SARAH OPPENHEIMER IN PERSPECTIVE

Julian Rose

It is one of the great ironies of architectural history that Leon Battista Alberti, who famously published the first description of linear perspective in 1435, explicitly warned architects not to use the technique. Alberti himself was well known as an architect, and he credited another great Renaissance designer, Filippo Brunelleschi, with inventing the system he elucidated. (Fig. 1) Yet despite the fact that perspective was the most powerful tool then available for the representation of space, Alberti dismissed it as useless in his field.[1]

This apparent paradox revolves around the diagonal lines that characterize perspectival drawing. Although they are crucial for making the recession of space not just legible but naturalistic, seemingly almost real, they are unreliable as measures of distance: in creating the illusion of depth, they distort space itself. This renders them impractical, if not downright confusing, for both the architect attempting to accurately lay out the dimensions of a structure and the builder endeavoring to erect it. Architects, Alberti suggested, should stick to the technique now known as orthographic projection, wherein lines parallel in actual space remain parallel in the drawing, rather than converging toward a vanishing point. Here, depth is always approached indirectly—represented through the coordination of essentially two-dimensional representations that show space undistorted, but in only one plane at a time. (Fig. 2) A plan and an elevation, for example, together give an accurate accounting of the space of a building, but offer no impression of what it is like to inhabit: in quantifying and describing space, they transform it into an abstraction.

For Alberti, the distinction between these two representational techniques reflected an essential disciplinary division. While artists should strive to present things as they seem, architects must concern themselves with the world as it actually is. As he put it in his canonical treatise *On the Art of Building in Ten Books*, "The difference between the drawings of the painter and those of the architect is this: the former takes pains to emphasize the relief of objects in paintings with . . . diminishing lines and angles; the architect . . . without altering the lines and by maintaining the true angles, reveals the extent and shape of each elevation and side—*he is one who desires his work to be judged not by deceptive* *appearances but according to certain calculated standards.*"[2] In this rhetoric of truth and deception, Alberti was not only outlining different tasks for architects and painters but positing a profound conflict between *experiencing* space and *understanding* it, between subjective appearance and objective reality.

This fundamental split has persisted into the present, widening as space has become, paradoxically, both more rational and more subjective in the modern era. Industrial capitalism brought with it the need to homogenize and control space with a new level of precision; the open, unencumbered expanses of modern architecture, enabled by the invention of the free plan and the curtain wall, seemed perfectly suited to these ends. This was the terrifyingly objective architecture of the planning grid—of the factory floor, the office cubicle, and the housing block—the space that Henri Lefebvre condemned as having "nothing innocent about it: it answers to particular tactics and strategies; it is, quite simply, the space of the dominant mode of production."[3]

By the time Lefebvre issued this scathing critique in the mid-1970s, an emerging generation of artists was already seeking other options. If modern art had been defined in part by a rejection of the perspectival representation of space, postwar art was often characterized by desire to intervene in space directly, evinced in the proliferation of new spatial strategies ranging from the installation to the earthwork. But as artists tried to open up alternative understandings of space, they inevitably had to turn against

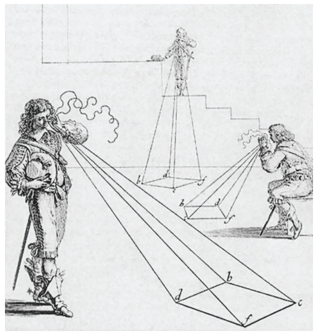

Fig. 1
Detail from Abraham Bosse, *Les Perspecteurs*, 1648

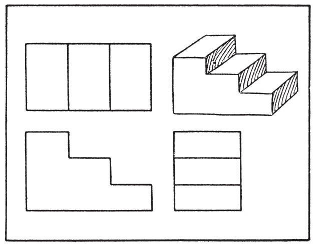

Fig. 2
Orthographic projection drawing of stairs, from Thomas E. French and Carl L. Svensen, *Mechanical Drawing*, 1919

architecture, too, given that it was deemed responsible for manifesting corporate and institutional power in concrete spatial configurations. In response to what they viewed as the hyper-rationalization and abstraction of architectural space, many artists emphasized the fundamentally contingent and subjective nature of experience, turning to understandings of space that were more phenomenological than visual, encompassing time, movement, and an embodied viewer. In this way, the oppositions originally outlined by Alberti—between art and architecture, the subjective and the objective, appearance and reality—were fiercely redoubled.

Today, disciplinary conflicts over the nature of space seem to have reached a strange stalemate. Architects are more and more frequently the purveyors of icons and images, leaving space itself to the specialists who can best organize and monetize it, as exemplified by the common practice of so-called starchitects designing only the form and exterior surface of a building, leaving the interior layout to consultants and efficiency experts. No doubt this trend is exacerbated by an ongoing paradigm shift in architectural representation. As digital modeling and rendering become ubiquitous, architects no longer need to grapple with spatial abstraction and translation on a daily basis and instead enjoy the illusion that they can design directly in real (digital) space. Artists, too, have largely abandoned spatial interventions for the pursuit of spectacular visual effects at an ever-larger scale, as both the production and consumption of art have been increasingly drawn into the branding exercises and global tourism central to the economy of contemporary culture. And so space itself seems to be fading from view in both disciplines, perhaps because its divergent trajectories have proved irreconcilable.

