

# Speculations on Series Through Quattrocento Dust

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If the notion of a series – mathematical, logical, rhetorical – is often imagined as a line whose path may be straight, elliptical, recursive, parabolic, or hyperbolic, then what is to be made of an indeterminate or inchoate series of floating points which, like dust particles struck by a beam of light, diffuses geometric certainty? During my investigation of the Gubbio and Urbino studioli, two small image-filled chambers with trompe-l'oeil wood inlay conceived for Duke Federico da Montefeltro in the late fifteenth century, several curious aspects regarding dust came to light.<sup>1</sup> The following notes speculate on an alignment of artisanal techniques with philosophical considerations, centered on the writings of Lucretius and reflected in works by Piero della Francesca and Leonardo da Vinci. While it is possible that these associations were simply a result of things “in the air,” a colloid of related and unrelated matters, it is striking that in each scenario dust served as a medium of transmission. Of what?

Very briefly, we visit the studioli. Many quattrocento perspectives – especially such architectonic, in-the-round compositions as Andrea Mantegna's *Camera degli Sposi* at Mantova, the *Sala dei Mesi* at Ferrara, and the Montefeltro studioli – were not composed solely according to the procedures described by Leon Battista Alberti in 1435; many works embodied commonsense methods conceived in the artisan's workshop. This would have neither surprised nor antagonized Alberti: in the first passage of *De pictura*, he borrows a Ciceronian proverb concerning the “coarse wisdom” of “*grassa Minerva*” to distinguish the sensate knowledge of a painter from a mathematician's abstract mensurations.<sup>2</sup>

For intarsists, the original *maestri di prospettiva*, Minerva's practical wisdom was keenly important. Works of wood inlay, including the studioli panels, were assembled from intricately fitted puzzle-pieces and required careful planning: an incorrect line could not be easily erased or painted over. To save time and prevent waste, a cartoon of a desired shape was often drawn on paper, glued to a wood surface and cleanly incised along its outlines by a special shoulder knife, sacrificing the drawing. Alternatively, intarsists might use the *spolvere* method and transfer the cartoon to another surface (paper, wood or wall) by pouncing carbon dust through perforated outlines in the drawing, thereby preserving the template for reuse.

Both techniques appear to have been employed in the Gubbio studiolo,<sup>3</sup> where evidence of this inherently composite, collage-like process is revealed on closer scrutiny. In the Gubbio studiolo, as Martin Kemp observes, the *mazzocchio* doesn't sit flat on the bench,<sup>4</sup> a telling detail that the illusionism in the studioli is achieved “through an aggregate of compelling motifs which lead us to assume more overall coherence than is apparent on close analysis. We are, in effect, cunningly seduced into seeing more lucidity than the designer has actually supplied.”<sup>5</sup>

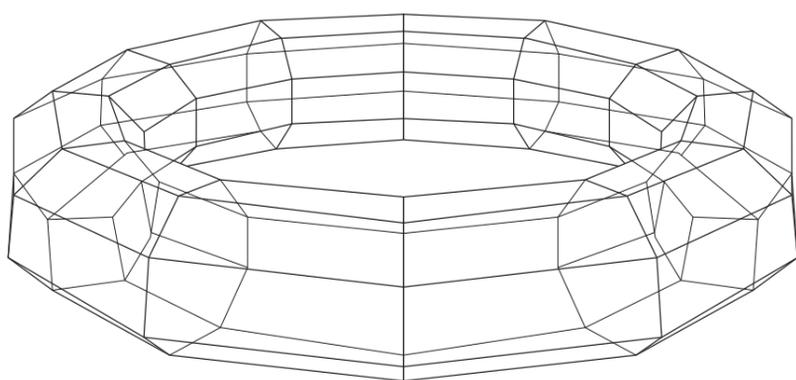


Figure 1. Diagram of a *mazzocchio* based on Piero della Francesca, from *De prospectiva pingendi*. © Robert Kirkbride 2009

