

# Cognitive Depth in Cubism

KAY EDGE  
MARGARITA MCGRATH  
Virginia Tech

## OUTLINING VISUAL EXPERIENCE

*“Touch isolates objects while vision unites them.”—Alois Riegl<sup>1</sup>*

What is visual experience? We can consider and describe visual experience in a number of different ways, at least two of which seem particularly useful to architects and to teachers of architectural design. These two descriptions of visual experience, which can be called “matching” and “completing” share the perceptual dilemma between what the eye sees and the mind knows, between objective (sensual stimuli) and subjective (cognitive reception) vision.<sup>2</sup> The one is the act of matching raw visual information to preexisting conceptual patterns; the other, completing, is the act of imagining—constructing the spatial situation in which the visual information can make conceptual sense. Alois Riegl writes that the ancient’s *horror vacui* is based on a bias against subjectivity, and that this is the cause of the “avoidance of thought and avoidance of space in primitive art.”<sup>3</sup> To architects, what is most relevant is that each presents an approach to filling in the blanks of what the eye cannot see.

### matching

*“The eye especially demands completeness.”—Goethe<sup>4</sup>*

The mind and the eye together play a constructive role in visual completion and understanding. In keeping with Kant’s claim that the mind takes an active role in the construction of reality when it imposes the categories of time and space on all perceptions, we can say that similarly, the eye and mind together take an active role in the construction of visual experience. We are not

simply passive recipients of visual sense data, but participants in the apprehension of the visual world.

Rudolf Arnheim addresses this role of the eye and mind in *Visual Thinking* and in *Art and Visual Perception*. Representing a series of frontal or partial views does not preclude perceiving the whole object as a three-dimensional thing, since the eye working with the mind is more than perfectly willing to finish the unfinished. Arnheim further claims that when we see shape, it is then that we begin the process of concept formation; part of the process is the fitting of perceived shapes to already existing “templates” of shape.<sup>5</sup>

The “active role” that the eye takes in this matching process might be called abstraction. By training and habit, we distinguish “concrete” from “abstract” things as if they were mutually exclusive. The hindrance to visual thinking and hence to artistic activity is this separation of visual perception from conceptual thinking. The learned misconception is that for an idea to be truly abstract, it must be free of any perceptual baggage. In other words, instead of relying on sensory experience, abstract thinking is supposed to occur without images—in words and rational constructs instead. The computer, as Arnheim has pointed out, is an example of a process which “sees” but it does not act to construct visual experience. As a design tool then, it often becomes a vehicle in this separation of thinking and perceiving by allowing the step of combining those acts to be skipped altogether. Aristotle’s belief that the soul never thinks without an image serves us better.<sup>6</sup>

### completing

*“the mastery of nature is intimately connected with the mastery of space.”—Gyorgy Kepes<sup>7</sup>*

The second way of considering vision that might be useful to design teachers concerns the role of vision as a way of orienting and placing oneself in a sequence of spatial events. Visual experience is linked to spatial experience. In this mastery of space *and* time, visual cognition is concerned with not only actual, physical space or distance, but implied depth as well.

As the eye moves around a cube for example, the apparent shape, angles and proportions change constantly. Yet the eye, working in cooperation with the brain, continues to insist that the object is a cube. Arnheim claims that it is orientation over time that makes this possible; that is, sequential views add enough to our understanding that we are able to continue perceiving a cube. Similarly, the three-quarter view of the Parthenon and the various views we get on the approach, lead us to an assumption about the whole of the building. It is movement over time that allows this act of perceptual completion.

Unless it could take up all positions around the object at once—performing a complete fly-through in less than the blink of an eye—the eye itself cannot actually see an object in three dimensions. The collapse of time to the point of simultaneity was central to Colin Rowe's essay on literal and phenomenal transparency in Cubist painting and architecture. Rowe's terminology stems from Gyorgy Kepes "transparency means simultaneous perception of different spatial conditions."<sup>8</sup> Literal is what the eye alone might see; phenomenal is that perceived in collaboration with the mind. This difference can be seen in the Cubist handling of material qualities and compositional order. In Juan Gris' *Still Life*<sup>9</sup> the newspaper on the table is visible through an implicit "window" in the tablecloth. The representation of the glass behind, its phased rotation and shift in viewpoint from straight on to above, is an obvious example of simultaneous views. It is time that is flattened, not space.

