PERSPECTIVE *SHIFT*

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> "We want the Exact & the Vast [;] we want our Dreams and our Mathematics…" [1]
> *- Ralph Waldo Emerson*

Mathematical and technological advances are inscribed in and by architectural drawings. The effects of these advances have consequences for architecture as well, not least because of the shifts they produce in architectural representation.[2] The cultural relativity of this approach, following Erwin Panofsky's famous exegesis, *Perspective as a Symbolic Form* (*Die Perspektive als 'symbolische Form,'* 1924-25)[3] suggests that each historical period might have its own particular "symbolic form," reflecting a particular *Weltanschauung,* or worldview. This is based on an idea that the work of art is a kind of cultural product, from which the initial conditions of its cultural history can be derived.[4] Panofsky offers analyses of artworks to accompany his articulation of the function of perspective as an expressive apparatus corresponding to the symbolic element fundamental to the form: from a "second style" fresco in Boscoreale, first century A.D., to a 16th century study by Albrecht Altdorfer for the *Birth of the Virgin*, in Munich, 1520.[5] In the following, I examine a shorter and more recent history, drawing parallels between painting and architectural representation, and their attendant techniques. Following Panosky, I focus on the technique of perspective, first in Renaissance paintings, and then in the context of computation and digital techniques. I do not call for an end to perspective but for a perspective shift that will engender the representation of new content.

TECHNIQUE

Notwithstanding the fact that time has recast the terms and their associated expectations, Panofsky's description of perspective must be acknowledged as oracular: "…we shall speak of a fully 'perspectival' view of space … only when the entire picture has been transformed… into a 'window,' and when we are meant to believe we are looking through this window into a space."[6] Whether the "window" is a photographic, telescopic or microscopic lens, a cinematic screen, a digital monitor or a software interface, Panofsky's definition neatly categorizes all these as perspectival. Architectural perspectives are no exception. Though some argue that it was predicated on the rejection of perspective, modernism did not entirely disturb its reign. [7] Ultimately, the most powerful expressions of modern art engaged perspective, maintaining its fundamental aesthetic function even as they used formal abstraction to provoke larger themes related to the imitation and representation of nature. Similarly, as William Mitchell realized, the "fully rational - that is, infinite, unchanging and homogeneous space" of the perspectival view is the foundational mathematical space of all digital representations.[8] To recognize this parallel, and to draw the conclusions suggested from the juxtaposition of Panofsky and Mitchell, is to necessarily inquire after the shift generated by the technological innovation of automated mathematical computation to the "symbolic form" : perspective. Has there been a shift? If so, what are its implications in the realm of cultural production? Perhaps to perceive a shift, we must

also alter our position, to shift perspective from a focus on the view of form itself, to a temporally-extended view of the representation of its process of formation, or on the behavior and effects of its constituent surfaces, extending ourselves to engage the space of our own perception.

Panofsky saw the construction of perspectival space as "a translation of psycho-physiological space into mathematical space; in other words, an objectification of the subjective…. this formula also suggests that as soon as perspective ceased to be a technical and mathematical problem, it was bound to become all that much more of an artistic problem."[9] Appearances are subjective, impermanent. Their representation depends on the point of view of the observer, and on her technological instruments. As Leo Steinberg commented, "…representation is not a matter of mechanical reproduction, but of progressive revelation."[10] As we learn from photography, the same instrument and the same observer, even when framed by the same set of rules, produces different representations. If we think that computation has solved the technical and mathematical problem of perspective representation, this should remind us that nonetheless, the artistic one persists.

Figure 1: Fra Angelico, *Annunciation,* 1439-1443.

"Stylistic 'progress,' that is, each discovery of new artistic values," Panofsky says, "must first be purchased with a partial abandonment of what ever has already been achieved. Further development, then, customarily aims at taking up anew (and from new points of view) that which was rejected in the initial onslaught, and making it useful to the altered artistic purposes."[11] With regard to the progress of architectural representation using digital media, the phase of the initial onslaught should now come to an end. Once abandoned, perspective, parallel projection, and their attendant techniques, can be taken up anew and made "useful to our altered artistic purposes." The cultural implications of digital media as a "symbolic form" are broad and productive for architecture. Without eschewing its fundamental role as representation, it can invigorate spatial and narrative expressions that challenge the condition of the absent subject,[12] and generate new formal expressions.