The seeming intractability of the problem of space is what makes Sarah Oppenheimer's work so urgently important. She has placed the centuries-old conflict between experience and understanding at the crux of an oeuvre that continually confounds expectations. At a time when both art and architecture seem to be abandoning space, she brings it back into focus; after decades of artistic hostility toward architecture, she embraces and expands the discipline. And at every stage in her work—from its design to its fabrication to the experiences it engenders—she radically multiplies our knowledge of space, both carnal and conceptual.

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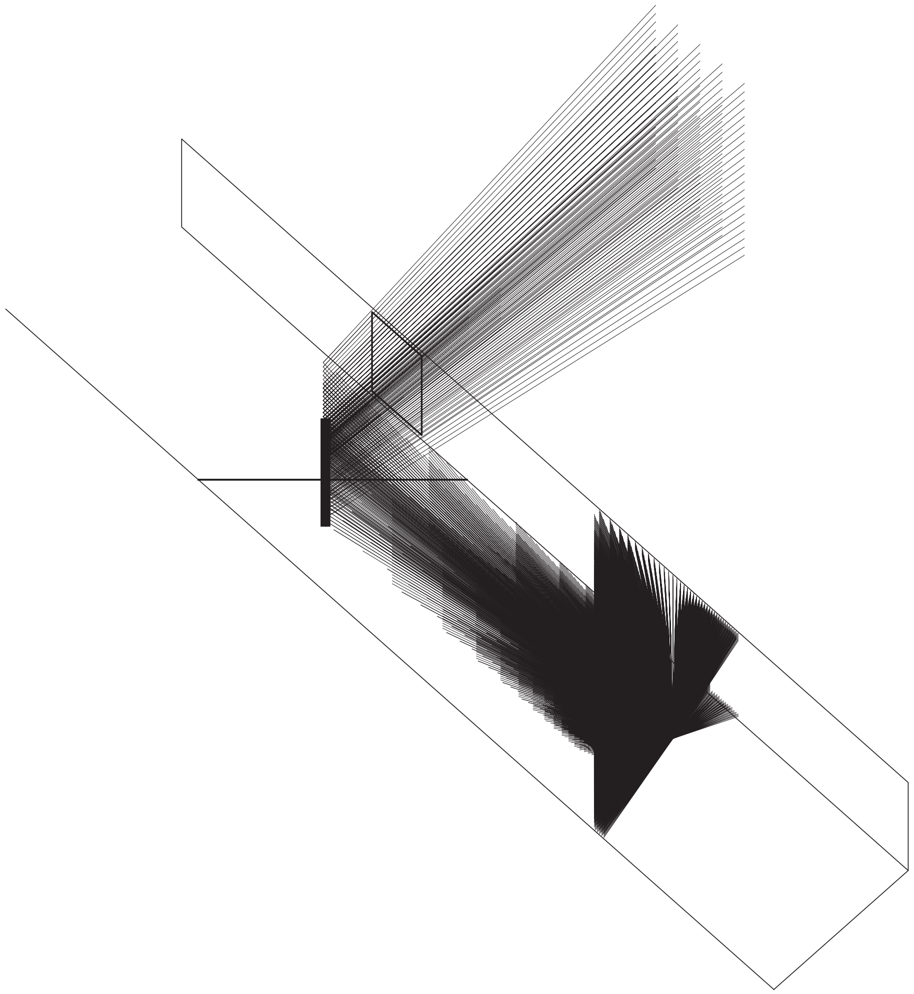
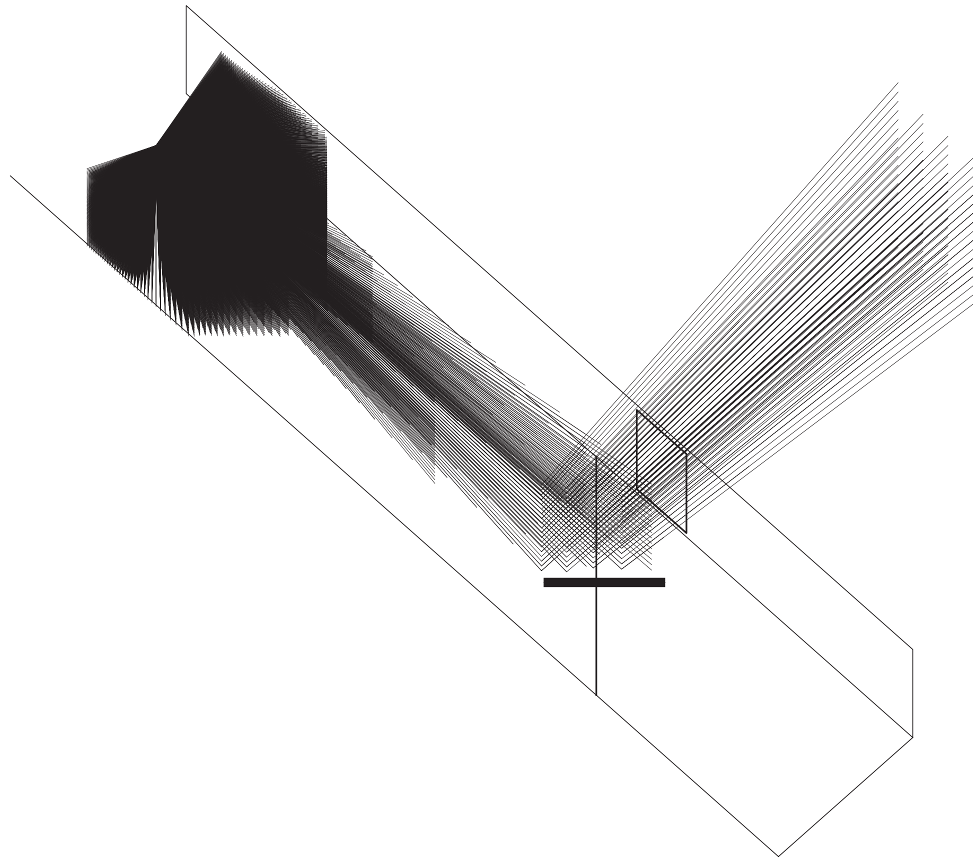
Yet it would not quite be accurate to describe space, per se, as the subject of Oppenheimer's practice. More precisely, her focus could be explained as the rigorous interrogation (and masterful manipulation) of the ways in which architecture frames perception. For Oppenheimer, in other words, space is neither an ideal, ordered expanse nor an impalpable medium of experience, but a concretely bounded set of horizons that generate a range of possibilities for movement and vision. Her first step in beginning any project, then, is to explore the fluid interchanges among eye, body, and architecture that exist within a given structure.

