The Visible and Tangible Eye

EUGENIA VICTORIA ELLIS
Granary Associates

In 1709, the bishop George Berkeley proposed a "new theory of vision" which relied upon both the visible and the tangible eye.' He suggested that visual perception is dependent on our experience of the relationships between objects based upon our own relative positions in space which he described as a tactile perception. He distinguished between the perceptions of sight and touch, and believed that one could not exist without the other in the perception of the world. *Giudizio dell'occhio* (judgment of the eye) could be considered to be the intuitive sense of spatial relationships developed from our experience of space by the extension into space of our senses through drawing what we see (visual and haptic perception); from the memory of being and acting in space. *Phantasia* (the creative imagination) is always related to a mental picture and *disegno inferno* is both perception and conception which is an activity of the senses and imagination as well as an activity of the practical intellect because it is necessary to imagine what we are going to do in order to be guided in doing it.? However, the more the sphere of application becomes rationalized (for example the replacement of thinking through drawing by computer applications), the less does the proper exercise of judgment along with practical experience take place.'

MNEMOTECHNICS AND THE RATIONALIZATION OF VISUAL SPACE

> It has been sagaciously discerned by Simonides or else discovered by some other person, that the most complete pictures are formed in our minds of the things that have been conveyed to them and imprinted on them by the senses, but that the keenest of all our senses is the sense of sight, and that consequently perceptions received by the ears or by reflexion can be most easily retained if they are also conveyed to our minds by the mediation of the eyes.
>
> – Cicero, *De oratore*, II, lxxxvii.

In classical antiquity at a banquet given by the nobleman Scopas of Thessaly, the poet Simonides of Ceos chanted a lyric poem in honor of his host and as was the custom included words of praise for the twin gods Castor and Pollux. Outraged, Scopas demanded that Castor and Pollux pay half the agreed-upon sum for apoemof which half he believed to be devoted to them. Shortly thereafter, a message was delivered to Simonides that two young men were waiting outside to see him. He left the banquet only to find no one there. Meanwhile, the roof of the banqueting hall collapsed, crushing all within and mutilating their corpses beyond recognition. Scopas and his guests were identified by the sole survivor, Simonides, who remembered who they were by their positions at the dinner table. The invisible callers. Castor and Pollux, had indeed paid Simonides handsomely for their share of the panegyric. Thus was invented the classical art of memory by the poet Simonides.[4]

What is significant about this fable in regard to the discussion to follow is the reliance on a visual memory which could only be considered to be *spatial* because it is comprised of two parts: an image which is associated with a place. Simonides' classical art of memory relied upon the orderly arrangement of images in space, a type of spatial visualization.

The ancients relied on mnemotechnics for a trained memory because their world was devoid of printing and paper for note-taking.[5] Poets were important in antiquity because of their storytelling and their use of imagery together with rhyme and cadence as a mnemonic device for their stories.[6] History was preserved and recorded throughout the ages in an oral tradition of intense visual memorization which could be passed on throughout the generations because it could be easily remembered. We moderns no longer have the need for memories because access to virtually all information is at our fingertips at the touch of the computer keyboard.

Since antiquity the sense of sight has been exalted above the other four senses and the primacy of vision in our culture today can be seen manifest in our reliance on gaining information through images on the television and the computer. Toward the beginning of *The Judgment* of *Sense,* David Summers brings to light the primacy of sight over the other senses and its heuretic functions of invention and discovery.' As discussed by Summers, the primacy of sight was established by two major philosophers from the ancient world, Plato and Aristotle, in two texts which reinforced each other in a long tradition from antiquity throughout the Middle Ages, *Timaeus* and *Metaphysics.* The influence of these two texts can be seen to continue well into the Renaissance through the writings of two major artists, Alberti and Leonardo, among others.