Although these two transparencies act to develop the clarity of the object as it exists, Rowe's interest intensifies at Cubism's venture into the "clearly ambiguous."<sup>10</sup> Here depth occurs as both a myopic nearness (insight into the object) *and* an irreconcilable distance. The latter is a cognitive extension produced by a method of composition: a signal is sent to the eye suggesting the physical overlap and spatial coexistence of entities in the plane. The horse and rider groups of the Parthenon friezes are an early example of this technique; Braque's painting *Bottle and Fishes*<sup>11</sup> an example of the Cubist approach. In the frieze, an interim suspension occurs during which the mind toggles between each object, first resolving the one, then the other, as complete

wholes. To gain an understanding of the "whole" the viewer must imagine the one thing behind the other; he/she must infer the hidden part and "construct" a spatial stage on which the given situation can occur.

In Cubism, this movement is a dynamic passage between objects, and the view does not slip behind: it occurs only on the surface of the canvas. And, of course, quite often the back side is not hidden at all, but composed on the canvas with other views of the object. The figures in *Bottle and Fishes* develop to be paper-thin. They seem more apt to advance off of the canvas toward the viewer, than allowing the viewer to in between or behind them. The knife slid between these flattened layers in Braque's *Violin, Glass and Knife*<sup>12</sup> shows this thinness. Instead of presenting an overlap in space, the objects signal an actual co-existence in plane. In other words, the process of perception does not invite the imagination to complete the back (that which is not visible), but instead the eye alone engages the passages that open up on the surface of the canvas.

The mixed signals imbedded in the Cubist canvas work to slow the present-ness of visual perception. We do not know whether Braque and Picasso actually intended that the non-representational planarity of the image free the eye from the mind in constructing the visual experience of the canvas; we do know that at least Braque hoped that the painted image would engage the hand (see quote below). The eye working independently perceives colored planes, but it cannot "see" depth or measure. It also cannot establish the impenetrability of an object that separates it from other objects. These shortcomings mean that the hand's experience must be linked to the eye in order to establish surface, distance (depth) and scale.<sup>13</sup> This link occurs in the mind, creating a cognitive bridge between the immediate perception of the eye and the memory of the hand. In "tactile cognition," eye response and what the hand knows combine to make visual understanding. Taken together, these approaches (Kant, Arnheim, Riegl) share the characterization that vision requires a precondition: by means of its structure, the mind organizes and makes sense of visual data and the hand remembers its past experience. This is the active role that the eye and the mind take; the hand then adds its own way of knowing to complete the understanding. The pre-knowledge or history of the hand's experience is important to setting the stage for spatial making.

## THE CUBIST TOOL BOX

*“it is not enough to make people see what one has painted; one must also make them touch it. .”*  
— Braque<sup>14</sup>

What tools can we glean from the Cubist movement in art that have specific relevance to enabling the architecture student to think spatially, and to move mentally through and around the work? How does Cubism’s embrace of “flatness” paradoxically present an opportunity to go beyond immediate perception to a deeper, still real, three-dimensional (spatial) perception? We find one tool particularly applicable—one that operates as a “conceptual” Swiss army knife offering multiple extensions. It can be found in etymology of analytic, as in the phase of cubism so named. The Greek root is *lyein*, to loosen. Here the loosening device operates not only on mental templates, but also on the conventions of representation, and extends even to the constraints of time and space.

### templates of essence

Cubism represents a distillation, an essentializing act on something that is complex in its form. Braque reacted against the preceding generation of artists’ aim to paint the transitory perception of the moment by expressing in his work a search for the solid, stable and enduring.<sup>15</sup> In the Cubist movement, representation was the outcome of a process of abstraction, implying a true knowledge or understanding of the object in space beyond what it actually looks like to the eye. This abstraction also produced a secondary effect in that the 1:1 correspondence between representation and its mental template weakens. (Picasso, *Portrait of a Girl*)<sup>16</sup> In other words, an abstract figure might match more than one pattern. An example of this occurs in the drawing numbered five discussed below with the *maquette*. The specificity of the objects opens up to multiple readings. Ambiguity allows the flat planes and contour lines in the Cubist paintings to be generative, that is, they have the potential to coax the eye into producing a space within which the imagination can then be engaged and invention can take place. This invention is then re-presented.

### conventions of representation

In addition to adding depth to perception through abstraction, the canvas itself actively engages the experience of vision by becoming an agent in the connection of thinking and seeing. The assembly of layers on the surface of the Cubist canvas promotes multiple transfers between three-dimensional and two-dimensional space.

That this is a dynamic relationship is evident even in the critical/historical studies of the Cubist movement in art. Many scholars were surprised when Picasso and Braque’s experiments with *maquettes* (casually constructed paper and cardboard sculptures) were documented as having preceded the shift of the work into *papiers collés*.<sup>17</sup> What this suggests is that direct impetus to the three-dimensional models was not an extrusion of two-dimensional paper cut-outs, but *visa versa*!