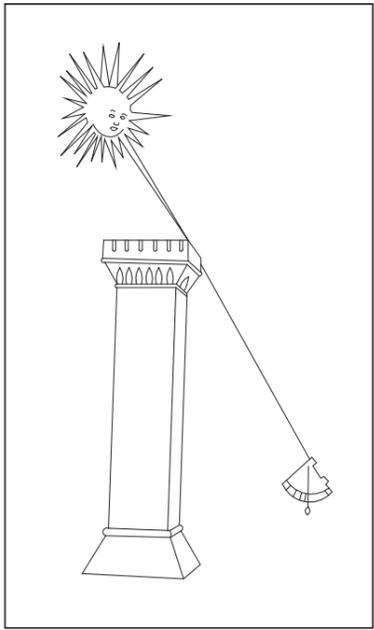


Figure 2. Alignment of the sun and a tower with a quadrant, after Francesco di Giorgio Martini, *Trattati di architettura ingegneria e arte militare*. See *Architecture and Memory: the Renaissance Studioli of Federico da Montefeltro* (Columbia University Press, 2008), from the Gutenberg-e Series: [http://www.gutenberg-e.org/kirkbride/detail/casting\\_lines.html](http://www.gutenberg-e.org/kirkbride/detail/casting_lines.html)) © Robert Kirkbride 2008

Revered for his mathematical and geometric constructions, Piero della Francesca was no stranger to the cunning wisdom acquired in a painter's studio. At the outset of *De architectura*, Vitruvius refers to the craftsman's knowledge as *sollertiae*, a term also found in the *Prohemium* of Piero's treatise on the five regular ("Platonic") solids, *De quinque corporibus regularibus*, dedicated in 1485 to Federico da Montefeltro's son, Guidobaldo.<sup>6</sup> One can envision Piero, porcupine quill in hand,<sup>7</sup> sight diminishing, patiently shepherding carbon dust from one parchment to another to transform "abstract mensurations" into numbers, solid geometry, and demonstrations of perspective.

Leonardo, illustrator of a "borrowed" version of Piero's work on the five regular solids,<sup>8</sup> employed the *spolvere* dust transfer technique to create symmetry in his anatomical drawings, by drawing an outline of one side of the body; perforating it; folding the drawing in half, vertically, along the spine; and transmitting carbon dust through the pinholes to create a matching dotted profile. In the marginal notes of one example, the so-called *Great Lady Drawing* (ca. 1510), Leonardo turns from delineating the female urinary and reproductive system to speculate on the symmetry of human sexuality. Mary Garrard comments: "Leonardo drew upon the philosophical opinion of Lucretius and the medical opinion of Galen that both female and male contribute "seed" necessary for conception... Citing the ability of a white mother mating with a black father to produce a child of mixed color, Leonardo concludes that 'the semen of the mother has power in the embryo equal to the semen of the father.'"<sup>9</sup>