At the end of *Timaeus* (47a-c), Plato praised sight as providing the clearest knowledge of the natural world and allowing the principles of order and harmony to become evident: "Vision is the cause of the greatest benefit to us, inasmuch as none of the accounts now given concerning the universe would ever have been given if men had not seen the stars or the sun or the heavens." Aristotle's openingremarks in *Metaphysics* (980a) declare that all by nature desire to know by delighting in their senses, especially in the sense of sight: "For not only with a view to action, but even when we are not going to do anything, we prefer seeing to everything else. The reason is that this, most of all the senses, makes us know and brings to light many differences between things." For Plato, sight allowed for the vision of what might be true; to Aristotle, it provided the ability to distinguish and discriminate one thing from another.

In echoing Plato and Aristotle, Leon Battista Alberti explains his own emblem of the winged eye by praising the eye as "... more powerful than anything, swifter, more worthy; what more can I say?

. . . Why else did the ancients consider God as something akin to an eye, seeing all things and distinguishing each separate one."[8] Leonardo da Vinci sums up the notion of the primacy of sight and its dual heuretic[9] functions of discovery and invention in his often-quoted phrase: "The eye is the window of the human body through which it examines its way in the world and enjoys the beauty of the world. . . it surpasses nature because things made by nature are finite, and the works that the eye commands of the hands are infinite. . ."[10] The eye is the sense which like a window allows the light of truth of the natural world to enter the mind; the eye discovers, the mind interiorizes this discovery and then the mind's eye "commands" the hands to work marvelous inventions.

The quest for the truth of the natural world has been a pursuit since antiquity. It was the eye which could provide the clearest vision of the principles of order and harmony, and it was through number and geometry that the nature of order could be revealed. According to Pythagorean doctrine of fifth-century Greece, the pure relationships among the numbers constituted the very nature of order and it was through proving statements about regular geometric forms by manipulating numbers that one could reach a higher realm.[11] The notion of rational thought came about from having to measure distances with primitive devices which required the use of ratios of integers, or rational numbers. Geometry allowed the irrational numbers of pi and the square root of two to be rationalized within the circle and the diagonal of the square. The invention of artificial perspective allowed for the rationalization of visual space by providing a technique by which the vision of the natural world could be captured and quantified on a sheet of paper.

Leon Battista Alberti is credited with having invented the art of perspective projection in 1435 with the publication of his book *Della Pittura.*[12] Although there had been methods of constructing artificial perspectives, Alberti was the first to publish a precise geometrical formula which could quantify and rationalize the process, thus making it available to become a common practice." In so doing, Alberti elevated art to a science.

In his small treatise *On Painting,* Alberti provides a guide to the study of the natural order of things in God's creation devoted to the intellectual rationale for painting within the context of human virtue and natural order.[14] *On Painting* consists of three books: Book I is primarily mathematical and demonstrates how the art of perspective arises from nature and principles of optics; Book II puts the art into the hands of the artist; and Book III instructs the artist on mastering the art of painting." Alberti discusses optics and perspective projection based upon a geometrical construction whereby one draws a rectangle which acts as an "window"[16] opening onto the natural world and superimposes a "veil"[17] or grid through which the eye and its visual pyramid passes. The one eye is fixed through the use of a siting eyepiece which keeps the eye immobile and at its original location.[18] Size is relative and determined through comparison, with man being "the scale and measure of all things."" In order to be successful in "representing with his hand what he has understood with his mind,"!" Alberti believed that the painter must above all "have a good knowledge of geometry"" and must be guided by a "well-informed judgment"[22] which comes from the practice and experience of drawing the natural world.

The natural world is an empirical visual space whose elements may be translated through artificial perspective into a pictorial space. Due to perspective's rationalization and geometricization this natural world becomes an abstracted space; a very modem notion based on an extended grid of infinite space. However, the natural world cannot be captured in abstract space because human perception cannot imagine infinity due to the spatial limits set by the faculty of perception itself which is bound to the human body.[23]

According to Panofsky, the use of perspective to depict the natural world resulted in the translation of psychophysiological space into mathematical space which objectified the subjective visual impression[24] and created a uniquely modern vision based on the objective

