza* 6 (1991): 3-31; and Paula Findlen, "The Formation of a Scientific Community: Natural History in Sixteenth-Century Italy," in *Natural Particulars: Nature and the Disciplines in Renaissance Europe*, edited by Anthony Grafton and Nancy G. Siraisi (Cambridge, Mass., 1999), 369-400.

⁵⁵ Palmer, 1985, 152.

⁵⁶ Findlen, 1999, 378, 393-4.

⁵⁷ Daniela Bleichmar, *Visible empire: botanical expeditions and visual culture in the Hispanic Enlightenment* (Chicago and London, 2012), 56. Bleichmar notes these trends in the eighteenth century having developed into international networks linked by the exchange of texts, in the context of a botany that has been fully absorbed into the bureaucratic mechanisms of imperial control and colonization, or as she puts it, "...creating global specimens out of local nature." Although Bleichmar is writing about the Spanish colonial context in the eighteenth and nineteenth centuries, her description of the intellectual culture of botany has roots in the sixteenth century.

⁵⁸ Tomasi, in Tomasi and Ferri, 1993, 11. "Gli uomini di scienza, i semplicisti, gli speciali, i medici e tutti coloro che per la loro professione devono spesso confrontarsi col

mondo naturale incominciano infatti a rendersi conto della fondamentale importanza delle immagini, in quanto la sola descrizione verbale non è più sufficiente ad assicurare una corretta interpretazione dei fenomeni, anche perché alcuni dettagli fondamentali possono essere descritti in maniera univoca solo a livello visivo.” Also see Olmi, 1991.

⁵⁹ For example, see Claudia Swan, *The Clutius botanical watercolors: plants and flowers of the Renaissance* (New York, 1998), 101. She writes that after Clutius’s death students petitioned to keep the botanical images of Clutius’s collection for use in their learning:

“This document clearly indicates the use to which the *Libri picturati* watercolors were put; in it the students claim that Clutius’s collection comprised more than four thousand dried specimens and “six books of all sorts of herbs and flowers, painted ‘from the life,’ which serve us in the winter in lieu of the garden.”

⁶⁰ David Freedberg, *The Eye of the Lynx: Galileo, His Friends, and the Beginnings of Modern Natural History* (Chicago and London, 2002), 66: “He [Cesi] called it the Academy of the Linceans, naming it not simply after Lyncaeus, that most keen-eyed of the Argonauts, but above all after the lynx, the small, wily, and intensely sharp-eyed animal that could still occasionally be found in the hills around his Umbrian home.”

⁶¹ *Ibid.*, 152-3.

⁶² *Ibid.*, 161. Magnificently detailed images of bees seen through a microscope were presented in the *Melissographia* in an eccentric effort to curry favor with Maffeo Barberini/Pope Urban VIII.

⁶³ *Ibid.*, 153.

⁶⁴ *Ibid.*, “Plants and Reproduction,” 195-244: David Freedberg has argued convincingly that even though the *Lincei* were committed to visual knowledge and its role in scientific understanding, they eventually ran up against the problem of the limits of external form when trying to understand plants and animals, and to develop a theory of the natural world, shifting their attention instead to mechanisms of reproduction.

⁶⁵ Pamela Smith, “Artisanal Knowledge and the Representation of Nature in Sixteenth-Century Germany” in *The Art of Natural History: Illustrated Treatises and Botanical Paintings, 1400-1850*, edited by Therese O’Malley and Amy R. W. Meyers (New Haven, 2008), 16 and 18. Here I borrow Pamela Smith’s phrasing, which distinguishes “nature study” from “scientific illustration” in that “nature studies” are an act of empirical visual research conducted by the artist. An illustration, by contrast, tends to be secondary to a text, acting as a support.

⁶⁶ Tomasi, in Tomasi and Ferri, 1993, 26.

⁶⁷ *Ibid.*

⁶⁸ *Ibid.*, 28: “E infatti le essenze vegetali dipinte da Ligozzi assurgono a livello di veri e propri ‘ritratti’, connotati da una precisa ‘individualità’, a testimonianza del fatto di essere stati rigorosamente ripresi dal vero.”