Pages 34–35
Fig. 3
Isovist reflection
diagram: *33-D*, 2014
Dimensions variable

The relationship between these three elements poses a notorious representational dilemma. Within architecture, the perspective drawing was long the method of choice for simulating visual experience, but because it is anchored in a single viewpoint, it cannot address movement, which entails a sequence of shifting viewpoints over time (although the perspective has now largely been supplanted by the photo-realistic rendering, the latter is subject to essentially the same restrictions). A plan drawing, on the other hand, enables the visualization of a range of possible progressions through a space but eliminates the possibility of seeing that space from any particular spot. The increasing popularity of digital animations would seem to alleviate this problem by introducing a mobile viewpoint. But such representations still suffer from the fundamental limitation of perspective, which is that it is by definition impossible to escape the perspective of a perspective view; the viewpoint itself cannot be tracked through space, and so the relationship between eye and architecture can be examined only indirectly.

Oppenheimer has deployed a new tool to address precisely this problem. In the 1960s and '70s, urban planners and landscape designers began to use a kind of diagram they termed an *isovist*, which describes the field of surrounding space visible from any given point. Unlike in a perspective drawing, however, that viewpoint remains visible in the image, sitting at the center of the isovist itself. (The concept is extremely useful in understanding, for example, how new development in a





downtown might affect the visibility of an existing landmark building, or how much of a park can be taken in from a particular spot within its terrain.) Collaborating with a computer programmer, Oppenheimer developed a custom plug-in for her digital modeling software that allows her to place a viewpoint in a three-dimensional model of a space and then visualize the isovist of that point three-dimensionally. Crucially, the software updates the isovist in real time as she moves the viewpoint around the space. (Fig. 3)

Seen in action, this software is remarkable. The isovist of a simple interior can be visualized fairly easily–in an empty room in which all points are visible from all other points, the isovist is isomorphic with the architectural envelope, and remains static as the viewpoint is shifted. But obstructions such as columns, corners, doorways, or windows complicate matters considerably, turning the isovist into a jagged star of wedge-shaped rays streaming outward from the selected point. (Fig. 4) And as the viewpoint shifts, the isovist transforms dramatically, suddenly spraying out through a doorway into an adjacent space, spilling past a corner, or abruptly retreating in the face of a column or wall. The most recent versions of this software produce more complex isovists by taking into consideration such variables as directional movement and reflective surfaces, precisely visualizing the ways in which a turn of the viewer's head, a step forward or backward, or the introduction of a mirror into his or her field of view might limit or expand the range of his or her perception.

p. 36–37
Fig. 4
Isovist study, 2014
Dimensions variable

What is most impressive about Oppenheimer's isovist tool, however, is its powerful combination of analytical abstraction and experiential fluidity. At a time when many architects are using new digital technologies primarily to immerse the viewer within ever-more-convincing simulations of spatial experience, Oppenheimer models spatial experience itself–demonstrating that it is the dynamic product of the ongoing interplay between a mobile, embodied viewpoint and an architectural envelope. And the computer's capability to continuously update the isovist in real time allows her to easily test the effects of an almost infinite variety of interventions–different spatial configurations, different trajectories of movement, different material conditions–in endless combinations. In other words, she has found a strikingly effective method of directly studying the seemingly intangible interactions that are the main subject of her work, laying the foundation for the manifold perceptual effects produced by her pieces themselves.

