

The Means and Meanings of Dashed Lines

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The edges which form a part of the outline of a figure must be visible, hence are drawn as full lines, while the lines or edges which are invisible are always drawn dotted.

—*Architectural Drawing*, Anonymous

We touch here the most difficult point, that is, the bond between the flesh and the idea, between the visible and the interior armature which it manifests and which it conceals.

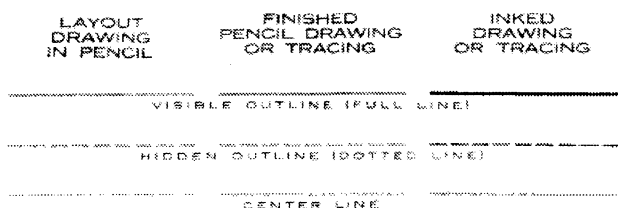
—*The Visible and the Invisible*, Maurice Merleau-Ponty

FINDING HIDDEN LINES

Use of the dashed line in architectural drawing is so ubiquitous that its significance becomes invisible. The architectural dashed line is rarely problematized and is seen merely as a transparent technical convention. But if dashed lines are mere technical notations, why is their use so consistent over long periods of time? Dashed lines are magical notations—allowing one to see the invisible, sewing together the physical and metaphysical.

During the Twentieth Century, even architectural drawing became standardized, however unsuccessfully prior to CADD. *Graphic Science*, now in its fourth edition, described the American Standards Association's "set of conventional symbols" for "all lines needed for different purposes" including three widths of drafting lines. The median was reserved for the "hidden outline (dotted line)."¹

Fig. 1. American Standards Association Alphabet of Lines.



Behind what appears to be a modern convention is a long and consistent use of dashed lines to represent particular in-betweens.

Theoretical unpacking of ordinary practices through historical analysis can reveal embedded imaginative potential. Architectural drawings are the site where theory and practice intertwine since drawing is not merely recording a known idea, but a fertile field that, when well tended, itself bodies forth a design. Drawing practices like the dashed line are consistently utilized to represent similar conditions not solely because of convention, but, it is claimed here, from the process of their making. In C. S. Peirce's terminology, the dashed line is an iconic sign based on likeness that was originally indexical, like a footprint as a sign of a human being.² This reverie will focus on Renaissance treatises to reveal the depth and role of the dashed line in the architectural imagination.

MAKING DASHED LINES

Reflection on the making of architectural dashed lines reveals that they occur simultaneously on two planes: one on the surface exhibiting a mark and the other floating above the marked surface. The pen, when "touching" the paper, visibly releases ink; when skyward, it continues its linear trajectory but at a heavenly altitude making its trace invisible, transient, and infinitely thin. In punctuation, a dash is an unvocalized physical presence indicating an omission or break in thought. Its denotative presence connotes an absence. The pen's movement above makes a transient line that is remembered by the equal but opposite movement of the pen along the paper's surface, depositing an inky trace. In executing the invisible suspended line, the hand perceives no resistance, while the visible, physical line plows a material surface, requiring a subtle change in the hand's force.³ "To Dash," according to Samuel Johnson's 1755 Dictionary, is "to fly off the surface."

For architectural dashed lines, each dash and space ought to be consistent lengths, marking a measure, a footstep of the finger. Broken lines have intentionally varying fragments that seem to presume a prior continuous line, parts of which later disappear under erasure or failure of marking. Making a broken line modifies the flow of the stroke but does not move between two planes like a dashed line.

The forward motion of the pen in a dashed line, whether above or on the surface, is roughly equaled by its movement up and down between the two realms. Dashing is primarily a vertical movement. To dash is usually a rather violent striking or puncture, a quick stroke. "Dashing" can be visually striking or spirited such as a dashing young man. The similar experience of making is proposed as the source of the continuity of deployment of dashed lines.

LOOK TO USE FOR MEANING

Drawing architectural dashed lines demands more time and care than drawing continuous lines. Why go to this additional trouble when simpler lines could be assigned to the sorts of tasks served by dashed lines? Julien Guadet, architecture professor at the Ecole des Beaux-Arts at the beginning of the Twentieth-Century whose textbook was widely influential on American students, introduced dashed lines for axes in plan. For Guadet, "the idea of the axis" was not merely a line, but "a vertical plane through the whole building separating the building into two parts.⁴ One could literally inhabit the space of this dashed line. In the Sixteenth Century, Sebastiano Serlio used dashed lines in his treatise to, among other things, indicate overhead conditions in plan drawings.