In the Renaissance, the "re-discovery" of perspective stimulated new possibilities for visionary and spiritual narrative expression in religious art. For example, the exaltation of the soul, the Holy Spirit or heavenly space could be made tangible to the viewer. In Raphael's *Disputa* (1510-1511), for example, the viewpoint is set at a position much higher than the viewer's actual eye level relative to the painting. This has the effect of elevating the viewer, symbolically raising them above the mortal plane. In explanations of *Disputa* which describe its use of geometry and proportion to code a theological meaning, this marginal distortion is called *da sotto in su* perspective. The elevated viewpoint disembodies the eye, creating a sense of transcendence in the viewer which makes a heavenly vision tangible. This distortion does not compromise the constructed perspectival depth of the painting but is clearly in excess of the function of depth illusion. In *The Psychology of Perspective and Renaissance Art*, Micheal Kubovy examines instances when Renaissance artists put perspective to use beyond "crass illusionism." Supporting Panofsky's sense of perspective as a symbolic form he concludes: "…perspective often enabled the Renaissance artist to cast the deeply religious contents of his art in a form that could produce in the viewer spiritual effects that could not be achieved by any other formal means." [13]

Paintings from the fecund period around the publication of Alberti's *De Pictura* (c. 1435) illustrate a full range of perspective techniques, with rich spatial and narrative expressions. Examples of these excess strategies of perspective, especially those that were related to depictions of architectural space, articulate some of the considerations of a newly emergent *artistic* problem of perspective as identified by Panofsky. In the fresco *Annunciation* [Figure 1] in the Convent of San Marco, Florence, the position of the viewpoint in relation to the viewer's (the "subject's") actual position in the chapel cloister are spatially equivalent. The architectural character of the scene depicted in the perspective is the same as an actual architectural perspectival view: architectural elements, like the columns and the vaults, are present in both the depiction and in the actual space that the painting occupies. The subject's alignment with the vanishing point of the perspective view is possible and subtley, but powerfully, encouraged. Contributing to this positioning of the subject, perceptual effects such as light and shadow act on both the painting and the wall on which the fresco is painted in the same way, introducing a deliberate correspondence between real space and the space of the painting. The geometric harmony and classical ideals presented a compelling model for society; the didactic function of perspective working in the service of this narrative, or *istoria, in* Alberti's terms, should not be overlooked.

Kubovy concludes that "Perspective was far from being an inflexible system and was subordinated to perception… Alberti's window cannot do justice to the subtleties and complexities of Renaissance perspective."[14] Recognition of the role of perception and physiognomy is palpable in the work of Andrea Mantegna. The frescoes he painted for the Ovetari Chapel, Ermitani Church, Padua (1451-55) and those in the Ducal Palace in Mantua (1474) are virtuoso achievements. In them, the position of the viewer relative to the picture is anticipated and manipulated in different ways to achieve a vivid experience of three-dimensionality that Kubovy likens to stereopsis. Here, the physical surface impacts the viewer's spatial perception at a maximum. Understanding that the perception of the actual two-dimensional surface is at odds with the success of three-dimensional illusion depicted on it, Mantegna uses the picture content to undermine the surface entirely. At the Ducal Palace, he paints an open oculus in the ceiling and the elements one would see through it, including the sky, clouds, birds, cherubs, and saints. Cherubs cling to the slim ledge or stick their heads through the linked-ring motif of the oculus wall, a motif corresponding to the architecture in the room below. The coûp de grace, however, is a potted plant that is drawn teetering on the edge of the "open precipice," so convincingly menacing, that Mantegna was obliged to paint a supporting bracket lest the falling pot hurt someone below.[15]