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Custom computational tools also help Oppenheimer mediate directly between her explorations of space and the material realities of the physical world. The work for which she has become known over the last decade involves subtle interventions into interiors, with each piece structured around a series of apertures (sometimes inserted into existing walls, and sometimes into partitions she has introduced), each sharply delineated by a matte black aluminum sleeve. Although the works are often quite spatially

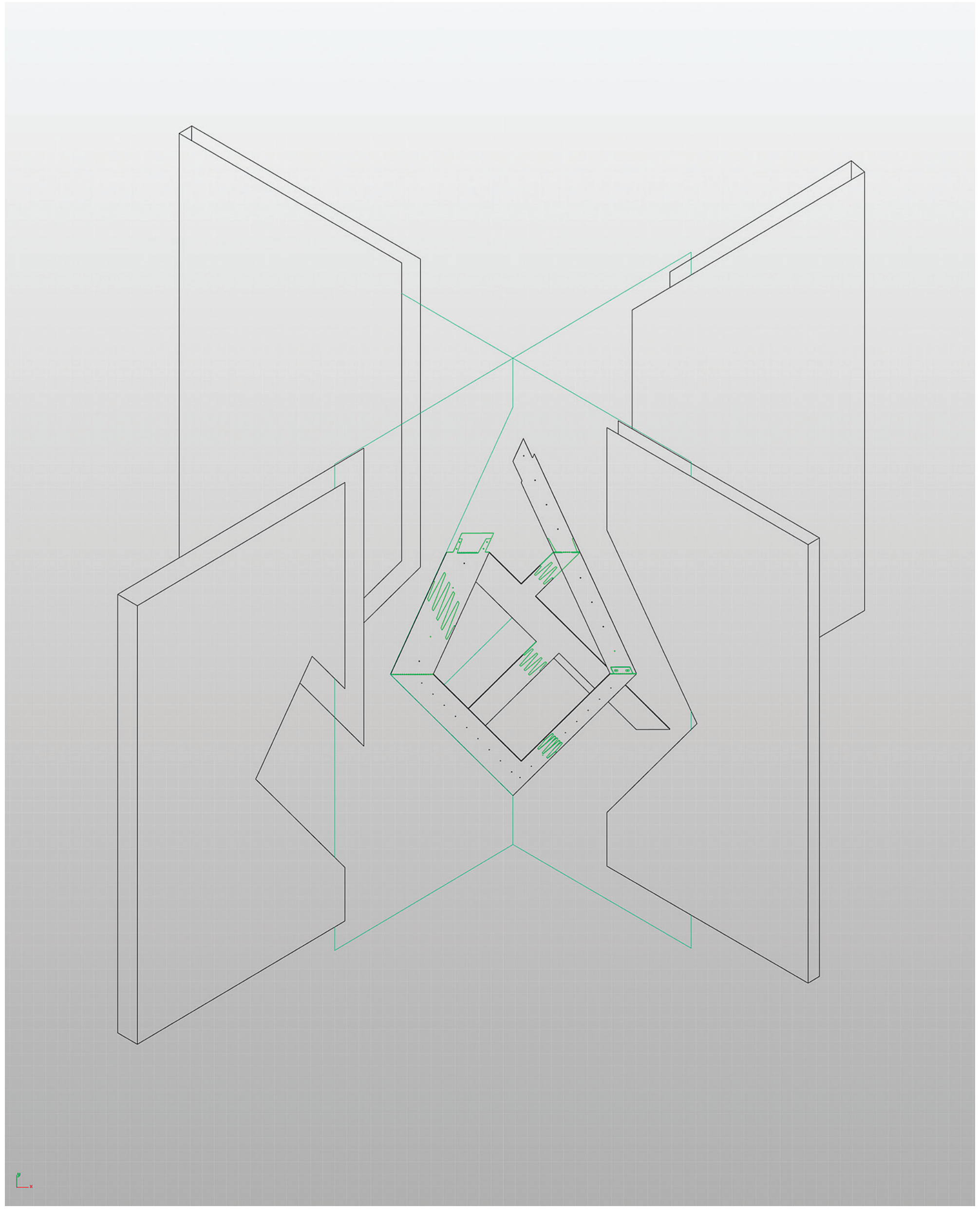

Fig. 5
Assembly diagram, 2012
Dimensions variable

complex, as she develops her design, Oppenheimer models them (digitally) in the simplest way possible: as a series of intersecting planes rather than as slabs of material with actual thickness. (Fig. 5 & 6) By keeping her digital model so minimal, Oppenheimer achieves an absolute conceptual purity. In this state, the entire piece has the strict precision of geometric proof: two planes intersect in a single line, two lines in a point.

But such exactness would seem impossible to render in physical form. The problem is most acute in the joints between the aluminum pieces at the corners of each cut, where intricate geometry necessitates sharp corners and tricky folds in their lining. Here, rather than two weightless planes meeting in a line, Oppenheimer is faced with the messy reality of two quarter-inch slabs of metal butting into each other, requiring a physical connection to keep them from falling apart. The artist had several options for these joints. She could have used hardware to create a mechanical connection, but any brackets or screws would have disrupted the visual clarity of the metal surface, introducing a tectonic dimension that seems at odds with their conception. The aluminum could be cut out in pieces and welded together at angles, but this would be labor-intensive, requiring extensive grinding and hand finishing, and it would be nearly impossible to achieve a crisp corner given the additional material deposited in the joint by the welding process. Alternately, the aluminum could be formed on a break-bender, a tool used to make precise folds in sheet metal. Oppenheimer has experimented with this last option, but although the tool creates bends with a tight enough radius to be suitable for a wide variety of architectural and industrial design applications, she found it to be too imprecise for her purposes. Bending a sheet alters its dimensions minutely, creating a nearly imperceptible distortion by compressing the material on the inside of the fold and expanding the material on the outside.