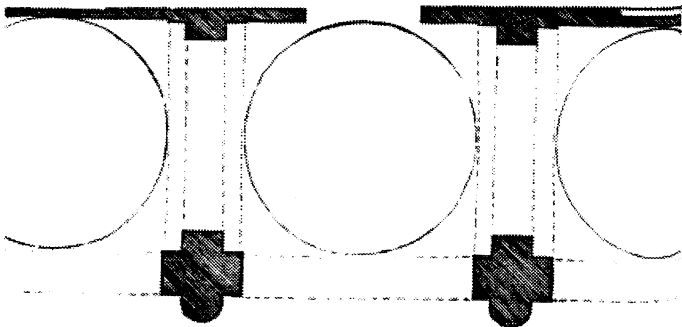


Fig. 2. Sebastiano Serlio. Plan.

As the viewer's head is over the paper looking down onto a plan, the dashed line is felt to be behind the head, suspended above. The viewer inhabits the in-between of the two sorts of lines. Whether in plan or elevation, the dashed line indicates something invisible but present: sensing something behind or above. The dashed line is also used to represent the past or future in a present drawing. Carlo Rainaldi used dashed lines to indicate plans of temporary festival structures within views of permanent civic buildings.⁵

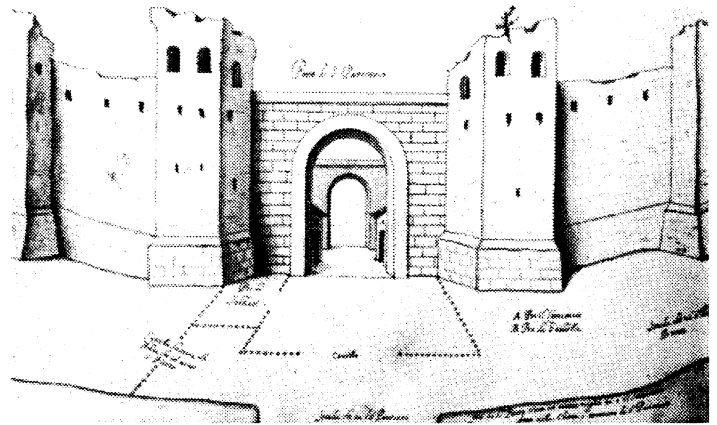


Fig. 3. Carlo Rainaldi. Porta S. Pancrazio.

For either time or space, the dashed line can reveal an absent presence of an in-between.

The predominant use of dashed lines in Serlio's treatise occur in Book One on geometry and especially Book Two on perspective. In Book Two, conceived together with Book One, Serlio provides what is probably the first theorization of dashed lines (*linee occulte*). Instances of Serlio's use of the dashed line suggests that for him it was related to geometry and most directly to perspective rather than to preexisting architectural drawing conventions.⁶ Serlio uses *linee occulte* in relation to perspective in several ways, always as representing the present but invisible.

POINTS AND LINES, PUNCTURES AND THREADS

It has been shown that geometric thought derives from physical experience in the world.⁷ A trope commonly used in Renaissance architectural treatises is the comparison between point and puncture, line and thread. Textual metaphors and drawn images convey the interconnected web of associations, simultaneously theoretical and practical. This is supported by Alberti's discussion of geometric line and point for the painter:⁸

Points and lines among painters are not as among mathematicians, where infinite points fall in a line. From our definition, a point is a mark (signum) because

the painter perceives it as if it were somehow a kind of thing between (medium quoddam) the mathematical point and a quantity which can be defined by a number, such as finite particles like atoms.

As the line was described as a thread, both Alberti and Filarete described the edge of a plane as a selvedge — the woven edge of a textile.

