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Dick Termes and his Spheres

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When one of Dick Termes's sons was asked what his father does for a living, he said, "my dad's work is like taking your eyeball out of your head, putting it in a building, and when it spins you can see everything from that one point in space." Termes laughs, but admits the description fits. His Termespheres are one-of-a-kind painted balls on which one can view the inside of the Pantheon in Rome or St. Peter's Cathedral, or a geometric surrealistic scene, as if it had been painted looking out through a transparent globe. In a Termesphere, however, you are on the outside of the globe looking in! Mercator and others attempted to paint the globe onto a flat surface, but Termes does something different—he paints the world around us onto the globe. As a creator of more than 150 Termespheres in the past 32 years,

Dick Termes is truly the modern master of perspective. "Whereas Picasso and the cubists painted a violin as if they were looking all around it," Termes says, "I paint as if I were the violin looking out at the world." As a result, comprehending a Termesphere takes us into a fairly amazing new sense of perspective.

Gaining Perspective

To understand the idea, let's begin with a cube. We build rooms in the shapes of cubes, and our rooms generate cubic houses. Cubic stores and apartments require cubic buildings to contain them. Before long, fences and streets meet at right angles, and so do property lines, and eventually we have ... Colorado, Wyoming! Similarly, cubes recreate themselves within our houses, as we stock up with cubic refrigerators and square rugs and paintings, or even cubic computers to chew up square pieces of paper with little cubic paragraphs which comprise this issue of *Math Hori-*



"Fish Eye View"

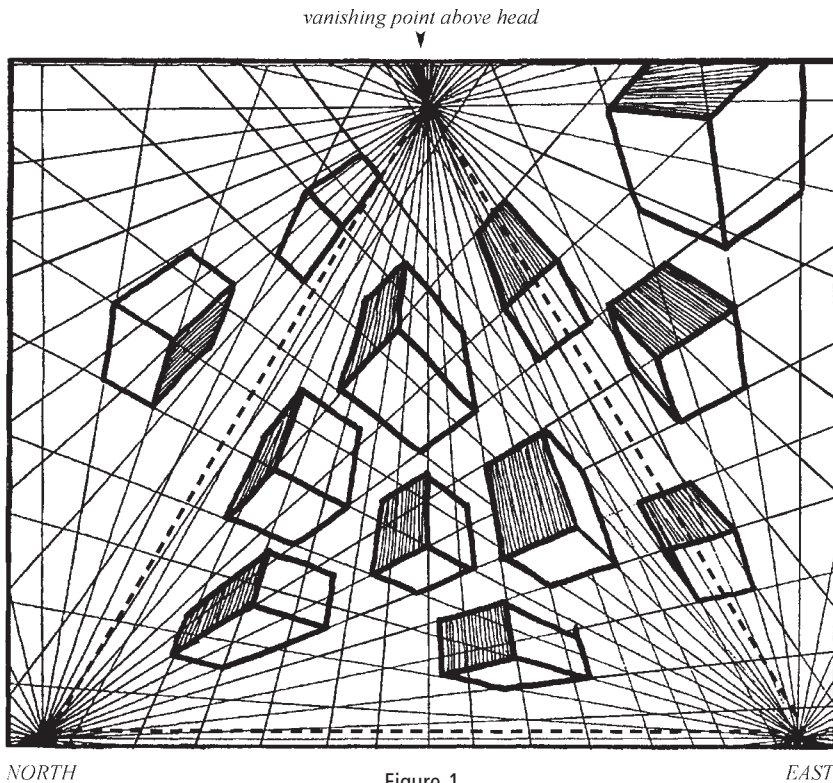


Figure 1

zons. With cubes, things just fit. And the cube happens to provide a wonderful playground for the study of perspective.