The technique Oppenheimer has developed, in close collaboration with her fabricators, is analogous to folding paper along a perforated line. Using a CNC milling machine, Oppenheimer removes a thin channel of material from the line along which the sheet is to be bent, and drills evenly spaced holes to facilitate folding. Distortion still takes place, but only across the thin sliver of material left at the joint, and with so much less metal being crunched on the inside of the fold and stretched on its outside, the corner can be formed with near perfection. Moreover, Oppenheimer has developed another software plug-in that largely automates the translation from the flat plane of her model into a cut file for the mill. Despite the origami-like structures the technique produces, then, it has nothing in common with so-called paper architecture, a phrase often used by designers to lend a sheen of avant-gardism to their willful neglect of material problems. Nor is it the "file-to-factory" fantasy of totally automated digital fabrication, where materiality loses its specificity by being entirely subsumed within technological processes, reduced to the generic abstraction of 3-D printer powder. Instead, Oppenheimer uses her software

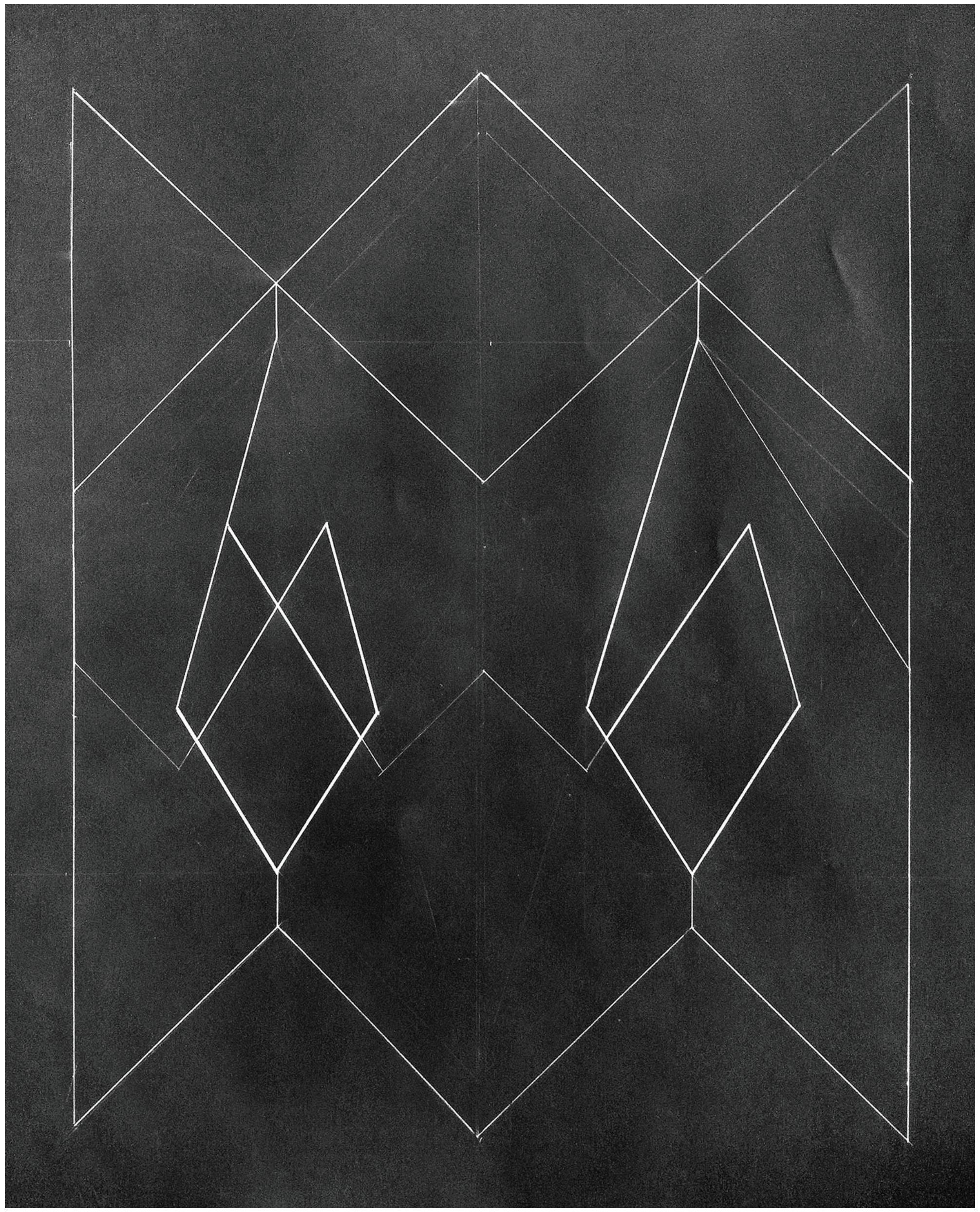

Fig. 6
A/B/C/D/E/F condition:
orientation diagram, 2012
Ink on paper
22-½″ x 26-¼″ (57 x 66.6 cm)

to translate the precision of her digital models into real material structures.[4]