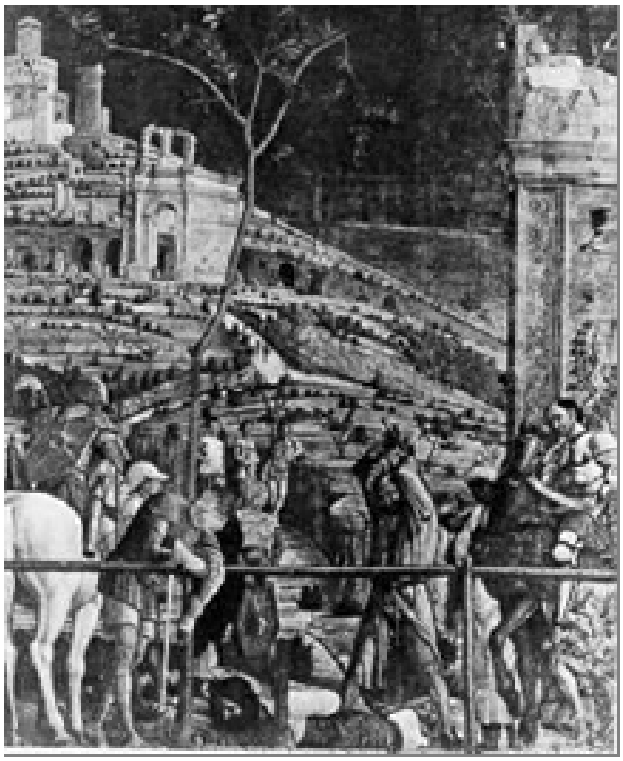

Figure 2: Andrea Mantegna, *Martyrdom of St.James*, 1451-55.

Similarly, in the Ovetari Chapel fresco, *Martyrdom of St. James*, [Figure 2] a soldier leans over the painted railing at the lower edge of the picture, looking at the actual floor of the chapel where, when the raised sword pictured falls, Saint James' head will most certainly roll. Few perspectival views demonstrate so well the technique to register the ambiguities Panofsky draws out in his text:

> For perspective is by nature a two-edged sword: it creates room for bodies to expand plastically and move gesturally, and yet at the same time it enables light to spread out in space and in a painterly way dissolve the bodies. At the same time that it subjects the artistic phenomena to mathematically exact rules, it simultaneously makes that phenomena

> contingent on human subjectivity: the psychological and physical conditions of the visual impression determined by the point of view. It is as much a consolidation and systematization of the external world, as an extension of the domain of the self. [16]

While most evaluations of the effects of computation emphasize the imposition of mathematics on artistic intuition, human volition and agency, Panofsky reminds us that as perspective subjects the artistic phenomena to mathematically exact rules; it simultaneously makes it contigent on human subjectivity—creating an extension of the domain of the self as it systematizes the external world. The parallels I have drawn between the effects of perspective and the effects of computation make Panofsky's conclusions equally instructive today. From this perspective, computation has the effect of increasing, rather than decreasing, the power of human agency over the creation and control of architectural representations and ideations.

Transcendent Technique

"Reflection, luster, refraction, luminosity, darkness…these are the properties that jeopardize perceptions of metric uniformity." [17] Certainly, these effects are responsible for the negative characterization of many contemporary architectural representations. These effects foster the loss of metric uniformity, even the capacity for clear measure and the sense of scale traditionally regarded as fundamental to architectural representation. However, these effects do not originate in computation. Though they are perceptual effects, their techniques of representation in photography are properly categorized as indexical -- direct results of the physical transformation of material by light. Digital techniques that produce "hypereal" imagery and "unreal" or disorienting lighting effects do nothing more than absorb previous shifts that were produced by an earlier technology, photography. Clearly, the art and science of photography has produced its own "symbolic form." These adaptations of photographic techniques were perhaps an unavoidable and necessary phase; however, they are misdirected, because the camera is an indexical apparatus, while the computer is not.

Similarly, the valorization of flatness that is manifest due to the surface nature of screen technologies is absorption of the "symbolic form" and the techniques of yet another type of visualisation: maps. [18] The image operates, not as a simulation of three-dimensional space, but as an *information-interface*: "…the intended function of the image had something to do with the kind of knowledge or information it conveyed and the kind of accuracy that was desirable. [19] The eye travels from object to object, rather than fixing on the static vanishing point of a perspectival construction. In digital representations, the increased flatness of the image promotes efficient navigation to linked or embedded databases such as information on building materials and conventions of construction. This is a bit different from the forensic antecedents of orthographic projections, the "cuts" of plans, sections and elevations that grew out of parallel advances in medicine fostered by techniques of dissection. In navigation-based, information-interfaces, nothing is ever discovered or revealed; all the entities in the drawing exist before they are assembled as part of the representation- created as symbols for existing quantitative and qualitative information.