Consider the worldly cube. It has three sets of parallel lines. If the lines of one of those sets meet at a vanishing point ahead of you, as a pair of railroad tracks might, you get one-point perspective. Artists got to this stage in the Renaissance. Two-point perspective takes two different sets of parallel lines on the cube to two vanishing points, say to the east and north of you (90° apart). In 3-point perspective, each of the three sets of parallel lines on the cube has a vanishing point. If, on a page, we draw converging parallel lines from all three directions of the cube, we obtain a grid containing three vanishing points, which perhaps represent the zenith (above you) at the top of the page, and the north and the east at the lower corners of the page. (See Figure 1.)

What in the world can 4-point perspective mean? Termes suggests two ways to grip this concept. For example, you can have vanishing points at the east, west, zenith and nadir (below you)—as if you were hanging onto the middle floor of a skyscraper and peering above your head and below your feet. (If you *do* grip this perspective, you will be gripping hard!) In this perspective, something strange happens when you attempt to reproduce what you see onto a flat piece of paper. The zenith and nadir vanishing lines bulge in the middle of the paper (as you register nearby objects, such as the flagpole you are clutching) and they taper at the top and bottom (as you scan down the building or upwards to the rescuing helicopter) Thus the up-

down perspective lines on your grid curve out like the lines on a football (Figure 2). Termes calls this the first curved-line perspective; it is a perspective that can give you vertigo!

There's a different way to think about 4-point perspective. In Termes's "continuous" 4-point perspective, the zenith-nadir (up-down) lines stay parallel, but the east, north, west and south directions all become vanishing points. Imagine trying to reproduce a room around you by sitting with a drawing pad in a swivel chair in the middle of the room. As you face a picture on the north wall, it appears to bulge out, just as the east-west lines leading to the corners of the room in your peripheral vision converge. But as you swivel around in your chair and face an adjacent wall, it's now the north-south directions with the vanishing points. Wait a minute! A vanishing point for this wall is smack in the middle of the previous wall. Obviously, the drawing must suppress some of this intrusion of vanishing points. In fact, the way to approach continuous 4-point perspective is to start with a long strip of paper on which north, east, south,

west, north vanishing points are lined up along the equator of the paper. Elliptical grid lines for east-west vanishing points intersect with the elliptical north-south vanishing lines. When the page with its drawing is rolled into a cylinder, the walls and