The numbered sketches hung in a photo taken in 1912 in Picasso’s studio<sup>18</sup> suggest a series of drawings done in conjunction with the *maquette*. As they are hung, three through five intrigue us as capturing or hinting at incremental conceptual developments. The third sketch is of the guitar rotated on its side, with echoes of the shadow cast by the sculpture on the wall radiating from the instrument’s body in divergent curves. Drawing number four seems to restate the conventions of perspective drawing implied by the diagonal lines in the upper left and right corners of number three. A “picture plane” — through which we see a glass shaped object — is drawn in similar proportion to the page. In both of these drawings the consistent thickness of lines of objects, background, and representational convention (the picture plane) manifest the Cubist’s interest in making the actual *process* of perception present on the canvas.

In abandoning the Renaissance illusion of one-point perspective, the Cubist’s offered a conceptual clarification of image, equivalent to, as Braque pointed out, the normative, explanatory architectural drawings of plan, section and elevation.<sup>19</sup> The selected compositional order is about what the object could potentially appear given a view of it from different vantage points. These are physical/ actual points in both time and space.

In spite of flatness, and the look of shallow depth, the Cubist painters often seemed to be moving the picture plane considerably in the same painting. This often implies a complete circumnavigation of the object...multiple views, a “fly-through” or “fly-around” in today’s computer jargon. A simultaneous closeness and distance from the object is created that is more analogous to the axonometric drawing than the computer animation. In the field of the axonometric the viewer is everywhere but nowhere at once — whereas the viewer always takes up a position in the *illusion* of computer fly-throughs. In the Cubist canvas, the picture plane is still a window, but you look on it rather than through it.

### constraints of time and space

This is because not only are the graphic conventions used to foster the illusion of space made visible on the

canvas, but so is space itself. Space on the Cubist canvas was never a void, and it seems that Picasso's interest in primitive art brought the fullness of space to the surface of the canvas. Alois Riegl's work on the development of space in *Late Roman Art Industry* [1908] also emerged from what was at the time a cultural fascination with primitivism. Riegl located the first depiction of three-dimensional space in ancient art is as it "adheres to material individuals."<sup>20</sup> This space is characterized by being "impenetrable coherent space measured cubically" not infinite deep space between and behind objects.<sup>21</sup> Picasso and Braque created space that at times actually advanced in front of the objects on the canvas (Picasso. *Les Demoiselles d'Avignon*)<sup>22</sup> and a space capable of bearing imprints of the object seen or anticipated by the eye. In Cubism this worked to create a thickened space, one that was as solid and permeable as the objects in the field. (Picasso. *Landscape with Bridge*)<sup>23</sup>

Once space is read as contingent to the object it is then possible to conceive of the border between the interior of the object and the exterior giving way. In Cubism this occurs literally on the canvas via the technique of *passage* and transparency (Juan Gris, *Painting*, the first painting referenced). *Passage*, loosening the boundary between object and space, actually ends up solidifying rather than softening space. The double occurrence — space becoming object and object becoming space — creates a fluid and occupiable threshold between field and figure. Brought into the study of architecture, the practices of making space and of spatial making are given a potent example of extension beyond the envelope of the building.

#### MAKING AS A SPATIAL ACTIVITY

*"(I was) unable to introduce the object until I had created the space for it"*<sup>24</sup>