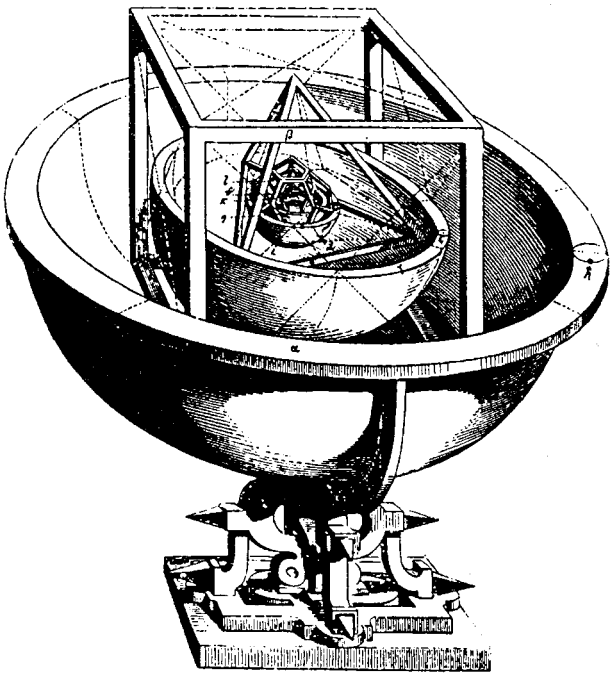

Fig. 1. Johannes Kepler, *Mysterium Cosmographicum,* "Harmony of the Universe," 1621.

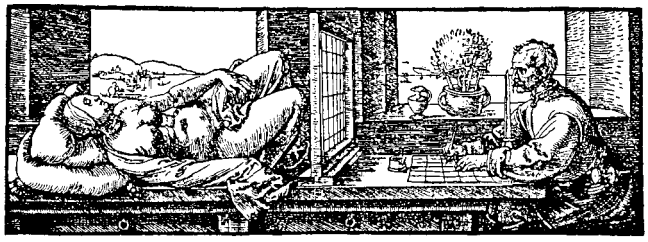

Fig. 2. Albrecht Diirer, *untitled,* 1538

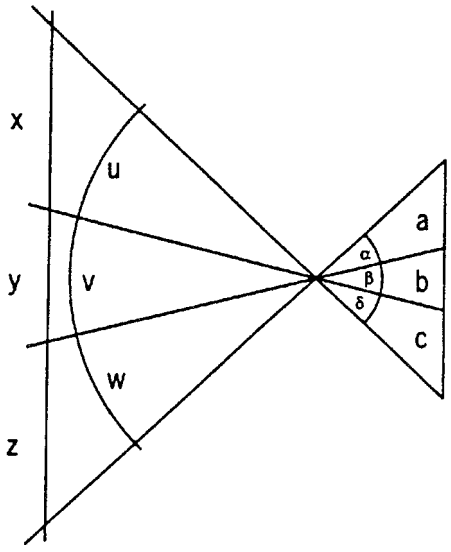

Fig. 3. Explanation of "marginal distortions." If a line is divided so that its three sections subtend equal angles, these sections will be represented on a concave surface as approximately equal lengths; whereas if projected on flat surface they will appear as unequal lengths.

viewpoint provided by perspectival space. Perspective projection creates a rational space which relies on two assumptions: first, that there is one immobile eye, and second, that the planar cross section of the visual pyramid can adequately reproduce the optical image.[25] First of all, we actually see with two constantly roving eyes which results in a spheroidal field of vision. There is an enormous difference between the psychologically conditioned "visual image" our consciousness receives of the visible world and the mechanically conditioned "retinal image" of our physical eye. There is a peculiar stabilizing tendency within our consciousness which combines perceptions from both the visible and tangible eye which allows us to ignore the distortions produced by the projection of the visible world onto the retina. Secondly, the flat perspectival construction is highly unlike the retinal image which is a projection onto the concave surface of the eye.[26] In other words, there is a fundamental discrepancy between "reality" and its construction because the sense impressions received by the eye and transmitted to the mind cannot be simulated by an immobile flat surface. This is also true of the analogous operation of the camera which produces photographs with marginal distortions greater the farther the subject.