As is clear from the history of perspective, a preoccupation with technique is a necessary phase before any meaningful shift can occur. Because of its basis in computation and its capacity to reduce both indexical and navigational techniques from other systems of visualization to mathematics, this has been a dominant focus. If a perspective shift is possible, it requires techniques that are drawn from computation itself and not from other media, and do not replicate techniques from other visual systems. In his meditations on the relationship between drawing and architecture, Robin Evans maintains that for the accomplishments of art to transcend intentions, technique must also; in works of art, technique must be more than an obedient instrument, otherwise there is no point in venturing further than intentions. Through a close analysis of drawings, paintings and architecture, Evans demonstrates several ways this is possible.[20] Evans' consideration of the uses of Alberti's technique finds other resonances with parallel projection: tectonic properties of axial organization and bilateral symmetry fostered by the powerful character of central line perpendicular to the picture plane, "the prince of rays." A comparison of Raphael's painting, *The School of Athens* (1511) and his project for Pope Clement VII, the Villa Madama on Monte Mario in Rome (1517-1521?) demonstrates the "eminently perspectival" character of both, suggesting that the technique used, perspec-

tive for the painting and parallel projection for the architecture, was less determinant than the *desire for pictorial depth*. [21] In this, and in the example of Alberti's own work, the façade of Sant'Andrea, Mantua, the techniques used for implying depth in drawings are used in buildings as well. The interaction between the illusion of depth and the actual perception of the three- dimensionality of the building gives rise to an unexpected "flutter" between the real and the imaginary. In the Renaissance and through most of the 19th century, the concordance between the architectural intentions and the drawing techniques used to achieve them was a strong "consolidating force." Ultimately, it is the unexpected results of their interplay that give rise to transformations in technique *and* in form, thus unhinging them a bit from each other.

Evans describes the transcendence possible when imagination and technique work together, and enlarge each other. The ingenious manner in which parallel projection is used in the design of the dome of the Royal Chapel at Anet is proof that drawing expands beyond the reach of unaided imagination. He is talking about technique in the hands of Philibert de l'Orme, the architect son of a master mason, with "a very strong presentiment of the sense within forms, and a penetrating ability to visualize spatial relations," but, he could be talking about anyone today who has harnessed these same traits using digital tools:

> This, then, was architectural drawing is in a new mode, more abstract in appearance, more penetrating in effect, capable of more unsettling, less predictable interaction with the conventional inventory of forms of which monumental buildings are normally composed, destructive also of metric proportionality…and suggestive of a perverse epistemology in which ideas are not put into things by art, but released from them. [22]

"A new mode" of architectural drawing is manifest as a result of digital techniques, especially those based on parametric models that engender stochastic simulations of dynamic processes and behaviors. Its effects have been unsettling, unpredictable, unconventional, and destructive of metric proportionality. This "drawing" is considered here as a perspectival representation of a three-dimensional construct that may be viewed instantaneously from multiple points of view. As such, it is subject to the unconscious compositional biases that we bring to it with our way of seeing.

Figure 3: Laura Lo, Course work for Visual Studies, 2010. Coordinator, Veikos, Instructor, Freese

Drawing in a New Mode

The automation of computation and the evolution of parameteric software that allows for infinite iterations of fully-associative models make possible a control of form based on properties of other forms or on randomly -or recursively-applied sets of rules. There is rigor and reason, but the possibility also, to move forward without a sense of direction. Intentions are deliberately held at bay. It is obviously defendable, in light of these developments, to posit digital technology as the final phase of a complete "scientification" of architectural practice, as Perez-Gomez concludes. Indeed, until recently, an anti-representational stance with scientific affectations rather than artistic intentions accompanied its production; conceiving the image as interface to data organized by sets of rules rather than as a representation of something already imagined or existing. However, recent work produced using these techniques belies allegiance to more humanist considerations. Beauty, elegance, and a near-romantic sensibility toward light and color emerge, and in the drawings, a kind of longing for the precise registration of the crisp line in space. [Figures 3, 4, 5]

"Artistic products are not statements by subjects, but formulations of material, not events, but results."[23] Like the rational and intuitive forces at work in the creative process, "dreams and the mathematics" should be combined in such a way to produce enhanced results. To set a dichotomy between technology and human desire is to force a choice between these two orders of representation and to miss an opportunity for discovery. How can the evolving drawing propagate its own agenda analogous to the spatial narratives and subjectivity demonstrated by the various uses of perspective presented here?