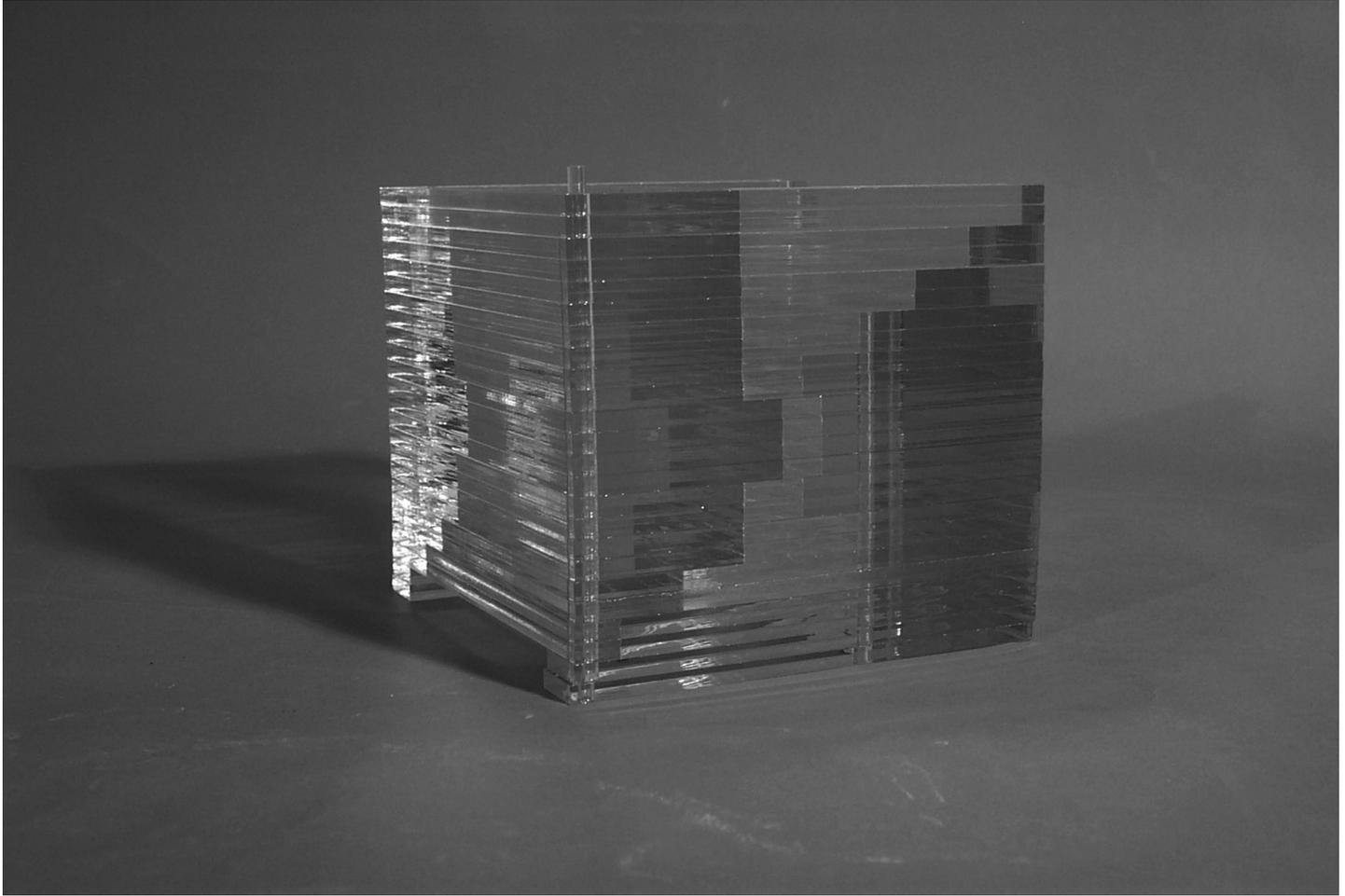
Analytic Cubism was followed by the Synthetic phase. The etymological roots of synthesis are Latin *facere* to make, do and Greek *tithenai*, place or set. This establishes a link with making as a three dimensional activity.<sup>25</sup> But most important for the design student is that the act of making joins touch, vision and imagination. Space that the student might have imagined or drawn in two dimensions, is given three-dimensional presence in the act of making. The imagination produces an idea of three-dimensionality, which the eye and the hand then construct. The hand's experience is linked to the eye and ultimately back to the mind's eye or imagination. Seeing and knowing, visual perception and conceptual thinking are reunited.

Our students, most of them products of an education that not only neglects the visual, but also separates visual perception from conceptual thinking, must be taught how to rejoin these things. As teachers, we need to foster and sharpen the active role of the eye. Conrad Fiedler holds the position that art is an epistemological activity in that our perception invents the world around us and art expresses that invention. Art expresses art *through* art, and so for Fiedler, visual perception translates directly into visual expression. The Cubist inspection and interpretation of vision seems to help in the effort to rejoin visual perception and conceptual thinking.

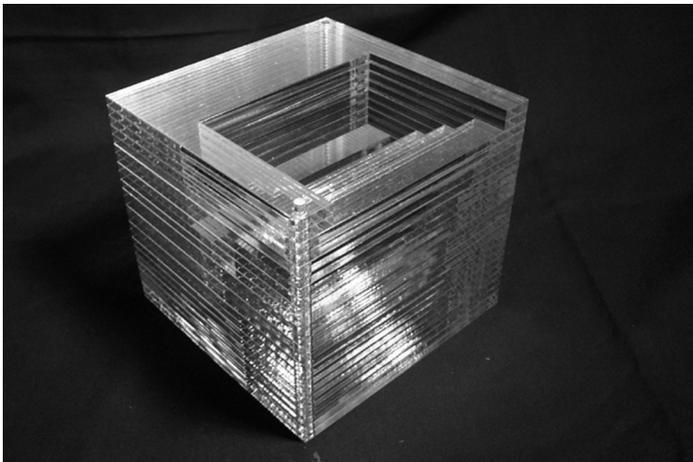
Concept art begins in early Cubist experiments with the slackening correlation between perception and cognitive categories (the double curve which is once the edge of the guitar, the curves of a figure, and an abstract shape). At the point when an idea can be art, we encounter the larger question of the role of cubism in the pedagogy of basic design—how the modern emphasis of thought over visual and tactile dexterity might have redefined our approach to design education. This pedagogy attempts to reshape the student's cognitive approach to design, assuming that the eye and hand will follow after. The mind is educated, but the student is expected to pick up visual and tactile dexterity tacitly through the studio atmosphere. It is ironic that this can actually widen the gulf between cognition and perception. What has already been overlooked in their education remains neglected rather than being reinforced and brought up to the same level as the mind! This is analogous to the presumption of a direct correspondence between the ability to read music and play an instrument. Although the student might develop the ability to compose, in teaching them to read music they aren't likely to be able pick up a guitar and play a piece of sheet music. What we take from the Cubist probe into visual perception is that thinking and making (writing music and playing music) are contingent, and that strengthening visual and tactile understanding in tandem with the conceptual is critical in early design.