The objectification of the subjective point of view through rationalizing visual space began a shift in the human observer from the classical observer who was immersed in the natural world haptically sensing the immediacy of surrounding objects to the modern voyeur who is distanced from the world visually perceiving the spaces between things. Antique vision was a fundamentally unmodern view of space whereby objects were conceived as "juxtaposed contents of a finite vessel." On the other hand, the modern sense of space has become one where bodies are "absorbed into a homogenous and infinite system of dimensional relationships."[27] Without the invention of perspective projection and the mathematization of visual space, today's computer representations would be historically impossible.[28] No longer jostled between elements of finite space as in antiquity, the modern is free to fly in, around and over objects in space using methods of spatial representation such as 3-D computer simulation and virtual reality.

SHIFTING PERSPECTIVES

> Since the spectacle's job is to cause a world that is no longer directly perceptible to be seen *via different specialized mediations, it is inevitable that it should elevate the human sense of sight to the special place once occupied by touch; the most abstract of the senses, and the most easily deceived, sight is naturally the most readily adaptable to present-day society's generalized abstraction.*
>
> – Guy Debord, *The Society of the Spectacle"*

The rationalization of visual space with the invention of artificial perspective began a shift in the human observer from one who is immersed in the natural world to the modern who is distanced from the world, so much so that with today's techniques of computer-aided representation and simulation vision itself has been relocated to a "plane" completely "severed from the human observer."[30] In *Techniques of the Observer,* Jonathan Crary traces the influences on the development of the modern observer which he believes are far more complicated than merely the shift in the modes of visual representation brought on by the development of representational conventions such as artificial perspective and photography. He believes the ongoing abstraction of vision to be "inseparable from a massive reorganization of knowledge and social practices that modified in myriad ways the productive, cognitive, and desiring capacities of the human subject."[31]

In the search to develop new methods of capturing the visible natural world, the *camera obscura* which had been around for over two thousand years began to be popularized in the seventeenth-century. There were different variations on the camera obscura.

Fig. 4. Athanasius Kircher, *Camera Obscura,* from *Ars Magna Lucis et Umbrae, 1646.*

When constructed as a small device it allowed for an easier mapping of the visible world by providing a surface from which to trace what is seen and was widely used throughout the seventeenth, eighteenth and nineteenth centuries as a convenient tool for artists." It also could be constructed as a room within which one could sit and contemplate the nature of vision or view an exciting spectacle." Although the camera obscura was obviously related to techniques of linear perspective it can be distinguished by its definition of an interiorized observer inrelationship to an exteriorized world. Through the use of the camera obscura developed the notion that the human mind is an inner space in which perceptions and sensations passed in review before the mind's eye as objects of quasi-observation.[34]

The distancing between the human observer and its object which developed during the eighteenth century can be traced to an unusual occurrence outside the art world in the spectacles offered by museums of natural history. Again the quest for truth of the natural world through an experience-based empirical science provides clues to the shifting perspectives of the observer. Barbara Maria Stafford examines this shift by looking at the most optical of eighteenth-century sciences, microscopy.[35] Microscopy influenced the way the world was perceived by: popularizing disengaged and disembodied witnessing of vanishing entities; creating a connection between the magnified natural image and the miniaturized artistic composition which relied upon seeing abstract material patterns without being able to touch or understand them; contributing to the growth of a new and visual form of education based on minima which were published as scientific "amusements or "useful toys"; and providing subject matter to fill the cabinets, or museums, of natural history thereby contributing to a form of exhibitionism which now governs all modes of communications. The scientific detachment afforded by the microscope created a scientific observer so distanced from its object of observation that the dissection of a live frog to reveal the circulation of its blood could be impassionately viewed simultaneously as science and as entertainment.

In the seventeenth and eighteenth centuries the sense of touch was an integral part of classical theories of vision. For example, in 1709 the bishop George Berkeley proposed a "new theory of vision" which relied upon both the visible and the tangible eye.[36] He suggested that visual perception is dependent on our experience of the relationships between objects based upon our own relative positions in space which he described as a tactile perception. He distinguished between the perceptions of sight and touch, and believed that one could not exist without the other in the perception of the world.