⁶⁹ *Ibid.*

⁷⁰ Marzia Faietti, in Marzia Faietti and Maria Elena De Luca, *Jacopo Ligozzi: Altro Apelle*, Florence and Milan, 2014, 39: “Infatti, a mio parere, con i suoi ritratti di piante e animali Jacopo Ligozzi intese estendere il genere pittorico della ritrattistica dagli esseri umani al mondo animale e vegetale, piuttosto che limitarsi a contraffare la natura, ritraendo dal vivo animali e piante, come altri avevano fatto prima di lui. Si tratto davvero di un’operazione culturale nuova e coraggiosa, destinata ad assumere una

polivalenza di significati e a rimanere in parte ambigua e misteriosa anche rispetto ai suoi interlocutori scienziati. Fu, questa, una delle sfide raccolte da Jacopo, l'“altro Apelle”, come ebbe ancora a definirlo Aldrovandi.”

⁷¹ Smith, 2008, 15. I have presented Weiditz as the primary author of this revolution because of Smith's suggestion that Brunfels didn't actually want Weiditz as illustrator, and Brunfels' text is conventional.

⁷² Claudia Swan, “Ad vivum, naer het leven, from the life: defining a mode of representation,” *Word & Image* 11, no. 4 (1995): 360.

⁷³ See Smith, 2008, 16 and 18.

⁷⁴ Swan, 1995, 358. Swan also notes that there were many cases in which works that were demonstrably not “from life,” but rather, copies, were labeled as “from life,” illustrating the value of works “from life” and the premium placed on them.

⁷⁵ See for example Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution*, (Chicago and London, 2004); and Long, 2011.

⁷⁶ See Smith, 2008, 24.

⁷⁷ Long, 2011, 8, 94.

⁷⁸ *Ibid.*, “Art, Nature and the Culture of Empiricism,” 30-61; and Smith, 2008, 24.

⁷⁹ Gallori and Wolf, 2015, 212.

⁸⁰ *Ibid.*, 217.

⁸¹ *Ibid.*

⁸² *Ibid.*, 219: “Grazie ad esse le serpi bolognesi sembrano alzarsi dalla carta e non galleggiare in uno spazio indefinito, acquistando così volume. L'eleganza descrittiva del foglio fiorentino si è quindi trasformata in una complessa e minacciosa dinamica spaziale e percettiva create dalle due serpi, che coinvolge, pur senza impegnarlo frontalmente, lo spettatore della tavola.”

⁸³ *Ibid.*, Gallori and Wolf also note compositional differences between the Florentine original and the work sent to Aldrovandi, and interpret this as evidence that Ligozzi was exercising his artistic ingenuity with this *invenzione*.

⁸⁴ *Ibid.*, 223.

⁸⁵ *Ibid.*

⁸⁶ *Ibid.*, 220.

⁸⁷ *Ibid.*, 223.

⁸⁸ David Freedberg, “the Failure of Color,” in *Sight and Insight: Essays on Art and Culture in Honor of E. H. Gombrich at 85*, edited by John Onians, (London, 1994), 249. See also Swan, 1995, 362; and Groom, 2015, 153.

⁸⁹ Maria Francesca Alberghina, Emanuela Massa, Anna Pelagotti, Salvatore Schiavone. “I segreti dei colori” in *Jacopo Ligozzi: Pittore Universalissimo*, edited by Alessandro Cecchi, Lucilla Conigliello and Marzia Faietti (Livorno, 2014), 313.

⁹⁰ Gallori and Wolf, 2015, 250. Gallori and Wolf note that the lack of context in these images makes them easy to recontextualize, for example as designs for pietre dure.

⁹¹ Tomasi, in Tomasi and Ferri, 1993, 28.

⁹² *Ibid.*, 28: “In taluni casi Ligozzi associa alla pianta un uccello, dando forma a sapienti composizioni che, per gli elementi di accentuata corporeità e per la focalizzazione dei particolari, costituiscono quasi un “frammento di realtà”, partecipando da presso al nascente gusto per la natura morta.”

⁹³ Ibid., 22.

