

The tricks of architectural space

BY RICHARD A. MILLER

Perhaps the least understood aspect of the great art of architecture is the simple question: how does the human eye see "empty" space?

It is a commonplace of architecture that its essential product is "space." Invariably the first decision of the client relates to how much "space" he will need, and to what kinds. And yet this central commodity of architecture, space, is paradoxically enough the one that is least often examined systematically. The physical dimensions are established easily enough. The quality of a space, the way the space "feels," is something else, and it depends first of all on how space is seen.

The perception of the outside world is relatively easy close up where all the senses operate and where the synthesis of their reports can be checked by some action on the part of the observer. But beyond the reach of the arm, it is not so easy. In fact, in apparent contradiction of the current saying that "architecture is space," space alone cannot be "seen" at all. Space is only seen in terms of the "things" in it. According to Philosopher Alfred North Whitehead, "the suggested procedure [for understanding space] is first to define things in terms of the data of experience, and then to define space in terms of the relations between things."

This is precisely what architects have been doing since the beginning of time, by enclosing space in walls or by punctuating it with columns. To a large degree, this is also what was proved by the classic demonstrations in perception, like the famous "fool-the-eye" demonstrations of the Dartmouth Eye Institute. Despite some of the naïve conclusions projected from the demonstrations (e.g., that the role of previous experience in perception proved the importance of traditional architecture) and despite the continuing questioning of psychologists (e.g., how much of perception is learned and how much is an innate part of the human structure), the basic demonstrations give some important cues to how depth is perceived and how space is perceptually "organized."

Art Professor Hoyt Sherman of Ohio State University, who has done a great deal to relate psychological theories of space perception to art and architecture, recently said: "Space is a judgment. It is perceived in a transaction in which external stimuli, abstracted by vision as cues, are interpreted by past experience, future anticipation, and immediate purpose." The so-called cues are the keys to the transaction. The binocular cue of "disparity," which uses both eyes to localize a position in space, is not particularly influential beyond 20 ft. Beyond that, and in perceiving the close-in environment as a "whole," the influential cues are monocular (or one-eyed). Since the retina of the eye is a two-dimensional screen in monocular vision, three-dimensional space is really perceived by two-dimensional cues.

Although the perception of space requires a continual feed of stimuli which are received and interpreted by man as he moves about in the space itself and, in effect, sees a motion picture of it, the basic cues can be analyzed in still photographs like those that follow.



NEW YORK WORLD TELEGRAM & SUN

Position

The simplest way of defining space is by means of the relative position of objects in it. Without the towers, this foggy space above Manhattan would be impossible to see in terms of depth or orientation.



TORKEL KORLING

Position

In Frank Lloyd Wright's Johnson Wax building, the columns are positioned on a regular grid on the floor, and they sweep up and out to touch one another at the ceiling. The position of the observer in relation to close-in columns can be used to judge space farther out aided by the regular decrease in column size. Other space cues are minimized by long horizontal lines, curved walls, and glass corners at the ceiling, thus presenting a synchronous, nondistracting environment for work.



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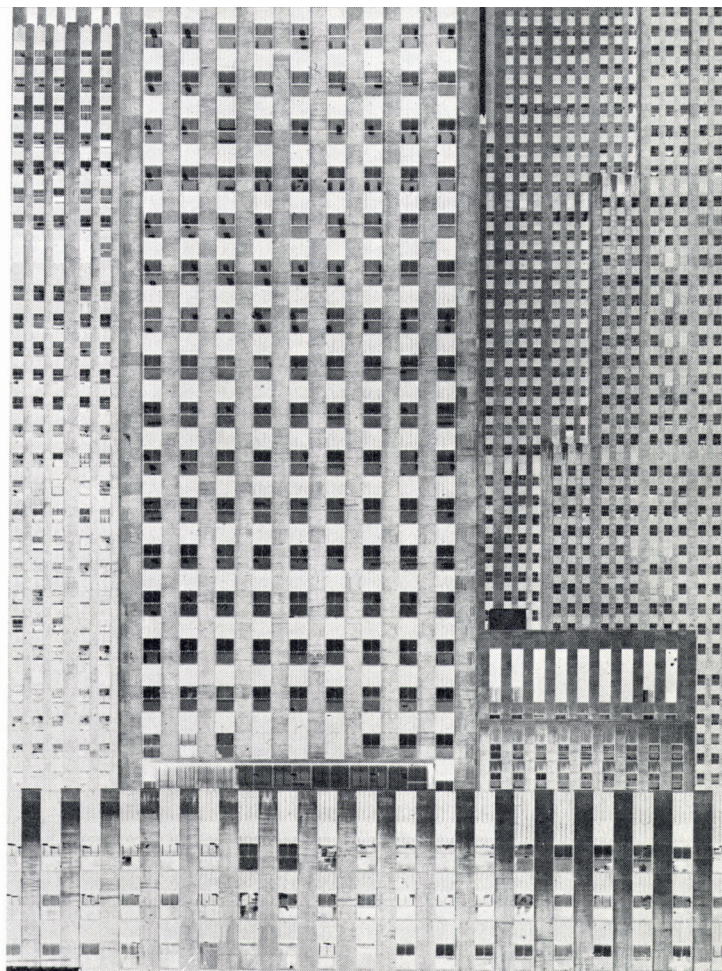
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Size and brightness