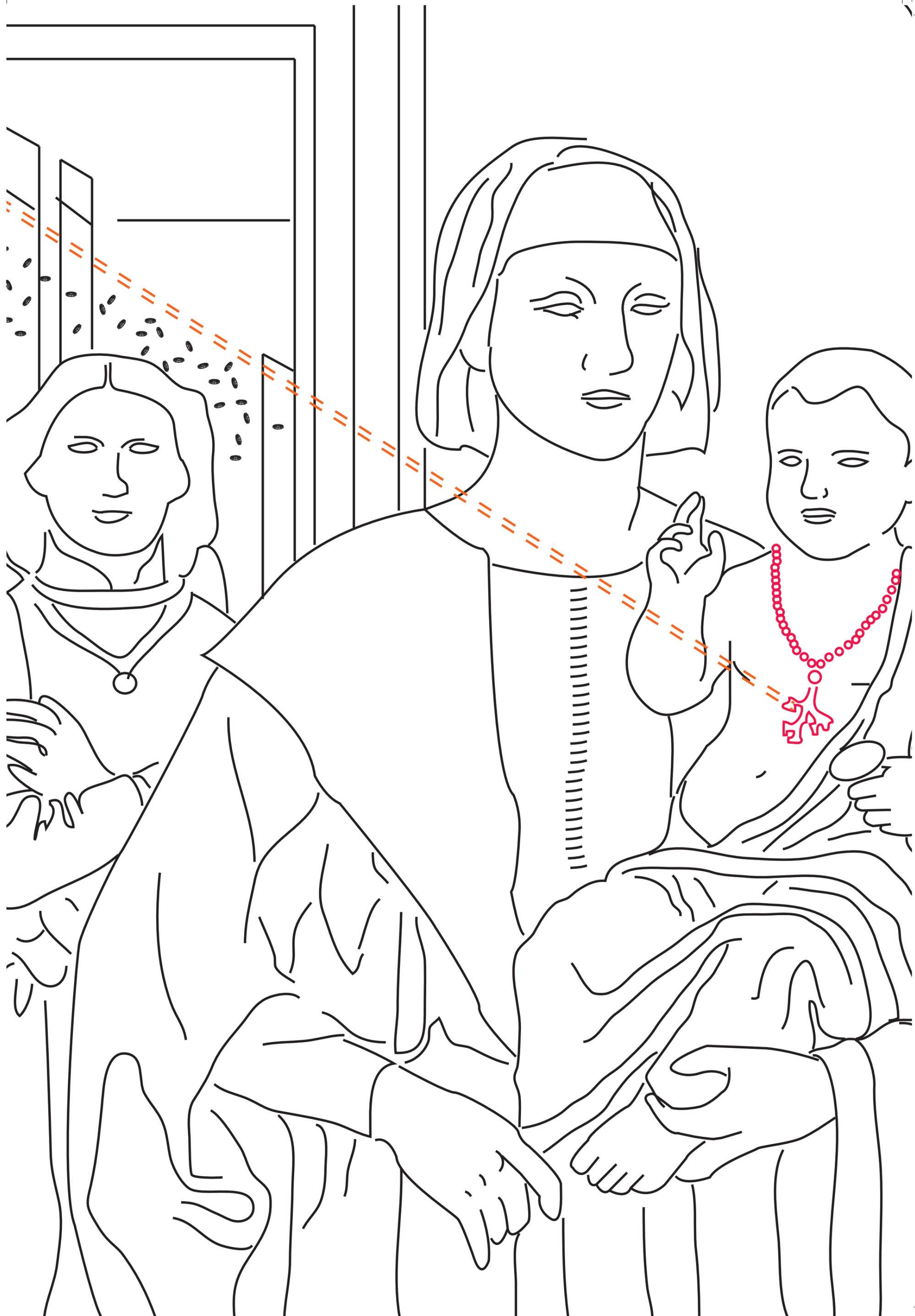
Proportions offered other forms of palpable knowledge. While divine numerical ratios informed visual and musical compositions, artists and artisans also encountered proportions tangibly, while mixing their colors. The ethereal, powdery light of Piero's skies would not exist without a skilled and deliberate mixology of pigments and mineral dusts.<sup>10</sup> The ceiling of the Gubbio studiolo was adorned according to a color scheme carefully prescribed in a notarized contract between architect Francesco di Giorgio Martini and a local artist. The colors specified – including plum, coral and chalcedony – were cited for their astrobiological benefits in Marsilio Ficino's *The Book of Life*, in which celestial bodies are compared to "eyes" that transmit the quintessence of the worldly soul to the earth by rays of light, according to Euclidean geometry.<sup>11</sup> These rays were believed to influence a person's spirit through the eye: "the effects of the heavens work especially well through a straightness of the rays and the angles."<sup>12</sup>

At the late quattrocento Urbino court, one finds several corollaries to Euclid's influence, with a pronounced Franciscan inflection. Alexander of Hales, an author cited among Montefeltro's favorites, had considered the works of Euclid as theoretical equipment to determine proportions between terrestrial and purgatorial time. Duns Scotus, whose name is inscribed in the studiolo, had applied Euclidean geometry to prove the existence of angels. Among the studiolo portraits, Scotus is near to Euclid, who is depicted with compass in hand. Downstairs in the ducal library, Piero's *De quinque corporibus regularibus* rubbed covers with another manuscript that belonged to the painter, and includes Euclid's *Optics*.<sup>13</sup> This compendium had been copied for Piero in 1458, while he was producing a fresco at the Vatican and immersed in the humanist circle of Alberti, Nicholas of Cusa and Cardinal Bessarion.