⁹⁴ Bacci, 1963, 60. Here she is writing about Ligozzi's painting of Saint James in the cloister of the church of Ognissanti, in Florence and Ligozzi's use of shadow.

⁹⁵ Faietti, Nova and Wolf, 2015, 150.

⁹⁶ John Variano, "Snake Eyes: Caravaggio, Ligozzi, and the 'Head of Medusa'" *Source: Notes in the History of Art* 24, no. 1 (2004): 14-17.

⁹⁷ Faietti, Nova and Wolf, 2015, 151.

⁹⁸ Ibid., 150. Also from that page: "Ciò che colpisce di più non è tanto il virtuosismo delle foglie appassite, già di per sé *frappant*, quanto la volontà da parte del Caravaggio di ricreare, pur dipingendo a olio su tela, l'effetto della tecnica particolare impiegata da Ligozzi, che preparava le sue carte con un'imprimatura a bianco di piombo."

⁹⁹ Groom, 2015, 147, 151, 158-9.

¹⁰⁰ Ibid., 158-9.

¹⁰¹ For an excellent discussion of the ways in which display of natural objects in collections can be arranged to influence the practice of seeing, see Daniela Bleichmar, "Learning to Look: Visual Expertise across Art and Science in Eighteenth-Century France," *Eighteenth-Century Studies* 46, no. 1 (2012), 87.

¹⁰² Giuseppe Olmi, in Tomasi and Ferri, 1993, 7: "Ma che un artista, soprattutto un buon artista, accettasse di sottomettersi e spersonalizzarsi totalmente, lasciasse che la sua mano diventasse null'altro che un mero organo di riproduzione grafica di ciò che lo scienziato vedeva, fu evento che non si verificò troppo di frequente nel corso dell'età moderna ... Spesso, insomma, non era facile trovare un punto di mediazione fra lo scienziato, che voleva effigiato il "vero", e il suo pittore naturalmente orientato, secondo i canoni ormai tradizionali della professione, a rappresentare il "bello", a fornire un prodotto esteticamente piacevole: mentre il primo desiderava avere al suo servizio un freddo "fotografo", il secondo solo in parte sapeva rinunciare a dar prova del proprio valore."

¹⁰³ Groom, 2015, 139-40.

¹⁰⁴ Smith, 2004, 8.

¹⁰⁵ Ibid., 9.

¹⁰⁶ Ibid., 8.

¹⁰⁷ Merla, 2018, 222-227, 235-236. For a discussion of ways that shells were cleaned, polished, and prepared for display in the eighteenth century, see Bleichmar, 2012, 94.

¹⁰⁸ Merla, 2018, 224.

¹⁰⁹ Ibid., 226.

¹¹⁰ Sara Ferri in Tomasi and Ferri, 1993, 204.

¹¹¹ Marzia Faietti, "Le sfide di Jacopo Ligozzi, Apelle del Granduca," in *Jacopo Ligozzi, "Altro Apelle"* edited by Maria Elena De Luca and Marzia Faietti (Florence and Milan, 2014), 20-21. Faietti notes that Aldrovandi also wrote in his autobiography that Ligozzi was "un altro Apelle" (another Apelles).

¹¹² Bacci, 1963, 53. Conigliello, 2005, 8.

¹¹³ Mina Bacci and Anna Forlani Tempesti, *Mostra Di Disegni Di Jacopo Ligozzi: (1547-1626)* (Florence, 1961), 22.

¹¹⁴ Kaufmann, 1988, 95-96.

¹¹⁵ Swan, 1998, 11; and on Hoefnagel: Thomas DaCosta Kaufmann, “The Sanctification of Nature” in *The Mastery of Nature: Aspects of Art, Science, and Humanism in the Renaissance*, (Princeton, 1993).

¹¹⁶ This is much like the case of Joris Hoefnagel, who is also known to have painted independent still life miniatures, which, though mentioned in archival sources, are now lost. See Kaufmann, 1993, 15-17.

¹¹⁷ Ibid.

¹¹⁸ Ibid., 19.

¹¹⁹ Tomasi, in Tomasi and Ferri, 1993, 26.

¹²⁰ Gallori and Wolf, 2015, 219 and 223.