In the design studio, the *Layer Assignment* mimics the Cubist invention of "2 out of 3" and brings it to the realm of architecture. In keeping with the Cubists, the students study structure by means of a series of parallel planes.<sup>26</sup> The students are asked to construct a six-inch cube from a series of layers. In each layer they are to make two square cutouts.

First, they see how to make space and solid volume from a series of flat, two-dimensional elements. Kepes goes on to say of making:



"The movement of a tool on a medium is a spatial message. One cannot avoid seeing, beyond every spatial configuration, the force, the speed and direction of movement which created it...the action and the power of the tool, the structure and the texture of the surface resisting the tool..."<sup>27</sup>

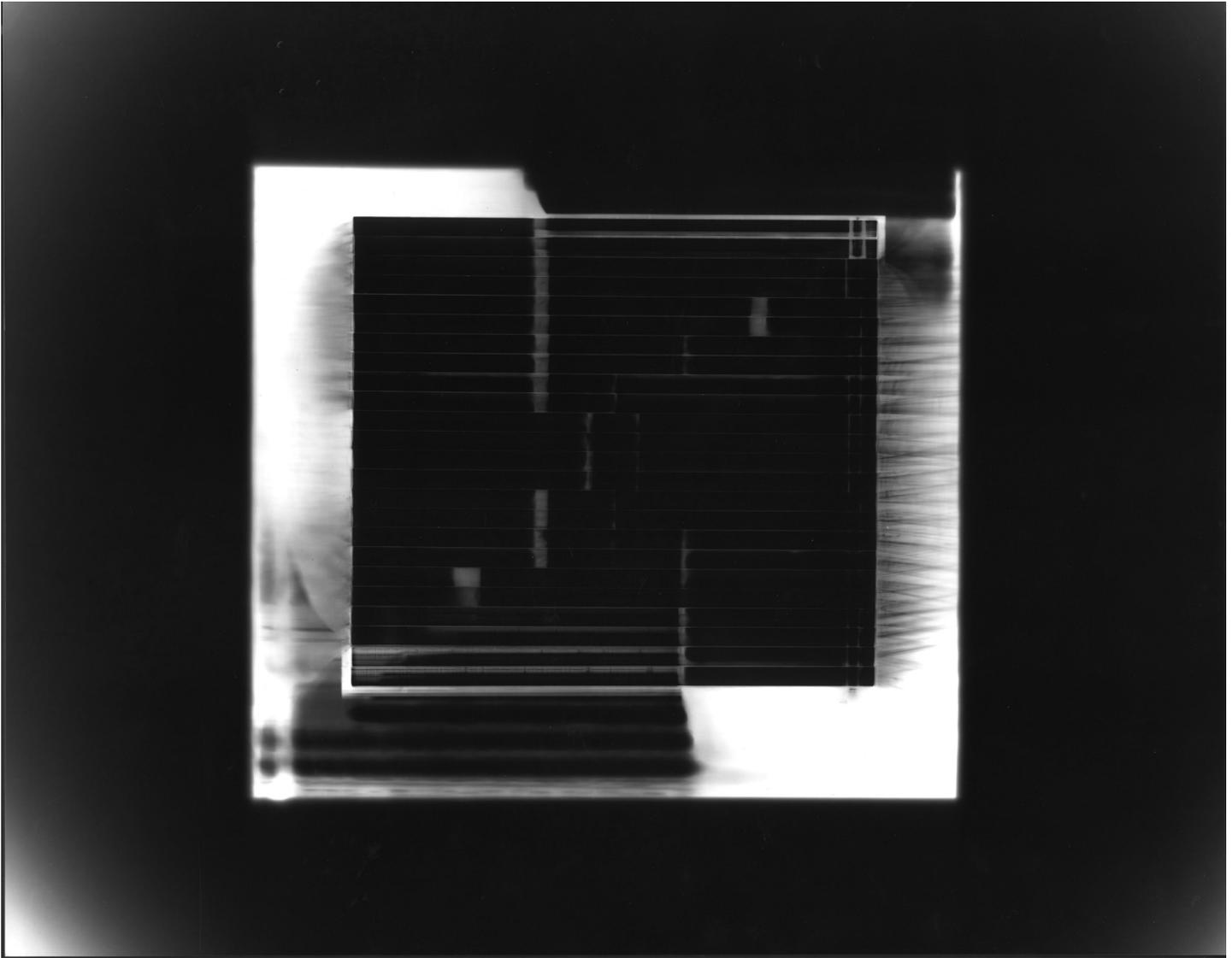


The process of cutting each layer prolongs the duration of making into a series of precise, incremental acts of

the hand. This extends the eye's active role in the construction of visual experience, mentioned earlier, to the hand and visual experience is reinterpreted through the act of making. To develop the ability to transfer back and forth between two dimensionality and three dimensionality, once the cube is made, the students slice it either conceptually, through drawing, or actually in the shop. This makes visible exactly what it is that they have made. Photograms are a particularly useful means of study if the cube is made of a transparent material. These drawings, photograms and resultant objects then offer a new round of spatial manipulation and two-dimensional representation of three-dimensional conditions.