At a quick first look, the right photo in this pair of views of Skidmore, Owings & Merrill's Connecticut General building appears to have been taken from farther away; actually, both photos were taken from the same position. There is a conflict between the space cues given. The brightness of the night-lit windows appears to bring them closer, but their apparently smaller size works even more positively to push them back. Actually, the daytime "window" is window-and-spandrel. At night, only the actual window is bright.

Size and alignment

The relative distance of these Rockefeller Center buildings, all seen head-on, is judged primarily by the apparent diminution (at increasing distances) of the windows, which the viewer subjectively judges equal in actual dimension. In the distant building, the difference in horizontal alignment between windows in the front face and those in setbacks is an additional cue to depth.



PETER R. PETERSEN

Size and overlay

The cues of relative size and "overlay" determine the space occupied by these theater seats. Here, overlay is simply the way in which the back of one seat overlaps the back of the seat farther forward. If the observer imagined that the seats were cobblestones, the apparent distance would be much less. Psychologist James Gibson describes the method of judging "near" or "far" on the basis of "bigger" or "smaller" apparent size in very small things (such as cobblestones) as the "texture gradient" method.



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ANDREAS FEININGER—LIFE

Atmosphere and overlay

Snowflakes (or fog or smoke particles) actually "fill" space, allowing a judgment of depth on the basis of apparent density. The density of the atmosphere increasingly obscures objects that are farther away. In this picture of New York's Fifth Avenue, distance is read also by the overlay of the buildings. Where relatively more of the side of a building shows, one judges that the intervening space between the building and its near neighbor is relatively greater.

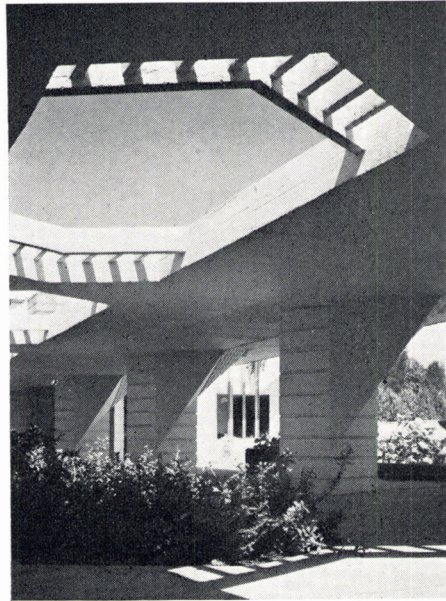


Overlay

In contemporary architecture, which includes fewer size and position cues (e.g., smooth glass walls have replaced "windows"), depth perception is heavily dependent on overlay cues. In SOM's Inland Steel building in Chicago, the huge projecting columns have enough depth to provide a clue to the space between them even though the camera viewpoint is very nearly in line with the face of the columns. Smaller columns, more closely spaced, would appear as a flush surface from this point of view.

Overlay

The off-the-right-angle surfaces of the piers in Frank Lloyd Wright's colonnade at Florida Southern College increase the apparent distance between the piers because more of each pier is apparently exposed behind the overlay of the pier in front of it. Wright, widely recognized as a master of architectural space, intuitively used all the various space cues.



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AARON SISKIND

Figure-ground and position

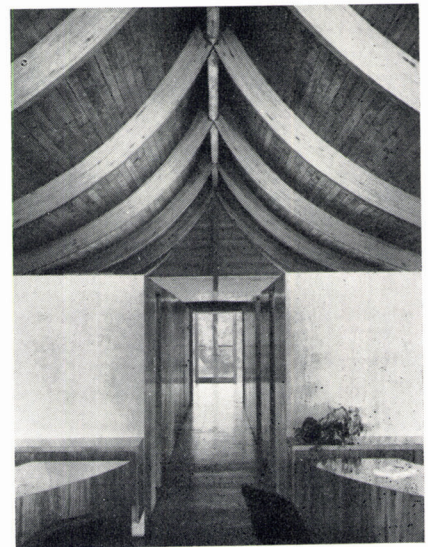
Gestalt psychology suggests that man sees the whole first, the parts later. This instinct leads one to assume that the poster in this typewriter showroom is on the wall because the wall is the anticipated "ground" or environment for a "figure" (in this case the poster). Actually, the poster is on a pipe standard several feet from the wall. The position cue of the column intersecting the floor is not so powerful as the tendency to "put" the poster on the wall.