¹²¹ Bernhard Siegert, *Cultural techniques: Grids, filters, doors, and other articulations of the real* (New York, 2015), 164-166, 178, 187. Siegert’s attention to the sensory aspects of still life and miniature imagery were also important in the development of the ideas expressed here.

¹²² Tomasi, in Tomasi and Ferri, 1993, 28; and Faietti, 2014, 39.

¹²³ Eugenio Battisti, *L’Antirinascimento: con un’appendice di manoscritti inediti* (Milan, 1962), 259. Battisti writes: “Fortunatamente, I disegnatori, specialmente fiamminghi, scelti dagli scienziati come loro illustratori, hanno assai meno scrupoli del trattatista, per altro già notevolmente aperto d’idee, e dichiarano spregiudicatamente, come Georg Hoefnagel, il quale nel suo viaggio al sud copia i costumi della Biscaglia, la solfatara di Pozzuoli, e la pesca del tonno presso Cadice: ‘Natura sola magistra.’”

¹²⁴ For example of these meanings see Gian Paolo Lomazzo, “Trattato dell’arte della pittura, scultura et architettura,” in *Gian Paolo Lomazzo, Scritti Sulle Arti Volume 2* edited by Roberto Paolo Ciardi, Florence, 1974, 396-400 and 412-415.

¹²⁵ Catherine Wilson, “Aesthetic Appreciation of Nature in Early Modern Science,” in *Vision and Its Instruments*, edited by Alina Payne (University Park, PA, 2015), 56-58.

¹²⁶ Beatrijs Brenninkmeyer-De Rooij and Rudolf E. O. Ekkart, *Roots of Seventeenth-century Flower Painting: Miniatures, Plant Books, Paintings* (Leiden, 1996), 49-50. There is not a direct correspondence between these two works, so “copy” might be a strong word. Brueghel may have been looking at a Hoefnagel print (or similar) and using it as an inspiration from which to construct his own Hoefnagel-like composition. The mouse, for one thing, is not facing the same direction as in the print. Perhaps Brueghel had access to an original miniature by Hoefnagel (or someone working in a similar mode) that is now lost, or constructed his own miniature-like scenario.

¹²⁷ Pamela Jones, in Federico Borromeo, *Sacred Painting. Museum*, edited and translated by Kenneth S. Rothwell, JR. (Cambridge, Mass. and London, 2010), note 43, p 266. A note by Pamela Jones in *Musaeum* suggests it is parchment mounted on a copper panel. However, the Ambrosiana Gallery’s website (accessed Dec 2018) lists the image as oil on copper (in agreement with Brenninkmeyer-de Rooij). Brueghel’s illusion is so convincing that it has caused some confusion in the sources as to the actual medium of this piece.

¹²⁸ Borromeo, 2010, 173: “Sed ut minutarum etiam inter se rerum pugna cernatur, fecit Bruguelus in membrana murem et rosae alabastros aliquos bestiolasque nonnullas, quam ipsam inter alias describere et designare membranam volui, ut intelligeretur eius pretium hoc ipso, quod mures etiam in ea placent.” Translation by Rothwell.

¹²⁹ Florence Hopper, “A Munich prayer book and Jacques de Gheyn II ‘Translatio—Imitatio—Aemulatio’?,” in *Nederlands Kunsthistorisch Jaarboek (NKJ)/Netherlands Yearbook for History of Art* 38 (1987): 97-109. Hopper discusses the copying of some of Jaques de Gheyn II’s natural history illustrations (from the volume in the Fondation Custodia collection, which is thought to be from the collection of Holy Roman Emperor Rudolf II) into the Prayer Book of Maximilian I Duke of Bavaria (this connection first noted by Wolfgang Muller).

¹³⁰ Lucia Tongiorgi Tomasi, *An Oak Spring Flora*, (New Haven, CT and London, 1997), 64-65.

¹³¹ Sachiko Kusukawa, *Picturing the Book of Nature* (Chicago and London, 2012), 50. Kusukawa notes the cost of production for two volumes published by mid-sixteenth-century Dutch printer Christopher Plantin, and the illustrated volume cost four times (per page) more than the unillustrated one.

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