The most successful projects were from students who chose to make the cutouts in the interior of the square rather than the ones who made their cuts at the edge of it.

Those that attempted to operate on the exterior of the cube—the constrained outward shape of assembled layers—found it difficult to affect the boundary of the object in a way that would significantly modify the



contours of the surrounding space. In the relationship of object and space, the space was not put on equal terms with the mass (one of the intentions of the project). The interior cutouts, on the other hand, fostered through subsequent studies, the development of a spatial positive rather than a negative or subtracted substance.

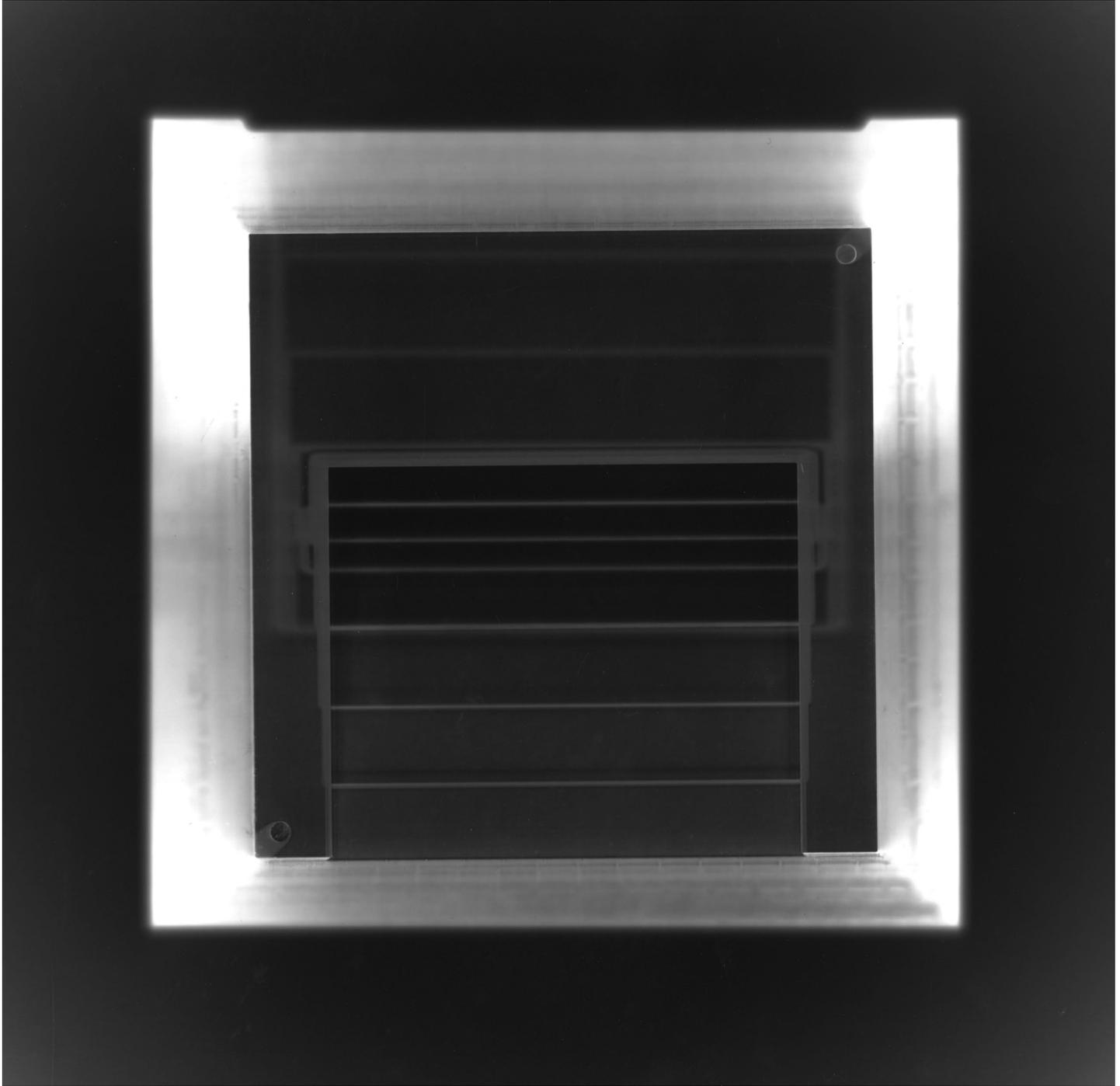
Those students who made cutouts inside each layer were required to imagine, without the benefit of a complete view, the space created inside. This suggested an ability to visualize in advance the three-dimensional possibilities that a flat layer of material with openings in it might offer in its multiplicity. In these cases, the section drawing or the section cut through the synthesized object became an unveiling that showed, in some instances, what had been imagined. In other instances, this revelation yielded surprise results. The intended result of the project is a knowledge acquired by means

