BRIDGES
Mathematical Connections
in Art, Music, and Science

The Linear Visualization of Mathematical Anomalies In Sculptural Space: An Artist Presentation

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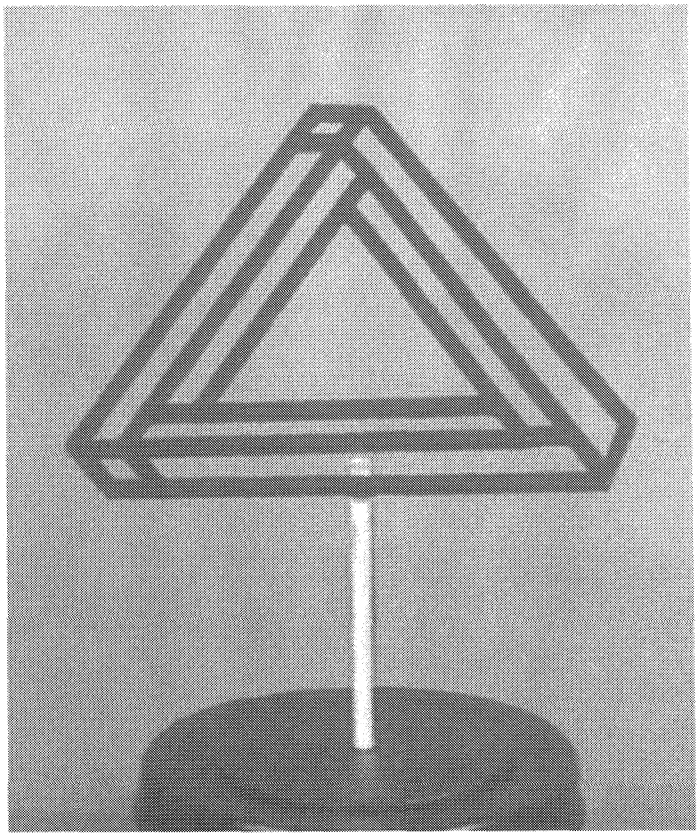
Perhaps the simplest and yet greatest challenge for the sculptor is the translation and creation of an essentially two-dimensional visual concept into a three-dimensional physical reality. Surely, most have the mental capacity to mentally visualize a fictitious three-dimensional object in the mind's eye. However, if we were asked to illustrate that fictitious object onto a two-dimensional surface, we could only produce one viewpoint at a time. After producing several drawings from a variety of viewpoints, we could give another observer, as well as ourselves, some idea of what we initially conceptualized to occupy three-dimensional space. Today, of course, there are computer software packages that are designed to help us to create multisided views of a proposed object in succession from the initial drawing of a single viewpoint to the extent that the object can appear to exist in the three-dimensional space of virtual reality.

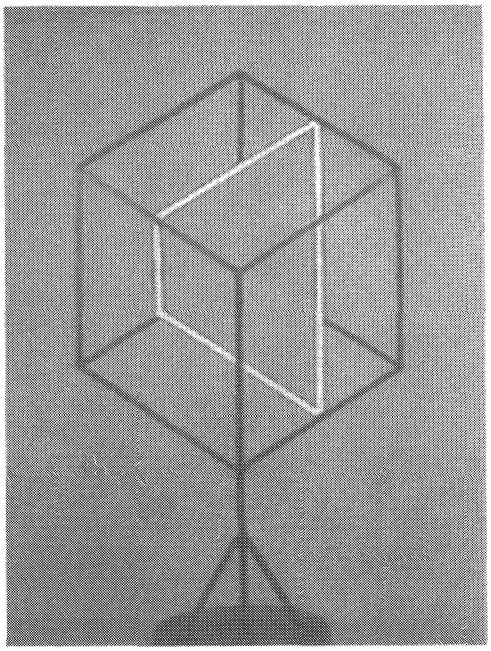
There is a class of objects, known as impossible objects, for which this illustrative approach in virtual reality may or may not be true. These objects, such as the famous tribar (see Anomaly #1), are said to be able to exist only on a two-dimensional surface as an illustration. Their realization in three-dimensional spatial reality is said to be impossible. This presupposition poses an interesting challenge not only for the computer artist but for the hands-on sculptor as well. The famous mathematician Roger Penrose and his father, L. S. Penrose, dealt with this challenge of the tribar a number of years ago. They stated that "two-dimensional drawings can be made to convey the impression of three-dimensional objects", as we already know. However, "in certain circumstances this fact can be used to induce contradictory perceptual interpretations". Numerous ideas in this field of perceptual anomalies have been exploited by the artist M. C. Escher. The present note deals with one special type of figure, the tribar. Each individual part is acceptable as a representation of an object normally situated in three-dimensional space; and yet, owing to false connections of the parts, acceptance of the whole figure on this basis leads to the illusory effect of an impossible structure. An elementary example is shown in Anomaly #1. Here is a perspective drawing, each part of which is accepted as representing a three-dimensional rectangular structure. The lines in the drawing are, however, connected in such a manner as to produce an impossibility. As the eye pursues the lines of the figure, sudden changes in the interpretation of distance of the object from the observer are necessary. Actual objects suitably designed, viewed from particular angles, can give exactly the same impressions as inconsistent drawings such as the one referred to above Anomaly #1. These "fool the eye" constructions are just that, "fool the eye" constructions. They are clever illusions designed to mystify the viewer and make them think the object really exists in spatial reality.