Her construction method is also diametrically opposed to the typical architectural approach. Traditionally, architects start with an assumption about the degree of imprecision inherent in their building materials and work backward, building a contingency factor known as construction tolerance into their designs. While the degree of acceptable tolerance varies greatly depending on the kind of building, the ambition of the architect, and the skill of the builder, in the case of a typical workaday structure–for example the kind of interior stud wall in which Oppenheimer often intervenes (or emulates in her additions to the rooms in which she works)–a normal tolerance would be in the range of a half inch; this means that a given component of the wall could be located anywhere within a one inch zone surrounding the point at which it was drawn on the plan. Working with such a wide tolerance is almost like looking at space through a blurry lens–it is impossible to tell exactly where anything is. Oppenheimer's approach, on the other hand, allows her works to be constructed to a tolerance of less than one thirty-second of an inch: she sets space into razor-sharp focus. While at first glance her work looks like architecture, then, it actually belongs to another spatial order entirely (this is even true of the seemingly unassuming partitions she often introduces–while they appear to be typical Sheetrock walls, they are actually constructed from MDF, which can be cut or milled to much finer

tolerances). This extreme precision establishes a fresh perceptual clarity; viewers become hyper-aware of even the most subtle visual or spatial shifts, and new kinds of effects become possible.

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If architecture is the starting point for each of Oppenheimer's works, it is architecture of a specific type: almost all of her pieces are housed within the blank, rectilinear volume of a gallery or museum. These structures have evolved to offer a vision of space at its most coherent. The white box, that ubiquitous viewing environment for contemporary art, emerged from the belief that gallery space should in no way distract from the art it contains–it must be so obviously legible as to go almost unnoticed. And as linear perspective demonstrates so clearly, understanding space is inseparable from the problem of perceiving depth. While depth perception works according to several principles, the distances within a gallery are far too small for atmospheric perspective to come into play, the occlusion of overlapping planes is generally avoided, and the light is so even that strong directional shadows are eliminated. The only remaining visual cue is the recession of lines in space. These "lines" are formed where the boundaries of the room meet–wall to wall, wall to floor, or wall to ceiling. Because we know from repeated experience that galleries are almost always boxes, we know that all of these lines are *actually* parallel. Therefore, any lines that *appear* to converge are read as a sign of depth–just as in a perspective drawing.

Oppenheimer often begins her intervention precisely at the point where these lines are most visible–in the corners of the gallery. The best example of this strategy to date is probably her 2012 work *D-33*, installed in P.P.O.W Gallery in New York. Here Oppenheimer subdivided the gallery into six roughly equivalent squares (using an arrangement of two parallel walls both bisected by the same perpendicular wall) and then carried out a series of incisions through the walls' intersection. (Fig. 7) The most basic effect of this operation was to reshuffle the visitor's sense of adjacency and path of circulation. Because the openings were large enough to pass through, one could move through the spaces diagonally, transgressing the geometry of the grid that otherwise defines the space and enjoying a series of oblique views through the suddenly interconnected rooms. More importantly, Oppenheimer's intervention effectively removed or obscured the corners themselves. And when walls slip past each other, space becomes ambiguous–in a sense, the effect is similar to that generated by a curved photo backdrop or a panorama, where the absence of a definite corner suggests infinite depth.

In this work, and most others, the cuts themselves run obliquely in relation to the walls and floor. This is a deeply subversive move, because it creates diagonal lines that are not necessarily signs of depth. These lines appear to recede in space but they may not, or they may do so at a different rate than the apparently diagonal (but actually perpendicular) lines running along the junctions of

Fig. 7
D-33, 2012
Aluminum, glass, architecture
Dimensions variable

the walls with the floor and ceiling. The result is wildly exaggerated or confused readings of the extents of the room. For the viewer, walls no longer remain upright, but seem to lean crazily or threaten to collapse inward, as if the gallery had been rebuilt according to some mad, expressionist geometry.

All of this is the product of false signs of depth. To the degree that perspective is indeed a visual language–a symbolic form, as Erwin Panofsky famously argued–Oppenheimer is deconstructing it, piece by piece.[5] Indeed, when several successive generations of twentieth-century artists rejected perspective and the depiction of space in favor of actual spatial intervention, they did not really leave the problem of representing space behind. For when it comes to space, and particularly depth (the primary subject of perspective), experience itself essentially amounts to an act of systematic interpretation; even in physical space, we perceive depth primarily by "reading" the signs of perspective. Yet, as countless commentators have pointed out, perspective approximates, but cannot fully capture, depth as we live in it. In his *Phenomenology of Perception*, Maurice Merleau-Ponty referred to depth as "the most 'existential' of all dimensions" because "more directly than the other dimensions of space, depth forces us to reject the preconceived notion of the world and rediscover the primordial experience from which it springs."[6] This explains why Oppenheimer's incisive plays of diagonal lines seem to have more urgency and impact than we would expect from a purely linguistic operation, no matter how radical; in disrupting perspective, they encourage us to look past it, and thereby rediscover some of space's raw, enigmatic character.