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Coincidence of edge

In this picture of Victor Lundy's Chamber of Commerce building in Sarasota, Fla., the curving slope of the roof at the end of the building appears to be closer to the camera because the ends of the hip rafters coincide with the corners of the nearby partitions. What appears to be a flat corridor ceiling is actually a vertical glass wall at the end of the building. Coincidence of edge causes objects that lie at different distances to appear to lie at the same distance. Large objects tend to dominate, pulling the small ones to them.



ALEXANDRE GEORGES

Figure-ground

Until 1940, the pattern of the pavement of the Campidoglio in Rome (photo left) emphasized the actual oval shape of the plaza because the radial lines could be easily read as varying in length. Then, Michelangelo's original design for the pavement was restored (photo, right). The intricate pattern obscures the actual shape, and the viewer is likely to conclude, at first glance, that the area is a circle. The pavement pattern tends also to heighten the slight rise of the pavement toward the equestrian "figure" at the center.



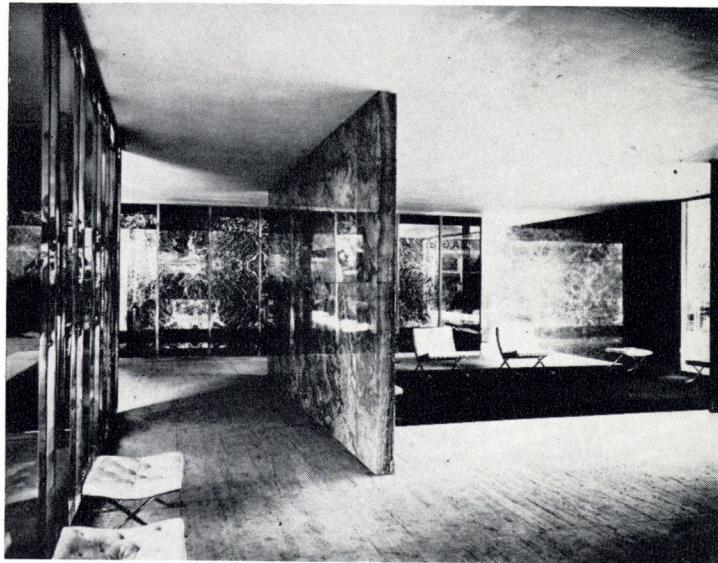
FOTO-ENIT-ROMA



RICHARD MILLER

Closure

The contemporary open plan is a product of the recognition that man moves through space. Pioneer architects like Mies van der Rohe realized that space could be closed incompletely by walls, leaving the rest of the job to the occupant's innate tendency to provide closure. In the interior of Mies's famed Barcelona pavilion, the occupant had many closure choices available as he moved around the space. This choice is one of the "freedoms" of modern architecture.



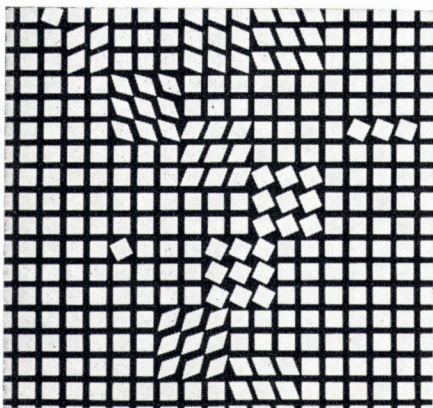
COURTESY MUSEUM OF MODERN ART, N. Y.

LUCIEN HERVE

Continuation and alignment

In an advertisement for the Italian art periodical *Quadrum* (photo, below) the disturbing "movement" of the groups of diamond shapes occurs because of conflicts in organization. With great concentration, one or more of the groupings can be brought to apparent rest, but only for a few moments. These conflicts do not exist in Le Corbusier's Marseilles apartment building (right) despite variations in pattern because vertical and horizontal alignment and continued lines maintain overall organization.

OLIVETTI CORP. OF AMERICA



Summary

The cues to depth perception illustrated are position, relative size, relative brightness, and overlay. The cues to space organization are coincidence of edge, figure-ground, closure, continuation, and alignment.