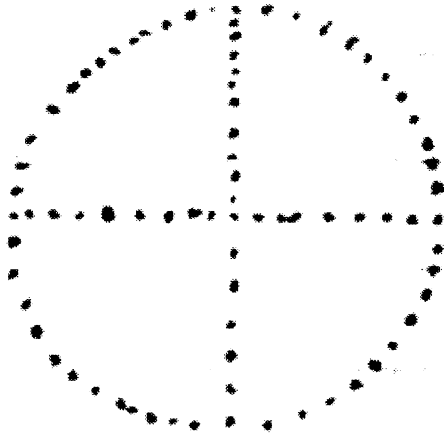
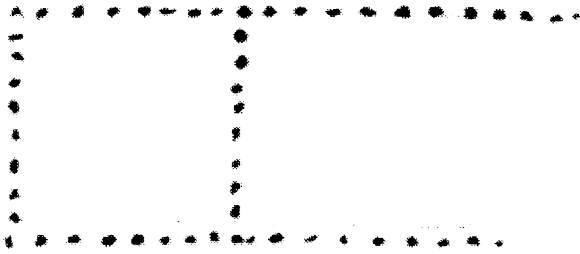


Fig. 4. Filarete. *Treatise on Architecture*.

At this time, fields like architecture, which applied mathematical knowledge to the sensual world, were considered intermediate sciences (*scientiae mediae*). For Alberti, the geometry of painting was “a fat wisdom” (*pinguiore Minerva*).⁹ While the geometric line has no thickness, the physicality of the painter’s line relies on paint as flesh to make its line.

Reflected in Serlio’s association of *linee occulte* with perspective is Alberti’s description of the invisible substance of visual rays. “Vi-

sual rays,” Alberti writes, impress “the images of things upon the senses.” “Let us imagine the rays, like extended very fine threads gathered tightly in a bunch at one end, going back together inside the eye where lies the sense of sight.”¹⁰ Threads are physically used as rays in later Renaissance books on perspective in pop-up diagrams, in perspective practices to project images on building surfaces, and even in engravings where viewers appear to hold rays represented as threads up to their eyes. The dashed line as a thread represents *species* that move between an eye and an object.

The stretching of lines over the ground to mark construction limits is an intermediate step between design and construction just as drawn lines are between design and imaginary ideas. Filarete describes this in word and image to lay out a piazza: “I first had the cords stretched according to the gridded drawing (*disegno lineato*), the square compartments having been marked out across the area of the site according to the squared-off plan.”¹¹ The drawn line and construction cord are equated through a process of translation. In ancient times, the layout of the temple was established with stretched ropes on posts to follow the invisible lines in the sky. Using conditions of construction in drawing representation is common. Nails had a similar role in perspective drawings. In the famous early perspective painting called the Baltimore panel, two rows of pin holes leading to the vanishing point probably held a string used for constructing the perspective.¹² Serlio drew and described nails in his perspective drawings. Serlio also mentions other perspective mechanisms, such as Alberti’s frame and Durer’s “pin-hole method” which use threads for lines and punctures for points. Modes of representation and means of construction are all closely intertwined in dashed lines.

TAILORING

As shown above, the trope of sewing was fundamental for Renaissance architects. The indexical origins of dashed line are embedded in tailoring procedures. The 1589 tailoring treatise by Juan de Alcega is titled *The Book of Practical Geometry*. The majority of the book consists of cutting patterns for cloaks and other clothing. The brief introduction explains that “unbroken lines show where to cut with the scissors” and “dotted lines show where there are to be extra-pieces”; in other words sewing.¹³

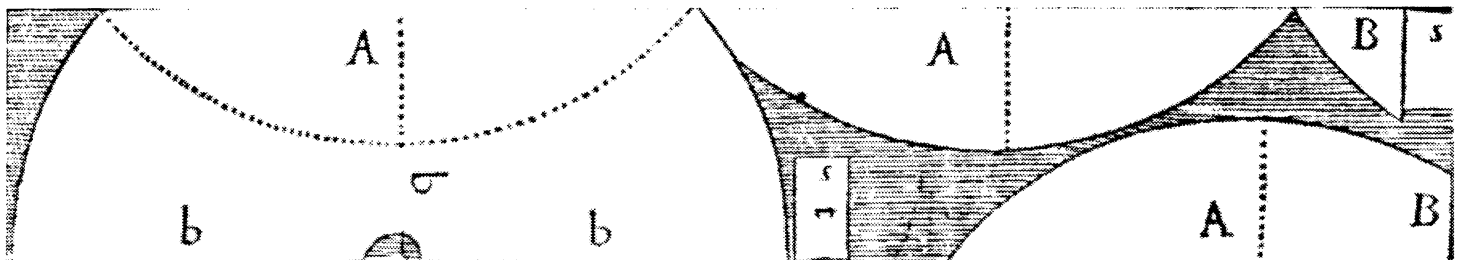


Fig. 5. *Cloak of Silk Cutting Diagram* by Juan de Alcega.