Yet these same works also undertake fascinating plays with flatness. Because the aluminum lining is a deep, matte black that absorbs light rather than reflects it, the metal bands tend to flatten out, almost as if they are hovering vertically in front of one's plane of vision. This graphic, almost pictorial quality creates eccentric patterns so complicated that it seems impossible that they could have been generated by simply carving through the intersection of two perpendicular planes. But while the practice of "cutting a section" has long had an explanatory and clarifying function in architecture, used to create drawings that reveal a building's underlying order, it is also an excellent way to release underlying complexity by abruptly reducing the three dimensions of a given spatial configuration to the two-dimensional plane of the slice. A section drawing relies heavily on the convention of making an incision along an axis parallel to the walls of a building. Crucially, the plane of this cut is also perpendicular to the direction of the viewer's gaze. In other words, a section drawing is organized so that you are looking straight through the imaginary window that constitutes both the drawing's surface and the section cut. This logic is, in a sense, replicated by the typical mode of viewing two-dimensional work in a gallery, where a visitor looks directly at a wall, directing his or her gaze to meet it squarely at ninety degrees. Routine

punctures in gallery walls such as windows and doors don't look alarming, because they create holes that are parallel to both our viewing plane and the walls themselves. But when the plane of cutting is not parallel to the plane of viewing, the compression of three-dimensional space into the two-dimensional surface of the cut quickly gets out of hand. In this way, an oblique slice through two perpendicular, intersecting walls can suddenly produce an eccentric figure that looks something like the result of a jarring collision between two mirrored Ys, a shape so complex it seems impossible for it to have been contained within the sober geometry of a ninety-degree corner. Oppenheimer thus reminds us that even if the typical room has been constructed to ensure that space is as legible as possible from our particular point of view—lines neatly receding into the distance, walls reassuringly straight, and corners at exactly ninety degrees—the space contains latent complexities that are revealed as soon as it is analyzed according to another logic.

As if all of this were not enough, Oppenheimer has also used glass to introduce another layer of visual effects into many of her pieces, most impressively with *33-D*, 2014, installed at the Kunsthaus Baselland. Glass can produce extraordinarily complex perceptual effects, but architects tend to domesticate it. Safely contained within a frame, and set parallel to our plane of vision (as in most windows and doors), it is something we look through and rarely notice. But take it out of its frame, and its edges will disappear. When viewed from an oblique

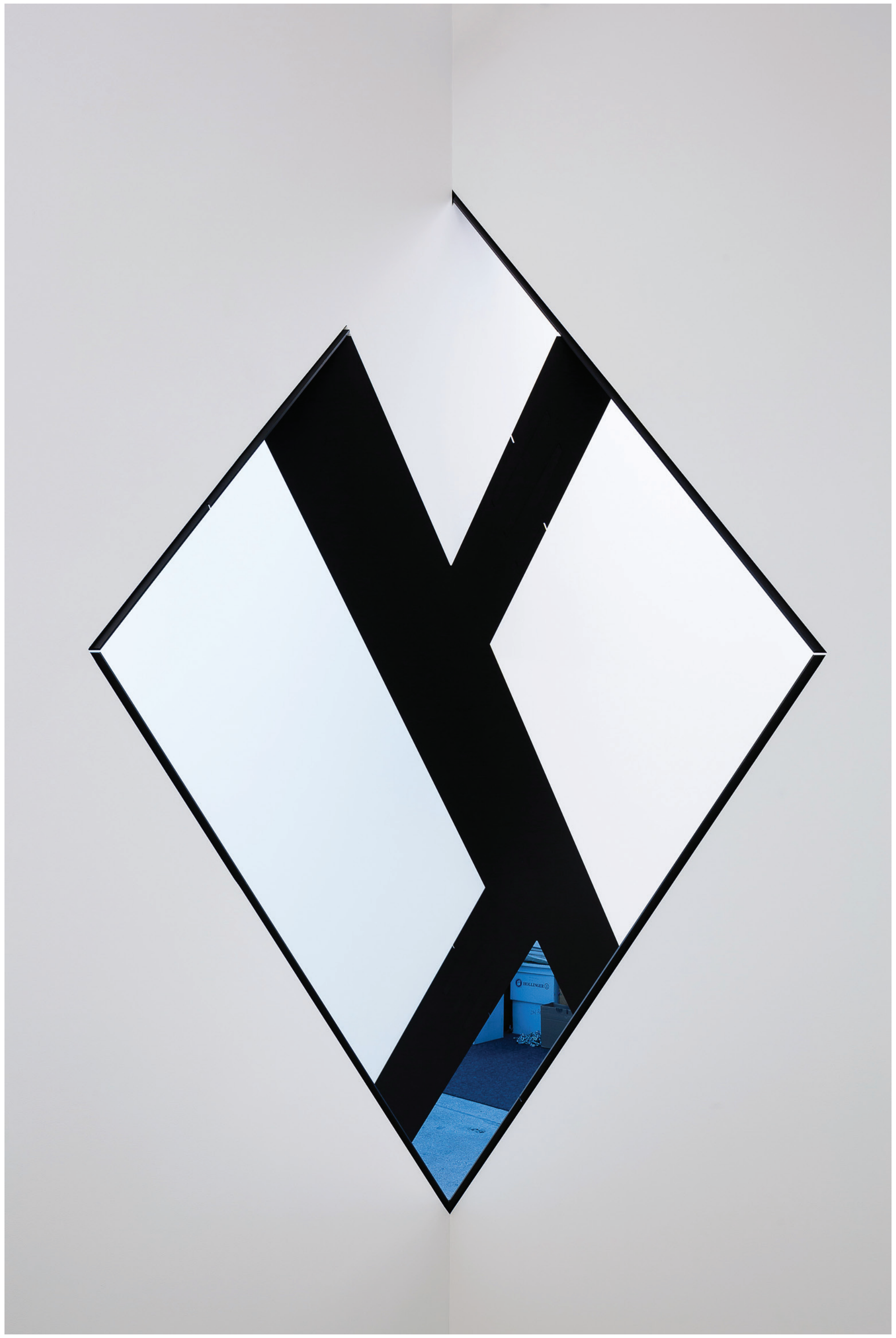
Fig. 8
Two views. *33-D*, 2014
Aluminum, glass, architecture
Dimensions variable