In the nineteenth century sight began to be disassociated with touch and the modem body began to be remapped so that visual perception need not reference the tangible and the eye itself no longer relies on its subjective relationship to perceived space.[37]

The nineteenth-century observer took delight in a variety of

Fig. 5. Jean-Baptist Haussard, *Dissected Stag's Head*, 1734-55

optical parlor games which amused by fooling the eye: zootrope, phenakistiscope, thaumatrope. magic lantern, and stereoscope. Jonathan Crary pinpoints the stereoscope as one cultural site where the breach between tangibility and visuality is clearly evident, where the tactile is subsumed within the optical.[38] The stereoscope constructs tangibility for the viewer through optical cues which deceive the mind into seeing a flat surface in relief and allows for the emergence of a non-existent space which is optically constructed in the mind's eye. A distance between objects is suggested which is not contingent upon one's own relative position in space. This breach in the subject-object relationship between viewer and viewed was inherently obscene because it eliminated any mediation whatsoever between eye and image. In optically constructing tangibility lies the complete denial of the body upon which perception of the tangible relies. This is a distancing which is and is not; somewhat like the *scarto* to which Pier Aldo Rovatti refers: *scarto* as the distancing from itself."' It is a type of "stereoscopic" vision in which an infinite play of the similar and the dissimilar can be combined to give rise to novelties of meaning: a uniquely postmodern type of metaphoric construction..'"

As the twentieth-century is rounding to a close the observer has become postmodern. One of the characteristics of postmodernism is the dematerialization of embodiment.'' Through the computer-animated technology of virtual reality (VR) the eye is entirely deceived and the mind's eye reconfigures a spatial environment which exists only in the consciousness of the beholder. The mind is fooled into believing the body is moving through space in the haptic sense, the body reaches out and the objects dematerialize upon contact with the hand. A distance which is *not* exists perceptually, a disembodied perception. VR puts the body into an intense feedback loop with a simulation which in a sense short-circuits the proprioceptive sense. Proprioception defines the body's boundaries and conveys the sense of bodily inhabitation; it creates the link between the body's extension and habitually used objects. In VR the proprioceptive sense flows out of the body to meet an object which does not exist and returns empty-handed in a feedback loop which tends to dematerialize the body itself.

The body may be able to disappear into information, however embodiment cannot, for it is tied to the contextual and the enacted through incorporating and inscribing practices.'' An incorporating practice is one where an action through habit becomes "second nature." It is an interiorization of a bodily movement which through practice and repetition becomes encoded into bodily memory. Typing is an example of an incorporating practice. The typist probably cannot remember visually which letter belongs to which key, but when typing the fingers automatically find the appropriate key for the required letter so that the keys seem to be extensions of the fingers. Habit is a knowledge and remembering in the body; the body "understands" without the mind's awareness. Inscribing practices correct and modulate the performance of the incorporating practice. The embodied action through habit does not occupy conscious thought, it happens automatically as if the knowledge of how to perform the action resides in the fingertips or physical mobility itself rather than in the mind. An action which has become embodied unconsciously into theconsciousness has done so through memory.

JUDGMENT OF THE EYE

> Whence the great Michelangelo said that it was necessary to have the compasses in the eyes and not in the hand, that is, to have judgment, because the hand works and the eyes judge (giudiziodell'occhio);*and for this reason he sometimes made his figures of 12 or 13 heads . . . and so* **with** *columns and members and other components, he always went after* grazia *rather than* misura.
>
> —Giorgio Vasari. 1570

The classical art of memory was developed as a tool for rhetoricians to remember their speeches.'' The first-known text-book the *Ad Herennium* was compiled circa 86-82 BC by an unknown teacher who identified two kinds of memory: the one natural, and the other artificial. The natural memory is that which is born simultaneously with thought and is naturally incised on the mind. The artificial memory is one's natural memory which has been strengthened by practice and training. The artificial memory is established by places, or *loci*, and images. The places must be easily grasped by the memory, must be particular and unique, and must be within reach tactually. The images are forms, marks or simulacra of what is to be remembered. The places can remain in the memory indefinitely and can be reused by placing another set of images for another set of material to be memorized. There are two kinds of images: one for things which holds a concept or an idea, and one for each individual word. The memory for words is much more difficult than the memory for things.