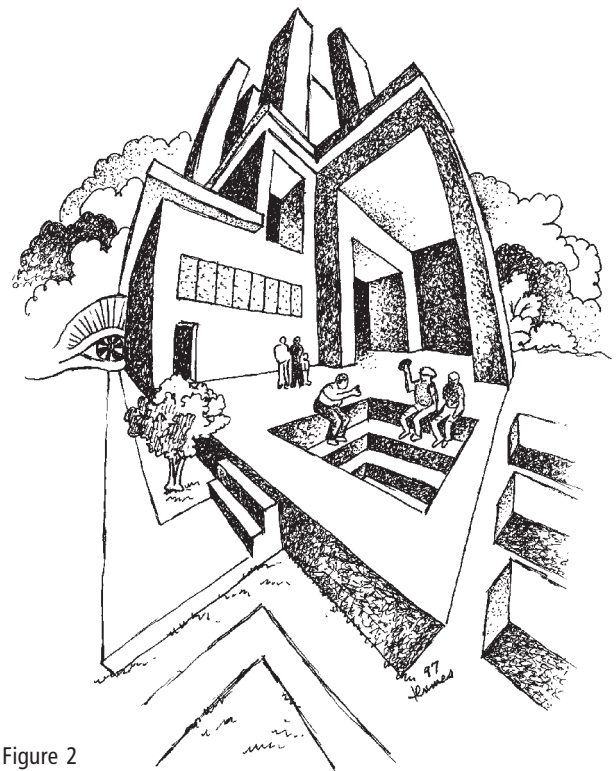


Figure 2

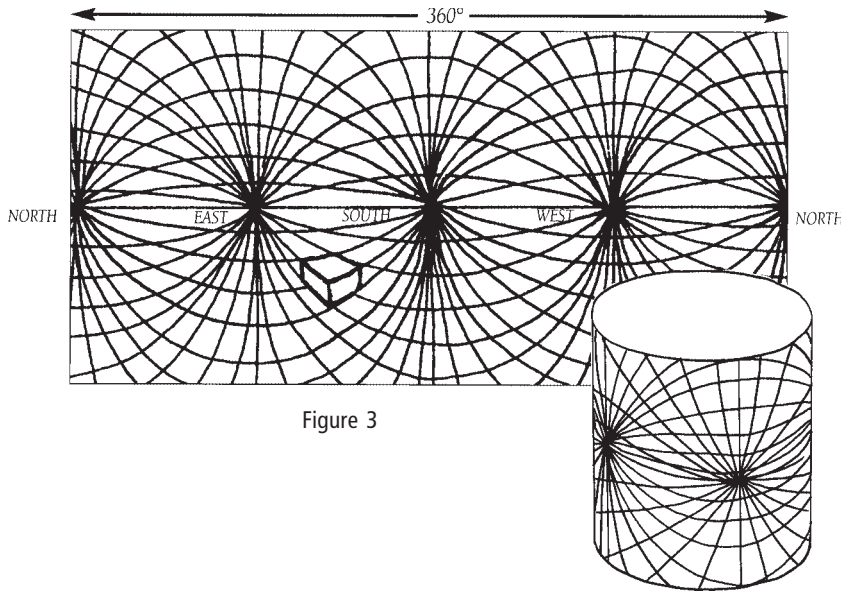


Figure 3

objects in the room look big and small like a visual Doppler effect. (See Figure 3.) Squeezing inside the cylinder and looking around produces the truest view. In fact, you don't need to be sitting in the center of the room: you can be located anywhere within the room and the perspective grid will still work.

Confused? Try the wonderful training exercises, abundantly illustrated, in Termes's book, *New Perspective Systems*. Now the plot thickens. To understand 5-point perspective, think of looking directly through a transparent hemisphere which has been formed by slicing a sphere vertically. Facing into it, paint the world around you onto the inside of the hemisphere. Observe the vanishing points east and west, zenith and nadir, and north—the points to your left and right, above and below you, and straight in front of you. Stand back, so the hemisphere looks flat like a disk, and you will find the center of the disk (which was straight ahead) is in fact the north vanishing point. This is 5-point perspective. (See Figure 4.)

Perhaps you now see 6-point perspective quite literally coming around the corner. Just add the vanishing point to the south, that is, behind you. You now see two disk-like drawings—one for the view ahead, and one for the view behind you. Or if you are Dick Termes, you turn around and around and reproduce the view onto a sphere. Now any couches or television cabinets in a room that had disappeared at the edges of disks in 5-point perspective, continue on. Of course, you are seeing the picture from *outside* the sphere. But to Termes, translating a concave view (from inside the sphere) to a convex one (on the outside) is a simple and natural exercise, one which definitely adds to our interest. Incidentally, if these six vanishing points are making you think of the six faces of the cube or the six vertices of its dual, the octahedron, your thinking is on the right track.

Is this life in a fishbowl? Well, yes. Termes has painted life from the inside of a fishbowl in his painting *Fishbowl*. (See page

15.) Fish are swimming around you, and you have a fisheye (this is *your eye!*) view of the cat. He has also painted many cathedrals and other buildings onto spheres. Termes did his preliminary sketches on location at such places as the steps of the *Paris Opera*, the lurking grounds of the phantom of the opera. He sometimes uses his own patented camera, which he mounts on the sides of regular solids, such as dodecahedra. Photographs taken from all the sides of the solid are matched up and reproduced onto actual dodecahedra which adults and children can reconstruct from their flattened forms.