of making and a grasp of what is not visible but is *potentially* visible.

#### CONCLUDING CONJECTURES

*"imagination is being able to remember what hasn't yet happened."*<sup>28</sup>

Though the issue of imagination is a complete topic in itself, when speaking of what is *potentially visible*, anticipated vision, the phenomenologists' understanding of it is relevant here. For them, imagination is of a very particular description: it isn't a translation of information gained through the senses and then re-played in our minds. Instead, imagination is an immediate, unmediated awareness not only of a thing as it is, but a thing as it might be in a variety of possibilities; it



goes beyond the visible horizon and the tactile reach.<sup>29</sup> And that seems to be a very important idea for us as designers.

Imagination is about the exploration of possibilities. Making is the visual/tactile result of an exploration of imagined space. And it is an activity that cannot be replicated even in the graphic perfection offered by the computer. The completion of the spatial stage crafted by the imagination is actually a form of anticipation. It

is often said that the Cubists were portraying the world not as they perceived it but as they intellectually knew it to be. But what they were portraying showed awareness not just of an intellectual condition but also an awareness of *potential perception*-exactly what an architect needs to know.

## POSTSCRIPT

What does cognitive depth have to do with learning how to think three dimensionally as a beginning design student? We have described the construction of visual experience as a collaborative undertaking: a conceptual activity, to match pre-existing patterns; imaginative, to complete the spatial stage. The resultant depth implies both a conceptual and implied spatial understanding. The *Layer Assignment* demanded a slowed or incremental approach, in fact reversing the analytic and synthetic phases. Our students are trained to approach a problem sequentially through the phases of thesis—analysis—synthesis. By inverting the conventions—the “making strange” theme of the modern begun by the example of the Cubists, the process of perception and cognition are loosened yet again. This sets the spatial stage for making. A basic difference between scientific and design thinking is to arrive at the thesis not cognitively but through the imagination/memory. As designers we actually think SPATIALLY—and this provides the link to cognitive depth: we can move around the ideas in space, and get the boundaries between to open up by essentializing. Ideas become like other things, making visible relationships.

## NOTES

- <sup>1</sup> Alois Riegl, “The Architecture,” *Late Roman Art Industry*, Rolf Winkes trans. (Rome: G. Bretschneider, 1985, first published Vienna, 1901).
- <sup>2</sup> In this paper we differentiate between the following: **seeing/receiving** is in the realm of the biological eye; **perceiving/vision** is eye + mind collaboration; **making** is eye + mind + hand.
- <sup>3</sup> Alois Riegl, *Late Roman Art and Industry*, p.23.
- <sup>4</sup> Goethe quoted in Gyorgy Kepes, *Language of Vision* (Chicago: Paul Theobald, 1944) p. 30.
- <sup>5</sup> Rudolph Arnheim, *Visual Thinking*, (Berkeley: University of California Press, 1969) p. 27.
- <sup>6</sup> Note that an archaic definition of idea is “a visible representation of a conception, a replica of a pattern.” Source at <http://www.merriamwebster.com>
- <sup>7</sup> Kepes, *Language of Vision*, p. 13.
- <sup>8</sup> Colin Rowe, *The Mathematics of the Ideal Villa and Other Essays*. (Cambridge, Massachusetts and London: The MIT Press, 1976) p. 160-161. In this passage Rowe is quoting Kepes, *The Language of Vision*, p. 77.
- <sup>9</sup> Juan Gris, *Still Life (1914)* in Kepes, *Language of Vision*, p. 95.
- <sup>10</sup> That which “ceases to be that which is perfectly clear and becomes, instead, that which is clearly ambiguous.” Colin Rowe and Robert Slutzky “Transparency: Literal and Phenomenal,” *Perspecta & The Yale Architectural Journal* (New Haven: School of Art and Architecture of Yale University, 1963) p. 45.
- <sup>11</sup> Braque, *Bottle and Fishes*. (L’Estaque, autumn 1910) in William S. Rubin, Picasso & Braque, *Pioneering Cubism*. (New York: Museum of Modern Art Graphic Society, 1989) p. 177.