The artificial memory is a visual memory which is *spatial.* Remembering becomes an act of moving through a cathedral of memory, the space of which is at one's fingertips, and passing unique places with unusual characteristics upon which are placed one's memory images. In the Middle Ages the artificial memory became the cardinal virtue of Prudence. Prudence arises from experience: it is through prudence that one in the present can make judicious decisions based on past experience regarding future endeavors. Prudence is an "interior sense" which is perfected by memory and experience through the "exterior senses" with which we perceive the sensate realm.[44] Historically, the external senses have been those

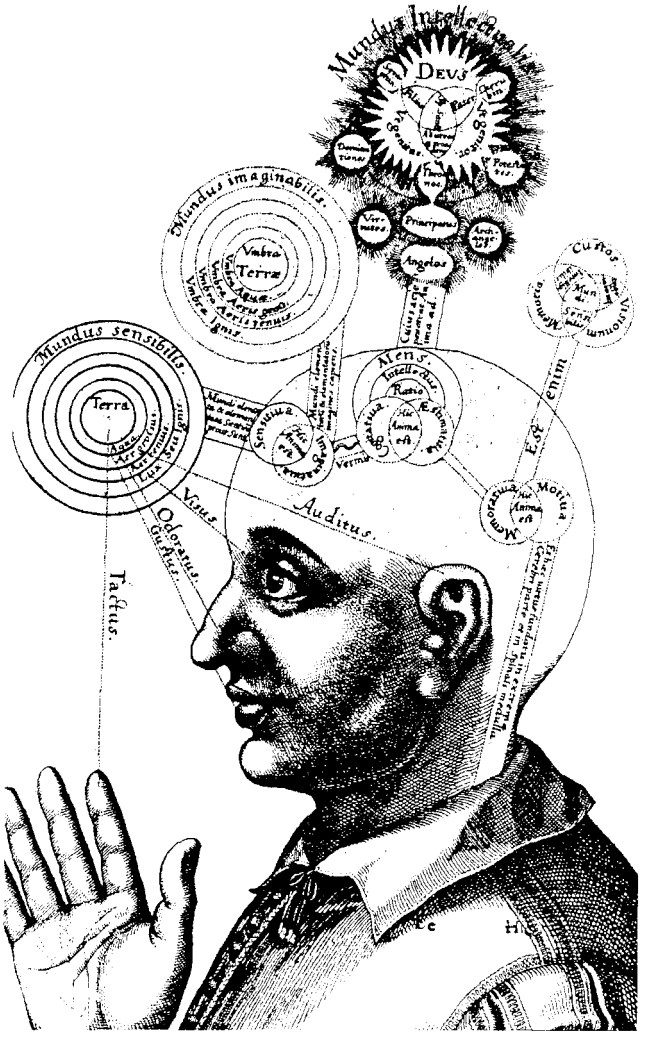

Fig. 6. Robert Fludd, *The Mystery of the Human Mind,* from *Utriusque cosmi majoris*, 1617-1621, II, p. 217. Engraving.

senses associated with the body and the internal senses have been considered to be all faculties of the soul which are thought to deal with mental images and the imagination. The imagination has the ability to (re)present to the mind's eye what is not actually present.

Giudizio dell'occhio (judgment of the eye) could be considered to be the intuitive sense of spatial relationships developed from our experience of space by theextension into space of our senses through drawing what we see (visual and haptic perception); from the memory of being and acting in space. Leonardo da Vinci recommended compiling an *istoria*[45] in order to develop this skill. A painter's *istoria* was arrived at by observing the natural world and continually recording in a sketchbook with a few quick lines one's observations: "And let it be of tinted paper, so that you may not erase them but change the old with the new, because these things must not be deleted and must instead be preserved with the greatest diligence, because the forms and actions of things are so many, that memory cannot retain all of them." These drawings were to be kept as helpers and teachers. By capturingmovement inaquicksketch, the memory could be aided later by this system of notation.