An analysis of contemporary digital representations suggests an agenda of at least two broad overlap-

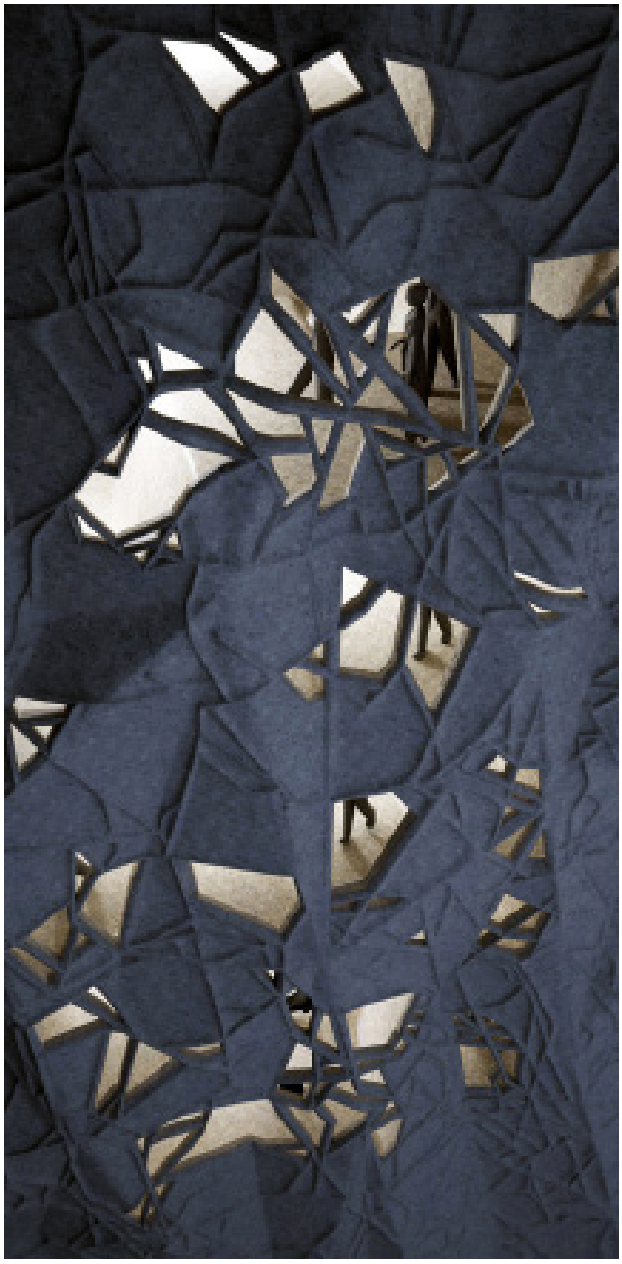

Figure 4: Fleet Hower, Course work for Veikos Design Studio, 2010

ping trajectories that result from a perspective shift. The trajectories are diagnostic, as all cultural histories aim to be: the first trajectory develops the representation of temporal content, such as the integration and complex interaction of forms in transition; the second elaborates on the extension of the subject into the space of the representation, immersive effects and the representation of atmospheres. Both trajectories address fundamental issues of drawing: orthographic and perspectival constructions and their conventions, relations of line, plane and volume, themes of light, shadow, color, composition, material and motion. There are crises of notation and frustrations with the saturation of information and the abundance of techniques. But there are surprises, unexpected results and discoveries as well.

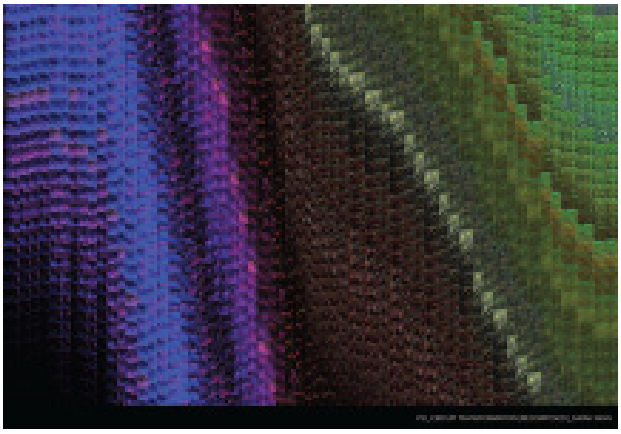

Figure 5: Sarah Wan, Course work for Visual Studies, 2010. Coordinator, Veikos, Instructor, Lucia