angle, or tilted in relation to the plane of a wall, it will bounce one's gaze in unexpected ways, producing destabilizing reflections. In *33-D*, Oppenheimer has inserted a sheet of glass into each of the two main openings (cuts through white walls lined in black aluminum, similar to those in *D-33* and most of her other works from recent years) that constitute the piece. (Fig. 8 & 9) The glass is rotated ninety degrees from the wall and passes through the aperture, so that it protrudes into the room on either side. Oppenheimer has purposefully left the edge of the glass sheet unpolished, its dull, milky surface melting into the air rather than creating a strong visual highlight, so that locating the edge of the sheet or understanding its orientation or dimension becomes extremely difficult; this indeterminacy blends the space of the work into that of the surrounding room.

Adding to the confusion about where the glass stops and starts—indeed, where it *is* at all—each sheet is exactly perpendicular to the floor, in the same vertical orientation as the wall it intersects, which means that it reflects that wall in such a way as to precisely double it. In other words, looking at the glass, one sees a perfect continuation of the line where the wall meets the floor, as if the wall itself continues and the glass is not there. This seemingly simple visual sleight of hand is entirely dependent on the remarkable precision with which Oppenheimer's works are constructed—if the glass and the wall were even a fraction of an inch out of alignment, the reflected line would swing up or down and the effect of

Pages 52–53
Fig. 9
Two views. *D-33*, 2012
Aluminum, glass, architecture
Dimensions variable

continuity would be broken. It is also perhaps the most thought provoking of her interventions. Most perceptual illusions are constructed around a single point of view, and so are quickly exposed to the roving viewer. This is certainly true of a perspective view constructed on a flat plane, as Brunelleschi himself emphasized in his most famous demonstration of his newly invented technique, wherein he forced viewers to look through a peephole at the reflection of one of his paintings in a mirror—rather than at the work itself—in order to ensure that it could be seen only from the point from which the illusion was most convincing.[7] But in *33-D*, the doubling of the reflection is *not* dependent on a fixed viewpoint, because it is solely the result of the relationship between the glass and the wall—of shared vertical orientation and perpendicular intersection—and accordingly, the effect will remain the same no matter where the viewer travels within the room. The persistence of this illusion even in the face of the viewer's movement calls into question the commonly assumed opposition between the way things seem and the way things are that is both endemic to art and architectural theory and as old as philosophy itself. Alberti, for example, dismissed visual effects as "deceptive" because he saw them as divorced from the objective standards by which architecture should be measured. But the ghosted wall created by Oppenheimer's reflective glass reminds us that sometimes the underlying order of the world is in fact made manifest through the impressions it produces, and that experience is neither entirely



subjective nor totally objective: it is a bridge between appearance and reality.

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A common trope in the discourse emerging around Oppenheimer's practice is the description of her pieces as disorienting. But this reading is a disservice to her work, which is about nothing so easily comprehensible as perceptual incomprehension. That narrative also fails to distinguish her contributions from the flood of work in recent decades that, in the guise of an exploration of experience, posits space as both immersive and essentially unknowable, an atmospheric condition or affective medium, favoring special effects that extravagantly transgress the limits of perception. In a sense, such work has fled from the inherent incongruities of space, as if surrendering to their insolubility. But these contradictions will continue to animate Oppenheimer's work precisely because she too recognizes them as ultimately unresolvable. Layering multiple articulations of space–some complementary, some contradictory–into a single architectural container, Oppenheimer abandons the binaries and dialectics that have so long structured our understanding of space in favor of a carefully calibrated embrace of simultaneity.

1 Appropriately, given his views on its application, Alberti published his description of perspective not in his writings on architecture but in his treatise on painting: Leon Battista Alberti, *On Painting*, trans. John R. Spencer (New Haven: Yale University Press, 1966). Originally published as *De Pictura* in 1435. His warning against its application in architecture was published in his treatise on architecture, *On the Art of Building*, discussed below.

2 Leon Battista Alberti, *On the Art of Building in Ten Books*, trans. Joseph Rykwert, Neil Leach, Robert Tavernor (Cambridge: MIT Press, 1988), 34. Emphasis mine. First published as *De Re Aedificatoria* in 1485.

3 Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith (Oxford: Blackwell, 1991), 360. Originally published as *La production de l'espace* in 1974.

4 I am grateful to the architect Leo Henke for sharing his insights regarding the application of computational tools to material problems in architectural construction, which have been invaluable in shaping my understanding of this aspect of Oppenheimer's work.

5 Erwin Panofsky, *Perspective as Symbolic Form*, trans. Christopher Wood (Cambridge: Zone Books, 1997). Originally published as *Die Perspektive als 'symbolische Form'* in 1927.

6 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 2002), 298. First published as *Phénoménologie de la perception* in 1945.

7 For an extensive discussion of Brunelleschi's experiment with this panel, now lost, which apparently depicted the Florentine Baptistery, see: Hubert Damisch, *The Origin of Perspective*, trans. John Goodman (Cambridge: MIT Press, 1994), especially pp 88–98. First published as *L'origine de la perspective* in 1987.