Looking for Order

It may help to understand Termes's 6-point perspective by considering how he mass-produces some of his spheres. A sphere is composed of two hemispherical polyethylene light fixtures which are lightly glued together. A scene is painted on the sphere with acrylic paints, and the sphere is popped apart into its two original hemispheres, which are then put into an oven. The paints melt to the plastic, and as the plastic melts into the disks, the distortions of 5-point perspective are perfectly maintained. The flat paintings on the disks are now reproduced as silk-screens and the process is put into reverse. The silk-screens are printed onto plastic disks which are returned to the oven to be blown back into hemispheres which are then glued together to be reborn as Ter-



Figure 4



Dick Termes at work on "Platonic Relationships."

mespheres. On the other hand, the creation of a *one-of-a-kind* Termesphere may take as long as a year.

Is there life beyond 6-point perspective? Yes, says Termes. For example, frequently in a large building like the Notre Dame Cathedral in Paris, the tiling of the floors is diagonal to the main lines of the building. Add a chair or a table "catty-wompus," and you introduce more vanishing points. Edges of objects all lie on great circles; unfortunately, too many of these additions create "an ugly picture." Termes believes that order makes things beautiful, and our eyes can take only so much in the way of disorder.

The largest Termesphere was commissioned by the Law Enforcement Academy in Douglas, Wyoming. This 7-1/2 foot di-

ameter ball was originally destined to become a giant orange, rotating Union 76 gas station sign before it was hijacked by Termes in its transparent state. He explains his painting in this way "You have orderly and disorderly people, and they must live together." Two groups populate the sphere: orderly people, recognizable by their conical hats, *construct* polyhedra and disorderly people in inverted conical hats *chip them away*. This outdoor Termesphere is painted from the inside and like its genetic parent, the Union 76 sign, it lights up and rotates.

Looking for Order is the name of one of the latest Termespheres. This sphere is illustrated with portraits of Einstein at different ages of his life. Reflecting on Einstein's quote that if you could look far enough in one direction you could see the back of your head, one of the artist's many translucent cubes in the portrait emanates from Einstein's eye, circles the sphere, and returns. This rotating piece, which dedicates itself to dimension and time, might have received a nod from Einstein himself. Or perhaps it *is* a nod from Einstein?

One feature of Termespheres is their ability to inspire a good deal of contemplative study as we view our world literally turned inside out. The creation *North is South* repeats the objects on the north and south walls of a room, but the view on east and west walls reveals a subtle difference: a cat seen on the east wall appears at a different angle and size on the west wall. Other, transparent Termespheres allow one to obtain a view inside and outside and *...through* space. Termes had been unaware of the great perspective artist M.C. Escher until graduate school. Escher once painted himself reflected in a mirrored ball; in admiration of that self-portrait, Termes created a sphere from the point of view of the ball, detailing Escher in his surrounding room!



"Notre Dame of Paris"



"Paris Opera"



"When North is South and East is West"

Dick Termes likes nothing better than to get up in the morning and wander about his studio, studying polyhedral structures, reading books on art and geometry, and contemplating the visual world of nature. His love of explaining puts him in demand for lectures and workshops, for example, with the Lakota-Sioux children in South Dakota. Using fondue sticks and styrofoam balls or numerous paper cutouts of triangles and pentagons melded together with tape, the children figure out the five Platonic solids in about one hour and then move on to Archimedean solids. With a new set of toy magnets his wife bought him, Termes has lately been reveling in the beauty of patterns which no mathematician's geometry book has seen.

After all, he comments, "mathematics is about patterns, and it's as beautiful as any art you've ever seen." It's no wonder that Termespheres have caught the eye of so many people, from a Jungian society interested in dream worlds, to international art museums, and lately, to the world of mathematicians. Termes presents to amazed audiences at meetings of the Mathematical Association of America. It's no wonder he has a following of students who are charmed by his pleasant and relaxed manner and by his willingness to teach us how to see the world—and life in it—from entirely new perspectives. ■

If you would like to turn your own world inside out, check out www.termesphere.com.



"Fishbowl"