- <sup>12</sup> Braque, *Violin, Glass and Knife*. (L’Estaque, autumn 1910) in Rubin, Picasso & Braque, *Pioneering Cubism*, p. 176.
- <sup>13</sup> This reading of vision as a cognitive collaboration between hand and eye is indebted to Alois Riegl, “The Architecture,” in *Late Roman Art Industry*.
- <sup>14</sup> Douglas Cooper, *The Cubist Epoch* (London: Phaidon Press Limited, 1971) p. 37.
- <sup>15</sup> William Rubin calls this the “classical” aspect of Cubism. He is quick to point out the lack of consensus regarding many details in the development and interpretation of the Cubism movement of art. Some critics believe that the division between the visual appearance of things and their true essence first entered painting through the work of Poussin. Braque’s look back to Poussin would have traveled through a time in painting where the artist was considered a transparent channel for the perception of the moment *Picasso and Braque: A Symposium*. Org. William Rubin, moderator Kirk Varnedoe, proceedings ed. By Lynn Zelevansky. (New York : Museum of Modern Art : Distributed by H.N. Abrams, c1992).
- <sup>16</sup> Picasso, *Portrait of a Girl* (Avignon, summer 1914) Rubin, Picasso & Braque, *Pioneering Cubism*, p. 333.
- <sup>17</sup> The chronology of the development is documented in Rubin, Picasso & Braque, *Pioneering Cubism*, p. 30 reference to footnote 52. On the distinction between collage and *papiers colles* refer to p. 36ff.
- <sup>18</sup> Wall arrangement at Picasso’s 242 boulevard Raspail studio as photographed by the artist, November-December 1912, incorporating his first construction sculpture, the cardboard *Guitar*, and various drawings and *papiers colles*. Rubin, Picasso & Braque, *Pioneering Cubism*, p. 35.
- <sup>19</sup> Douglas Cooper, *The Cubist Epoch*, p. 27-28.
- <sup>20</sup> Alois Riegl, *Late Roman Art Industry*, p. 26. Agreement with Fiedler on the epistemological nature of art is found in Riegl’s portrayal of the ancients’ fear of space, and their using art to quell this fear by sticking to the plane. Unavoidable space (shelter) was strictly contained—architecture was a boundary of space, not an instigator. The changing appreciation of spatial experience lead to its embodiment in the interiors of Late Roman secular and sacred architecture. Since then the creation of space has been understood as a primary task of architecture.
- <sup>21</sup> Ibid.
- <sup>22</sup> Picasso. *Les Demoiselles d’Avignon* (Paris, June-July 1907) Rubin, Picasso & Braque, *Pioneering Cubism*, p.73.
- <sup>23</sup> Picasso. *Landscape with Bridge* (Paris, spring 1909) Rubin, Picasso & Braque, *Pioneering Cubism*, p.123.
- <sup>24</sup> Vallier, “Braque, la peinture et nous,” p. 16 quoted by Rubin, Picasso & Braque, *Pioneering Cubism*, p.26.
- <sup>25</sup> “Making is a spatial activity.” quoting Kepes in *Language of Vision*, p. 187.
- <sup>26</sup> Laszlo Moholy-Nagy, *The New Vision* (New York: Geoge Wittenborn Inc., 1947) p. 33.
- <sup>27</sup> Kepes, *Language of Vision*, p. 187.
- <sup>28</sup> Isabella Allende quoting her granddaughter in an interview with Bill Moyer on *Now*, June 13, 2003 marking the release of her new book, *My Invented Country*.
- <sup>29</sup> To further clarify this, we can turn to the philosopher Richard Kearney, who wrote about the imagination. He tells us: “Imagining does not involve a courier service between body and mind but an original synthesis which precedes the age-old opposition between the sensible and the intelligible.” Richard Kearney, *Poetics of Imagining: Modern to Postmodern* (New York, Fordham Press, 1998), p. 6.