Drawing is a corporeal act, and by capturing the infinite movement of things by hand on paper through practice and repetition, the act of drawing becomes an incorporating practice. In this way, the perception of things, space and movement becomes internalized and encoded onto the consciousness which enables the mind's eye to make judgments about spatial relationships. Through the practice and experience at looking at things and drawing what is seen, one is able to make judgments about what is *not* seen. The act of drawing develops one's internal senses which include judgment, memory and imagination. The ability to make judicious decisions comes from the memory of past experiences in order to image the unseen, or imagine.

In Leonardo's *Treatise of Painting* he writes about two types of judgment, of quantity and quality.[46] Judgments of quantity can be seen by the eye and can be measured. Judgments of quality can be established by the eye, however they cannot be measured. For example, given two whites in contrast to black and pray, the eye is "fooled" into seeing the white in contrast to black as being brighter. Qualitative decisions rely on memory and experience, and the judgments the eye makes in *disegno* may not necessarily be measurable by anestablished system of proportion or formula but may "fool the eye" by appearing proportional. The sense of touch also may be fooled. For example, if a ball is placed between two crossed fingers then it will feel like two balls. Only with the intervention of sight can the truth be discerned. The external senses of sight and touch work together to establish a mental image.

Phantasia (the creative imagination) is always related to a mental picture and *disegno interno* is both perceptionand conception which is an activity of the senses and imagination as well as an activity of the practical intellect because it is necessary to imagine what we are going to do in order to be guided in doing it.[47] The ability to make judicious decisions about spatial relationships in order to design relies on both the visible and tangible eye. Through drawing what is seen a sense of space is encoded into the consciousness through bodily memory. However, the more the sphere of application becomes rationalized (forexample the replacement of thinking through drawing by computer applications), the less does the proper exercise of judgment along with practical experience take place.[48]

The spatial environment of the computer screen exemplifies the dematerializationofembodiment. It cannot beexperienced haptically, its planar surface suggests a distance which is *not* and through 3-D simulation movement through space becomes a disembodied perception. The act of drawing itself on the computer is more textual than perceptual because it is more related to an act of typing than drawing. The embodied action of inhabiting space and encoding a perception of space into bodily memory is necessary in order to design space. A sense of space is arrived at through both the visible and tangible eye: by inhabiting space, sensing it at our fingertips and incorporating it into the consciousness through practice and repetition by drawing what is seen.

NOTES

1 George Berkeley, *A New Theory of Vision* (London: J. M. Dent & Sons Ltd., 1925), pp. 13-69.

2 David Summers, *The Judgment of Sense* (New York: Cambridge University Press, 1987), p. 287.

3 Hans-Georg Gadamer, "Theory, Technology, Practice: The Task of the science of Man" *Social Research* 44/3 (Autumn 1977): 529-547.

4 Frances Yates, *The Art of Memory* (Chicago: The University of Chicago Press, 1966), pp. 1-2.

5 Ibid., p. 4.

6 Giambattista Vico, *The New Science*, tr. Thomas Goddard Bergin and Max Harold Fisch (Ithaca: Cornell University Press, 1968), V, XXIII, p. 833: "It was by a necessity of nature that the first nations spoke in heroic verse... so that their memories might be aided by meter and rhythm to preserve more easily the histories of their families andcities." See also Elizabeth L. Eisenstein, *The Printing Press as an Agent of Change,* vol. I (New York: Cambridge University Press, 1979), pp. 65-69 and James Burke, *Connections* (Boston: Little, Brown and Company, 1978), pp. 125-127.