A focus on part-to-whole relationships characterizes the first trajectory. In this drawing construct, sets of dynamic relationships structure the elements of the drawing, rather than the geometrical entities (points, lines, planes/surfaces and volumes) themselves. The constructional hierarchy of the constituent elements is eliminated, as each can be construed as the foundational unit of an assembly and be given qualitative and behavioral properties. A change to the descriptive properties of the elements, for example, to the dimension of a foundational unit, or to the degree of its "attraction" to other elements in the construct, results in a transformation of all related elements. These provocations to static form can be termed "generative formal transformations." In practice, they become the basis for a series of procedural experiments: qualitative and quantitative values, such as accessibility, "openness" or maximum spatial occupancy, can be assigned to elements that are parametrically related. These generate geometries that combine these "information-loaded" forms through addition, difference or intersection. Dynamic morphologies simulate visual and corporeal spatial conditions and help to visualize and evaluate potential programmatic and aesthetic formal relationships.

These relationships are then manifest materially, sometimes directly, (CNC or 3D print) or through a manual virtual-to-material transformation. The latter method, in which the physical material and the contingencies of construction offer some resistance, enriches the transformation and suggests architectural inquiries that are not readily apparent in the direct digital translations. This implies that the perceptual mediation of the perspectival view is indispensable to a successful spatial exploration using these methods.

The second trajectory, which often overlaps with the first, desires an assimilation of the observer with the drawing. One strategy for the immersion of the subject is to capture ephemeral perceptual phenomena, and to associate these qualitative effects with the "generative formal transformations." Time-based operations, such as repetition, aggregation, difference, or erasure find expression in the invention of drawings that correlate the visual and the intangible. In this way, they resonate with the ineffable qualities we somehow perceive in the perspectival constructions of the Renaissance. Whether guided with pre-conceived intentionality, or conversely, the result of incremental decisions based on aesthetic preferences, these precise, mathematical transformations engender synthetic readings that move beyond the mimetic constructions of earlier digital representations and towards the evocation of particular atmospheres, or moods.

Reflecting on these two trajectories, we may conclude that the character of visual communication has completely changed; the metaphorical or symbolic codes evidenced in Renaissance paintings have been replaced by the direct and un-nuanced communication of mathematics, of geometrical forms embodied with data. But, their capacity to alter our perception, to *move* us, is, perhaps, not lost. "Our mathematics," and "our dreams," to paraphrase Emerson, are contingent on each other. While the techniques are mathematically exact, what the techniques produce continues to be represented through the technique of perspective, and as a result, is evaluated, judged and altered as a direct consequence of human perception. For Panofsky, the mathematical space invented by the technique of perspective would always be a "psycho-physiological space, and therefore, a space of "progressive revelation" rather than "mechanical reproduction." As we begin to recognize the validity of this statement, and change our position relative to the mathematical didacticism and perceived "automation" of the digital drawing, it will become increasingly clear that information, too, has its role as a perceptual effect.

ENDNOTES

1 A. W. Plumstead and Harrison Hayford, *The Journals and miscellaneous notebooks of Ralph Waldo Emerson,* (Cambridge, Mass.: Harvard University Press, 1969), 228.

2 I will not attempt to argue here the impact of architectural representation on architecture. Robin Evans' formidable work, *The Projective Cast: Architecture and its Three Geometries,* (Cambridge, Mass.: MIT Press 1995) considers the uses of perspective, parallel projection, stereonomy, descriptive and synthetic geometry in the enormously generative role played by drawing in the development of architectural form; also, Alberto Perez-Gomez demonstrates compellingly how the change in the meaning of geometry and number in the 17th and 18th centuries is linked to the identification of theory with process and discusses the results of this convergence for architecture. Alberto Perez-Gomez, *Architecture and the Crisis of Modern Science,* (Cambridge, Mass: MIT Press, 1983), 227- 303; See also, Perez-Gomez & Louise Pelletier, *Architectural Representation and the Perspective Hinge,* (Cambridge, Mass.: MIT Press, 1997).