Sewing is fastening together with a thread, a suture, creating a dashed line of union. The dashed line is here a seam (from Latin “to sow”) joining two things. In early punctuation, “hyphen” was a dash written below two letters to show they belong to same word at a time when words were only beginning to appear out of the continuous line of letters with the invention of spaces. Through tailoring, the physical relation of dotted lines as punctures in skin or drawing surfaces becomes apparent. Peake’s 1611 unauthorized English translation of Serlio from Dutch defined the geometric point as “a pricke made with a Pen or Compass.”¹⁴ Movement from sewing to drawing was common as fresco designs were transferred onto building surfaces by blowing pigment through holes punched along outlines.

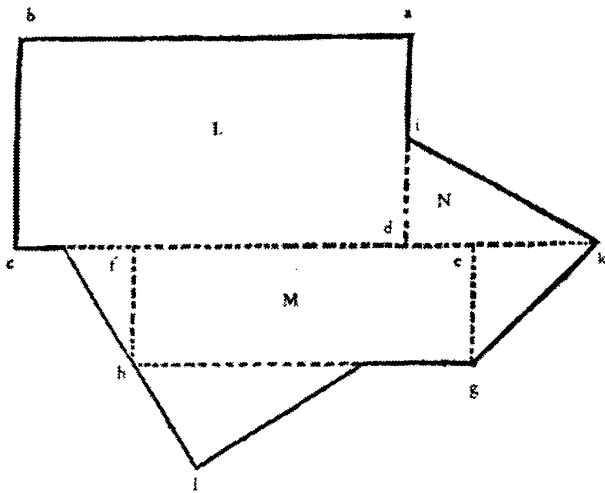


Fig. 6. Sebastiano Serlio. Diagram for dividing irregular sites.

Serlio implies awareness of his indebtedness of *linee occulte* to sewing when he refers to tailors cutting fabric after discussing dividing areas of land with *linee occulte*.

A line of points finds its material nature in “punctures.” In Spanish, *puntos* (point), is also *puntada* (sewing, stitching). The movement of the dashed line between two planes as a drawing can now be understood to represent the movement of the thread from above to below the cloth. Movement between recto and verso through a puncture makes the hidden portion of the line, that which is present but not seen, *linee occulte*. The dashing up and down movement in making a dashed line is now understood to result from the needle and thread puncturing a cloth. The support or drawing surface is revealed not as a passive receptacle, but an active participant in making the dashed line. The dashed line as sewn thread is an indexical sign where the physical activity of its making suggests its meaning.

EMANATING RAYS

In writing on perspective, Serlio theorizes the dashed line by comparing *linee occulte* to a human skeleton as a “transparent body” (*corpo trasparente*) opposed to a “solid body alive with its flesh.”¹⁵ The dashed line is present but invisible. *Linee occulte* are hidden lines shuttling between pure idea and materiality. For Serlio, the dashed line is not like the modern drawing where what is dashed changes with an observer’s viewpoint. It is a category defining the nature of the line’s existence. He describes dashed lines as a distinct entity, an essential rank of being, that cannot evolve into anything else. Serlio, a skilled woodcutter, was certainly well aware of the inversion between carving wood blocks and printing on paper. In preparing woodcuts, the material that is worked (removed) is that which in printing will remain white (unmarked).¹⁶ That Serlio would bother to theorize dashed lines in his treatise suggests they were an important part of his thinking. Like Serlio’s comparison between flesh and skeleton, the invisible present is a real category, in-between divine and mortal.