In this light, it is not entirely presumptuous to imagine these two manuscripts among a chosen few borrowed from the library by Guidobaldo and his uncle, Ottaviano degli Ubaldini, and stowed in an actual cabinet below the portraits of Scotus and Euclid. Nor is it too far afield to envision manuscript #501 – Lucretius's *De rerum natura* – in their rarified company, as an Epicurean antidote to preoccupations with the "straightness of the rays and angles." As Lucretius contends, if the universe were composed of particles traveling in unswerving parallel lines, "all things would fall downward through the deep void like drops of rain, nor could collision come to be, nor a blow brought to pass for the first-beginnings: so nature would never have brought aught to being."<sup>14</sup> In other words, if all universal flows were uniformly straight, **without meandering particles, no collisions would occur and nothing would exist.** To illustrate this model of universal structure and human existence, Lucretius highlights a commonplace experience:

look closely, whenever rays are let in and pour the sun's light through the dark places in houses: for you will see many tiny bodies mingle in many ways all through the empty space right in the light of the rays, and as though in some everlasting strife wage war and battle ... such jostlings hint that there are movements of matter too beneath them, secret and unseen.<sup>15</sup>

In Piero's *Madonna of Senigallia* (1472-74), light streams in through two windows behind the angel at the viewer's left, illuminating dust against a darkened background. Considering the presence of divine, penetrating light in Piero's earlier works,<sup>16</sup> what might the dust signify?



In the *Great Lady Drawing*, Leonardo asserts that a mother nourishes and not merely incubates the fetus with her life, food, and soul: "As one mind governs two bodies...likewise the nourishment of the food serves the child, and it is nourished from the same cause as the other members of the mother and the spirits, which are taken from the air – the common soul of the human race and other living things."<sup>17</sup> Is it possible that Piero has created a work for contemplating the secret and unseen motions and mysteries of existence, as revealed by divine rays through the "common soul" of the air? David Summers casts further light:

The notion persisted in the optical tradition that there is a generative image relation between external things and the 'images' we have of them in our eye and mind. In atomist theories of vision (Democritus, Epicurus, and Lucretius), bodies were presumed to issue eidola [source of *idea*] or simulacra (images of themselves that impressed the material medium of air) and thus to pass to and impress the eye... Given the visual angle, do the rays forming it go out from the eye (*extramission*), or do they come into it (*intramission*)? ... Plato came to be closely associated with extramission, although to the degree that he had a fully developed explanation of vision, he defended a subtler scheme according to which in daylight light from objects coalesces with 'light' issuing from the eye in the act of vision. The compendious and authoritative Euclid also assumed extramission, and Ptolemy followed. As I have said, versions of extramission were repeated into the Renaissance. Piero della Francesca, to take a significant example, described an extramissive scheme of vision as elegant as his perspective diagrams.<sup>18</sup>

Perhaps the elegance of Piero's extramission theory is that it is not exclusive to, but to a degree *coalesces with*, intramission. The celestial "eyes" transmit their beneficial and deleterious influences as beams of light according to Euclidean geometry, whereupon they collide with the rays emitted from *our* eyes, with the air between as the meeting place of souls. Rendered visible by the strong light, do the dust motes bring tidings of the "secret and unseen" movements of the world? With respect to human affairs, is truth and heavenly influence conveyed in straight, unswerving and unbending rays, or in the modulation of those rays (deflection, interruption, magnification) by the Lucretian swerve (*clinamen*)?

Were Piero and Leonardo messengers of an immaculate Epicurean philosophy? Not necessarily. Countless theoretical "collisions" had occurred in the intervening 1500 years. As one example; where Lucretius had no place in his philosophy for either immortality or fear of death – for him, all was a void before birth and after death, the transit of our lives being a fleeting instant – Piero and Leonardo were immersed in philosophical and spiritual debates that culminated in the Fifth Lateran Council of 1513, where immortality of the individual soul became church dogma.<sup>19</sup>

We return to *The Madonna of Senigallia*. In the foreground, the virgin cradles the Christ child, shown wearing the same coral necklace and pendant as depicted in the *Montefeltro* (or *Brera*) *Altarpiece*. In both works, executed shortly after Guidobaldo's birth, Federico's only legitimate son and successor is iconographically conflated with the infant Christ.<sup>20</sup> Not coincidentally, the shaft of sunlit dust aligns with the center of the Christ child's coral pendant. As a color and object, coral was commonly considered an antidote to Saturn's melancholy, an appropriate talisman for a young prince born in late January, under its humoral influence.