3 Erwin Panofsky, *Perspective as a Symbolic Form,* trans. Christopher Wood, (New York: Zone Books, 1991). Almost every serious study of perspective considers Panofsky's essay; interpretations and critiques constitute schools of thought both within and beyond the field of art history, including visual studies, cultural theory, and architectural theory. Most helpful in the context of this essay are, Hubert Damisch, *The Origin of Perspective,* (Cambridge, MA: MIT Press, 1994); James Elkins, *The Poetics of Perspective*, (Ithaca and London: Cornell University Press, 1994); Michael Ann Holly, *Panofsky and the Foundations of Art History,* (Ithaca: Cornell University Press, 1984); Michael Kubovy, *The Psychology of Perspective and Renaissance Art,* (Cambridge: Cambridge University Press, 1986); Alberto Perez-Gomez & Louise Pelletier, *Architectural Representation and the Perspective Hinge,* (Cambridge, MA: MIT Press, 1997); Samuel Y. Edgerton, Jr., *The Renaissance Rediscovery of Linear Perspective*, (New York: Harper & Row, 1975), 158. For critiques of the concept of perspective as a symbolic form, see E.H. Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation,* (London: Phaidon, 1960); Nelson Goodman, *Languages of At: An Approach to the Theory of Symbols,* (Indianapolis: Bobbs-Merrill, 1968) and Martin Kemp, *The Science of Art: Optical themes in western art from Brunelleschi to Seurat, (*New Haven and London: Yale University Press, 1990).

4 This is a foundational tenet for Visual Studies. For a summary of the theoretical frameworks, key figures and methodologies of Visual Studies and Visual Culture, see Margaret Dikovitskaya, *Visual Culture : The Study of the Visual After the Cultural Turn,* (Cambridge, Mass.: MIT Press 2005).

5 In the introduction to his translation,

Christopher Wood traces the methodological framework of the essay to Heinrich Wöfflin and Alois Riegl. He situates the essay in line with the work of "a second generation German critics of positivistic historical scholarship… [who] generally shared a vision of a more comprehensive science of culture…that would seek to understand and not simply accumulate data." Christopher Wood, "Introduction" by Erwin Panofsky, *Perspective as a Symbolic Form,* 7-24.

6 Panofsky, 27.

7 Both Anthony Vidler, *Warped Space: Art, Architecture and Anxiety in Modern Culture*, (Cambridge, Mass.: MIT Press, 2000) and Damisch concur on this, Vidler pointing out that his coinage, "warping" might correspond to the process Damisch develops as "thinking" in architecture.

8 William J. Mitchell, *The Reconfigured Eye: The Visual Truth in the post-photographic Era,* (Cambridge, Mass.: MIT Press, 1992), 126.

9 Panofsky, 66-67.

10 Leo Steinberg, "The Eye is a Part of the Brain," *Partisan Review* 70, (1953), 198.

11 Erwin Panofsky, *Die Deutsche Plastik*, quoted in Panofsky, "Introduction" by Christopher Wood, 19.

12 Perez-Gomez, & Pelletier. "The Image Without the Observer in a Scopophilic World," in *The Perspective Hinge*, 280-316; Anthony Vidler, *Warped Space: art, architecture, and anxiety in modern culture,* (Cambridge, Mass.: MIT Press, 2000).

13 Kubovy, 173.

14 Ibid., 121.

15 John T. Paoletti, Gary M. Radke, *Art in Renaissance Italy,* 2nd Revised edition, (New York: Harry N. Abrams, 2001).

16 Panofsky, 68.

17 Evans, *The Projective Cast,* 353.

18 Svetlana Alpers has described how the Dutch differed from their Italian counterparts in this regard. The impulse to map, a geologically and culturally-prodiced desire, overwhelmed the impulse to represent the illusion of depth using perspective in the Netherlands. Her research points to the exquisitely rendered objects in Dutch genre paintings; they establish another kind of ordering system that positions the viewer inside the scene as a moving figure, rather than as an outsider looking through a window. Svetlana Alpers, *The Art of Describing,* (Chicago: University of Chicago Press, 1983).

19 Alpers, 122.

20 Evans shows how Piero della Francesca supplemented Alberti's technique for spatial depth illusion and achieved paintings with emotive and mystifying effects. Piero's "Other Method," outlined in Book Three of *De Prospectiva Pingendi*, (Of the Perspective of Painting, 1480-1490) does not use a vanishing point; instead, vertical and horizontal coordinates are mapped onto a front elevation and plan. There is no perspective projection – there is a perspective result that is achieved entirely with orthographic means.

21 Evans, *The Projective Cast*, 110-113. (mine).

22 Evans, "Translations from Drawing to Building," 173-181.

23 Erwin Panofsky, "Der Bergiff des Kunstwollens," quoted in Panofsky, "Introduction," Wood, 7.