The Renaissance architectural dashed line’s significance results from its associated cultural meanings. Since it is a representational mode integrated with Renaissance cosmology and ontology, according to Peirce, it has a symbolic aspect. The neoplatonism developed by the Florentine philosopher Marsilio Ficino followed the already ancient tradition in presuming astral influences on the earth as rays emanating from celestial bodies. Renaissance magical practices were based on the belief that it was possible to attract and magnify these occult rays through particular images, materials, and even buildings. In the macrocosmos, Ficino explained the world spirit mediated between the divine heavens and the lower, earthly world. “Planets issue forth rays (*radios*) of spirit particular to each of them, and these rays are absorbed by objects in the world, natural or man-made. Thus, all we contact exposes us to planetary influence.”¹⁷ In the microcosmos, humans also participate in the spirit, which receives and is affected by celestial rays. Ficino wrote: “celestial goods pass to our soul and body down here through our spirit within us which is a mediator.”¹⁸ This *spiritus* or etheric substance allows communication between the physical body and the soul. Information from the external senses was believed to be translated into *spiritus* or phantasms (images) by the inner senses to communicate with the soul and conversely, the soul sent instructions to the body through the spirit. Ficino believed vision operated through species forming a “ray shining forth from the eye.”¹⁹ Renaissance perspective was based on similar theories. *Spiritus* was also key in the creative imagination of the artist, believed by Ficino to be the vehicle through which divine inspiration as images reach the artist. Serlio reveals his sympathy with these beliefs in comparing his planned seven books on architecture to the seven planets and identifying his fourth book on the Orders with the sun, cosmologically the middle sphere. Serlio uses radiation theory to describe his creative genius, deriving from his teacher and his patron, as a ray.

Ficino does not so much describe the physical process of radiation as assume it. The proper description of the rays was widely debated, but there was general agreement that they were somehow in-between the physical and the metaphysical as a very subtle matter or a very heavy intellect. The rays were believed to be an incorporeal substance, a fifth element or spirit. Ficino explained *spiritus* is neither purely physical nor purely mental. St. Augustine's early emanationist thought lead him to describe three kinds of vision: "one, through the eyes, by which we see the letters; a second through the spirit, by which we think of our neighbor even when he is absent; and a third through an intuition of the mind, by which we see and understand love itself." St. Augustine's intermediate spiritual vision is thus a present absence which "is not a body, and yet is something."²⁰ Roger Bacon's widely influential late medieval ray theory described spiritual rays as made up of individual points or *species*. It "possess exceedingly incomplete being" because it does not "exist of itself, but in something else."²¹ According to Bacon, *species* are corporeal but have no body and move by transforming the medium (air) through which they travel.

How emanations were imagined in the Renaissance is difficult to ascertain, but there is good evidence to suggest dashed lines were a primary representation. Species or ideas were probably imagined as points radiating in a line. Robert Fludd, a late Renaissance English polymath steeped in hermetic and alchemic thought, was keenly visual and produced widely-known treatises with fascinating figures. Fludd, like others, illustrates his emanationist concepts with conic sections or pyramids of rays. Descending from the higher to the lower is the "forma Pyramidis" and ascending is the "materia Pyramidis."²²

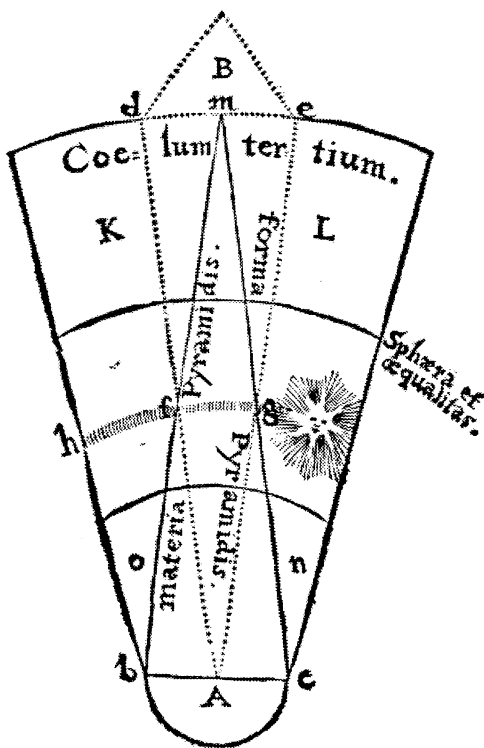


Fig. 7. Robert Fludd. *Anatomiae Amphitheatrum* (Frankfurt. 1623).