For the late quattrocento, clothing, jewelry, diet, architecture and its ornament were believed to equip humans with agency to counteract uncertainty and misfortune. At the beginning of his treatise on prolonging life, Ficino assured his readers: "Long life is not only a matter of what the Fates have put in store for use from the beginning, but something our diligence takes care of as well."<sup>21</sup> Niccolò Machiavelli surmised that "it may be true that fortune is the ruler of half our actions, but that she allows the other half or thereabouts to be governed by us."<sup>22</sup> Through the movement of dust motes, Lucretius transmits to the reader's imagination a model of universal order perforated by the agency of free will. For Federico, whose entire career centered on establishing the legitimacy of his rule and offspring, such a theme was of particular significance. Concerns of fate and free will also colored Guidobaldo's court. As Baldassare Castiglione soberly observed: "Fortune, often in mid-course and sometimes near the end, shatters our frail and vain designs, and sometimes wrecks them before the haven can be even seen afar."<sup>23</sup>

In the *Madonna of Senigallia*, there is further Lucretian nuance in the contrast of the "armies of dust" swirling in the background with the serene nativity at the fore. Book II of *De rerum natura* begins with the essence of the Epicurean view: "Sweet it is, when on the great sea the winds are buffeting the waters, to gaze from the land on another's great struggles; not because it is pleasure or joy that anyone should be distressed, but because it is sweet to perceive from what misfortune you yourself are free."<sup>24</sup>

Close reading of these works invites coincidences and opposites to mingle, provoking reflection on one's own predicament. As Lucretius fired the thoughts of Piero and his colleagues, so do the studioli and *The Madonna of Senigallia* fuel our own. The mechanism of the Lucretian model, the clinamen – the “swerve” of an atomic mote – has influenced a legacy of minds, more recently including Samuel Coleridge, Alfred Jarry, Marcel Duchamp, Man Ray and Georges Perec, to name only a few. For all (that may yet be) concerned, dust offers ideal, solarized transport between the innermost kernel of self and the remote reach of the imagined universe.

\*With special gratitude to Martin Kemp for discussing the dust in Piero della Francesca's *Madonna of Senigallia*. Also to Hironao Kato and Amelia Cunard, for producing diagrams of Piero's *mazzocchio* (HK), Francesco di Giorgio Martini's sketch of a tower and quadrant (AC), and Piero's *Madonna of Senigallia* (HK). A short companion monograph, *Piero's Daydream*, is available in *AIR: Alphabet City No. 15*, ed. J. Knechtel (Cambridge, MA: The MIT Press, 2010), 124-27.

<sup>1</sup> *Architecture and Memory: The Renaissance Studioli of Federico da Montefeltro* is available in print (Columbia University Press, 2008), and as an online multimedia e-book: <http://www.gutenberg-e.org/kirkbride/>

<sup>2</sup> From Cicero's *De amicitia*, 5.16. See Martin Kemp's introduction to Grayson's translation of *De pictura*. It is also worth noting that the goddess Minerva was prominently displayed alongside Apollo in an intarsiated door of the Urbino ducal palace, which leads from the duke's bedchambers to the throne room.

<sup>3</sup> Antoine Wilmering describes these techniques, *toppo* and *commesso di silio*, in *The Gubbio Studiolo and its Conservation*, Vol. II, 79.

<sup>4</sup> Martin Kemp, “Making It Work,” *The Gubbio Studiolo and Its Conservation*, Vol. I, 172. A polygonal wooden ring used in fashionable Florentine headware, a *mazzocchio* is worn by the kneeling figure (believed to be Guidobaldo da Montefeltro) in *The Goddess of Rhetoric*, composed for the Gubbio studiolo by Justus of Ghent and Pedro Berruguete.