7 David Summers, *The Judgment of Sense*, pp. 32-39.

[8] R. Watkins, "L.B. Alberti's Emblem, the Winged Eye, and his name, Leo," *Mitteilungen des Kunsthistorischen Institutes in Florenz* 9 (1960): 256-257.
[9] Panofsky is credited with having coined the term "heuretic" in Summers, p. 32.
[10] Leonardo da Vinci, *Trentise on Painting*, ed. and tr. A. P. MaMahon (Princeton, NJ, 1956): I, 34.
[11] David Porush, "Hacking the Brainstem: Postmodern Metaphysics and Stephenson's *Snow Crash*," *Configurations* 213 (Fall 1994): 541-543.
[12] Alberti wrote *De Pictura* in Latin in 1435 and the following year translated the work into Italian.
[13] Erwin Panofsky, *Perspective As Symbolic Form*, tr. Christopher S. Wood (New York: Zone Books. 1991), p. 63.
[14] Martin Kemp, "Introduction" to *On Painting* by Leon Battista Alberti, tr. Cecil Grayson (New York: Penguin Books, 1991), p. 2.
[15] Alberti, *On Painting*, p. 35.
[16] Ibid., p. 54.
[17] Ibid., p. 65.
[18] Martin Jay, "Scopic Regimes of Modernity," *Vision and Visuality*, ed. Hal Foster (Seattle: Bay Press, 1988), p. 7.
[19] Alberti, p. 53.
[20] Ibid.. p. 59.
[21] Ibid., p. 88.
[22] Ibid., p. 93.
[23] Ernst Cassirer, *Philosophy of Symbolic Forms, vol. 2: Mythical Thought, tr.* Ralph Manheim (New Haven: Yale University Press, 1955), pp. 83-84.
[24] Panofsky, *Perspective As Symbolic Form*, p. 66.
[25] Ibid., pp. 29-32.
[26] See also Walter Gropius, *Scope of Total Architecture* (New York: Harper & Row, 1955), pp. 25-27.
[27] Panofsky, pp. 42-45.
[28] Alexander Tzonis and Liane Lefaivre, 'The Two New Sciences of Representation," *Design Book Review* 27 (Winter 1993): 11-15.
[29] Guy Debord. *The Society of the Spectacle*, tr. Donald Nicholson-Smith (New York. 1990), sec. 18.
[30] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, *MA:* MIT Press, 1994): 1.
[31] Ibid., p. 3.
[32] Margot Lovejoy, *Postmodern Currents: Art and Artists in the Age of Electronic Media* (Ann Arbor: *UMI* Research Press. 1989), pp. 29-32.
[33] Crary, pp. 33-34.
[34] Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton, 1979), pp. 49-50.
[35] Barbara Maria Stafford, "Voyeur or Observer'? Enlightenment Thoughts on the Dilemmas of Display." *Configurations* 1/1 (1992): 95-128.
[36] George Berkeley, A *New Theory of Vision*, pp. 13-69.
[37] Crary, p. 19.
[38] Ibid., pp. 19, 62. 127.
[39] Pier Aldo Rovatti, "Maintaining the Distance." tr. Barbara Spackman in *Recoding Metaphysics*, ed. Giovanna Borradori (Evanston: Northwestern University Press, 1988): 117-122.
[40] See also Paul Ricoeur, "The Metaphorical Process as Cognition, imagination and Feeling," *Critical Inquiry* 5/1 (Autumn 1978): 143-159.
[41] N. Katherine Hayles, "The Materiality of Informatics," *Configurations* 1/1 (1993): 147-170.
[42] Maurice Merleau-Ponty, *Phenomenology of Perception*, tr. Colin Smith (New York: Humanities Press, 1962), pp. 98-115, 136-147; Paul Connerton, *How Societies Remember* (Cambridge: Cambridge University Press, 1989).
[43] Yates. *The Art* of *Memory*, pp. 4-26.
[44] Summers, *The Judgment of Sense*, pp. 27, 87.
[45] Leonardo, *Trattato della pittura*, intro. Ettore Camesasca (Milano: Tascabili degli Editori Associati, 1995), II, 169. p. 104. I am grateful to Marina Della Putta for finding and translating this passage for me.
[46] Summers, p. 174.
[47] Summers, p. 287.
[48] Hans-Georg Gadamer, "Theory, Technology, Practice: The Task of the Science of Man" *Social Research* 44/3 (Autumn 1977): 529-547.