In his many images, Fludd consistently represents spiritual forms as dashed lines in contrast with material efflux as solid lines. Fludd also uses dashed lines to show the influence of the zodiac and meteorological events upon the human body, to distinguish imagination from the other inner senses, and as visual rays in a perspective machine. The prevalence of works by illustrative authors such as Fludd, utilizing dashed lines in similar yet varying ways, suggests the likelihood of educated Renaissance minds conceiving emanating *spiritus* as dashed lines.

Renaissance paintings of the Annunciation, when Virgin Mary asked Gabriel "how shall this be, seeing I know not a man," focus the problem of representation on a key Christian in-between. How can one depict divine incarnation, a miraculous penetration of the virgin's body without any physical evidence? Florentine painter Fra Filippo Lippi made dashed lines radiating down to, but not touching Mary. Each individual point was built up with gesso and a gold flake was covered by a drop of oil to make it appear much like descriptions of *species* as shimmering luminescences.²³ While some have recently found these dashed lines oddly diagrammatic in otherwise representational paintings, this analysis suggests that for the time, the radiant gold dotted lines may well have been considered mimetic of occult divine presence entirely appropriate for the scene.

THE PERSISTENCE OF DASHED LINES

In the Renaissance, the dashed line was a symbol of occult spirit; in modern times, a symbol of rays of invisible physical properties such as magnetism, x-rays, and nuclear radiation. Many sorts of emanations have been represented with dashed lines. Use of the dashed line is neither dependent upon nor reflective of, any singular world view. While put to use by late Renaissance neoplatonists, it was also taken up at the same time by Descartes to illustrate his materialistic spirits as bits of matter flowing through the body and in vision.²⁴ Similarly, dashed lines have been used to explain changing notions of electricity from Mesmer to Lord Kelvin.



Fig. 8. *Mesmerism*. Ebenezer Sibley. *A Key to Physic and the Occult Sciences*. 1814.

It is not necessarily because each of these investigators and illustrators were directly influenced by their predecessors, but that each continued to reinvent the dashed line's meaning as a present absence through the act of constructing the dashed line itself. In this way, its indexical nature was translated to an iconic and symbolic sign.

On the front page of a recent "Style" section of the *Washington Post*, a light-hearted article advocating the return of flirting in modern society was illustrated with a man and woman turning to catch each other's eye. The connection between them was illustrated with a dashed line.²⁵ Comparison with Ficino across some five centuries is startling. "Fascinations [can be] achieved by a sudden glance and very passionate loves instantly kindled by rays from the eyes, which are also fascinations of a sort."²⁶ The persistence of dashed lines in representing in-betweens is not because of conventions moving across these vast tracts of time and space. It is likely because of the indexical nature of the making of dashed lines which leads people time and again to this laborious representation. What makes the dashed line a symbol as well as an index, are the changing intellectual constructions we attach to it in the continuing struggle to understand the in-between — between physical and metaphysical — present yet invisible.

The dashed line conveys its indexical meaning neither behind an image nor by veiling it, but from within itself, simply by the manner in which it is constructed. Like the dashed line, participating in both the physical world with its inky line and in the intellectual world with its dimensionless void, understanding the dashed line as an imaginal joint between two realms may help to widen the architect's radiant wonder within architectural practice.

NOTES

¹Thomas French, Charles Vierck, *Graphic Science: Engineering Drawing. Descriptive Geometry. Graphical Solutions* (New York: McGraw-Hill, 1958) 38-39.

²Charles Sanders Peirce, "Prolegomena to an Apology for Pragmatism" *The Monist* 16 (January 1906) 492-497.

³Gaston Bachelard, "Hand vs. Matter" in *The Right to Dream*, translated by J. A. Underwood (Dallas: Dallas Institute Publications, 1982) 51-53.

⁴Julien Guadet, *Elements et Theorie de l'Architecture* (Paris: Librairie de la Construction Moderne, 1909) I, 40-41.

⁵Giovanna Curcio and Mario Manieri Elia, *Storia e uso dei modelli architettonici* (Milano: Editori Laterza, 1982) 308 - 309. Serlio also used dashed lines in his manuscript for the Seventh Book to indicate existing or past grades to contrast with his proposed or future design.