<sup>5</sup> Martin Kemp, “Making It Work,” *The Gubbio Studiolo and Its Conservation*, Vol. I, 174.

<sup>6</sup> “*Qui non minori artis studio/ingenio/solertia/&industria fuerunt.*” See *Architecture and Memory*, extended caption 21, and chapter 5, paragraph 5. *Sollertia/sollerzia* has been translated as *diligence, technical skill, and cleverness*.

<sup>7</sup> Wild porcupine continue to roam Urbino's periphery.

<sup>8</sup> Included in *De divina proportione* (1497/1509) by Luca Pacioli, whose 1494 textbook on mathematics, the *Summa de arithmetica, geometria, proportioni et proportionalita*, sponsored by Guidobaldo da Montefeltro, was also largely borrowed from Piero.

<sup>9</sup> Mary D. Garrard, “Leonardo da Vinci: Female Portraits, Female Nature,” *The Expanding Discourse: Feminism and Art History*, 58-86. See also: Martin Kemp, *Leonardo*, 97-112; Martin Kemp, “Dissection and Divinity in Leonardo's Late Anatomies,” *Journal of the Warburg and Courtauld Institutes*, Vol. 35, 200-225.

<sup>10</sup> In the *Summa de arithmetica*, Luca Pacioli expounds on the significance of proportionality across a range of subjects, including sin and punishment, medicine and mixing colors. See Perez-Gomez, “The Glass Architecture of Fra Luca Pacioli,” *Chora 4: Intervals in the Philosophy of Architecture*, 259.

<sup>11</sup> *Architecture and Memory*, Chapter 5. In the late 1470's, Ficino dedicated several translated works of Plato and neoplatonist philosophers to Federico da Montefeltro. Across the 1480's, while composing *The Book of Life*, Ficino corresponded with Guidobaldo's tutor, Ludovico Odasio, and Urbino's court astrologer, Paul of Middleburg. The specific colors mentioned were believed to counteract deleterious saturnine influences.

<sup>12</sup> Ficino, *The Book of Life*, 3.18.145.

<sup>13</sup> Piero's *De quinque...* was listed as #286 in the *Indice Vecchio*, the oldest surviving index of the Urbino ducal library (1480's). The compendium with Euclid's *Optics* (#285) was completed on October 24, 1458 by Michele Foresio, and included Ptolemy's *Sphera*, a work on the rising and setting of stars, and the movement of planets, and Al-Khwarizmi's *Alzabra et al-muqabala*, which addresses linear and quadratic equations.

<sup>14</sup> Lucretius, *De rerum natura*, Book II, 198-224.

<sup>15</sup> Lucretius, *De rerum natura*, Book II, 116-149.

<sup>16</sup> In particular, *The Dream of Constantine*, 1466, Basilica of San Francesco, Arezzo. See also Fra Angelico's *Annunciation*, executed for the Church of San Domenico in Fiesole, circa 1430. In the late 1430's, Fra Angelico introduced Piero to leading Florentine artists and architects who were exploring methods of perspectival construction.

<sup>17</sup> The italics are the author's. Mary D. Garrard, “Leonardo da Vinci: Female Portraits, Female Nature,” *The Expanding Discourse: Feminism and Art History*, 58-86.

<sup>18</sup> David Summers, *Vision, Reflection, and Desire in Western Painting*.

<sup>19</sup> Initiated by Paul of Middleburg, the Montefeltro's former astrologer who, during the Council, proposed revision of the calendar and encouraged a colleague named Copernicus to continue his studies on the phases of the moon. Paul's treatise, *Paulina sive de recta Paschae celebratione* (1513), was one of five works John Dee copied during a visit to Urbino in the 1560's. He also copied Piero's treatise on the regular solids, and Euclid's *Elements*.

<sup>20</sup> *Architecture and Memory*, Chapter 4.3, Paragraph 53.

<sup>21</sup> Ficino, *The Book of Life*, 2.1.38.

<sup>22</sup> Machiavelli, *The Prince*, 131.

<sup>23</sup> Baldassare Castiglione, *The Book of the Courtier*, Book IV.

<sup>24</sup> Lucretius, *De rerum natura*, Book II, 1-25.