⁶The translation cited here is Sebastiano Serlio, *Sebastiano Serlio on Architecture*, translated by V. Hart and P. Hicks (New Haven: Yale University Press, 1996). There are only five uses of dashed lines in Book IV, one in Book III, and one in Book V, where they all are unmentioned in the text.

In Book I, thirteen figures include *linee occulte* and are textually introduced in the first case. In Book II, On Perspective, however, not only are *linee occulte* used most often (twenty-one images have dashed lines in the second book) but Serlio also mentions them in the text regarding fourteen illustrations and mentions *linee occulte* twice again without any corresponding drawings. For a somewhat different discussion of the visibility of *linee occulte*, see George Hersey, *Pythagorean Palaces, Magic and Architecture in the Italian Renaissance* (Ithaca: Cornell University Press) 1976, Chapter 2.

⁷Ernst Mach, *Space and Geometry in the Light of Physiological, Psychological, and Physical Inquiry* (Chicago: Open Court, 1906).

⁸Leon Battista Alberti, "De punctis et lineis apud pictores". The translation is adapted from Samuel Y. Edgerton, Jr., *The Renaissance Rediscovery of Linear Perspective* (New York: Basic Books, 1975) 81; and from Jack M. Greenstein "On Alberti's 'Sign': Vision and Composition in Quattrocento Painting" *Art Bulletin* 79 (1997) 669 - 698, 681.

⁹Leon Battista Alberti, *On Painting* (London: Penguin, 1972) I. 1.

¹⁰*Ibid.*, I. 5.

¹¹Antonio di Piero Averlino, *Filarete's Treatise on Architecture*, translated by John Spencer (New Haven: Yale University Press, 1965) 101r.

¹²Richard Krautheimer, "The Tragic and the Comic Scene of the Renaissance: The Baltimore and Urbino Panels" in *Studies in Early Christian, Medieval, and Renaissance Art* (New York: New York University Press, 1969) 345-359, 464, 346.

¹³Juan de Alcega, *Tailor's Pattern Book 1589, (Libro de Geometria y Traca, Madrid: 1589)*, translation by Jean Pain and Cecilia Bainton (Carlton, Bedford: Ruth Bean, 1979) 19.

¹⁴Robert Peake, *Sebastiano Serlio's Architecture in Five Books* (New York: Dover, 1968) I. 1.

¹⁵Sebastiano Serlio, *Sebastiano Serlio on Architecture*, translated by V. Hart and P. Hicks (New Haven: Yale University Press, 1996) 58.

¹⁶Vaughan Hart, "Serlio and the Representation of Architecture" in *Paper Palaces. The Rise of the Renaissance Architectural Treatise*, edited by Vaughan Hart with Peter Hicks (New Haven: Yale University Press, 1998) 170-186.

¹⁷Marsilio Ficino, *Three Books on Life*, translated by Carol V. Kaske and John R. Clark (Binghamton, New York: Renaissance Society of America, 1989) III. 16. 1.

¹⁸*Ibid.*, III. 3. 93.

¹⁹Marsilio Ficino quoted in Paul O. Kristeller, *The Philosophy of Marsilio Ficino*, translated by Virginia Conant (New York: Columbia University Press, 1943) 234.

²⁰St. Augustine, *The Literal Meaning of Genesis*, translated by John Taylor, (New York: Newman Press, 1982) Volume Two, XII. 6. 15.

²¹Roger Bacon, *De multiplicatione specierum*, translated by David Lindberg (Oxford: Clarendon, 1983) III. 1. 55.

²²Allen G. Debus, *Robert Fludd and His Philosophical Key. being a Transcription of the manuscript at Trinity College. Cambridge* (New York: Science History Publications, 1979) 137.

²³Leo Steinberg and Samuel Y. Edgerton, Jr., "How shall this be? Reflections on Filippo Lippi's Annunciation in London" Parts One and Two, *Artibus et Historiae* 16 (1987) 25 - 44, 45 - 53.

²⁴Rene Descartes, *The World and Other Writings. Cambridge Texts in the History of Philosophy*, edited by Stephen Gaukroger, (Cambridge: Cambridge University Press, 1998).

²⁵*The Washington Post*, Tuesday, June 6, 2000, C.1.

²⁶Marsilio Ficino, *Three Books on Life*, III. 16. 57.