The sculpture I have created in this current body of work operates from this point of view. However, whereas, Roger Penrose's construction was incomplete and illusionary, my sculptures are physically complete and have spatial integrity. They exist in three-dimensional reality. Or do they? See Anomaly #3. What I have done is create a line drawing in space, which, by virtue of the varying sizes of material employed, gives more than the illusion of an impossible object; it offers a very real and convincing three-dimensional manifestation of a so called impossible object. These sculptures, I propose,

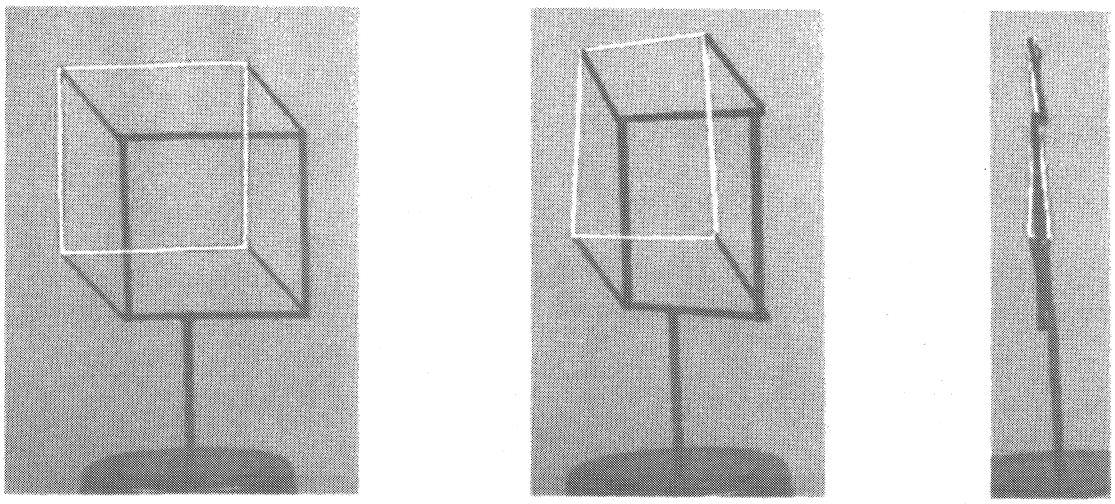
create yet another class of objects which exist in a fractal dimension somewhere between two and three-dimensional reality. Straight on, they are perspective drawings in space which when turned slightly to the left or right still retain a certain three-dimensional believability. When they are turned a full ninety degrees to the viewer, they suddenly lose their dimensional status and all but disappear. This quality provides a new experience for the viewer that cannot be had from either a drawing or a fully three-dimensional object. There exists in these works a variable fractal quality, which depends on the particular point of view at any given moment. Seeing is believing.



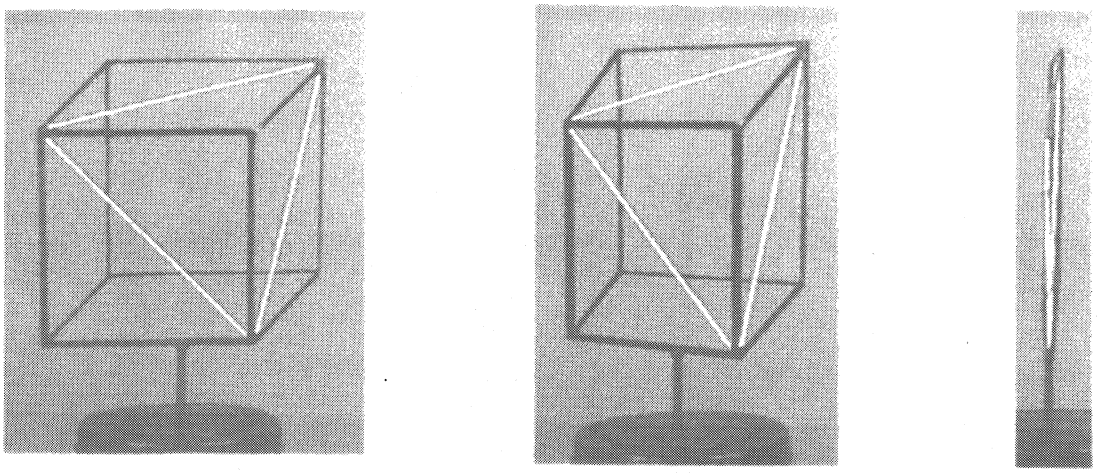
Anomaly 1



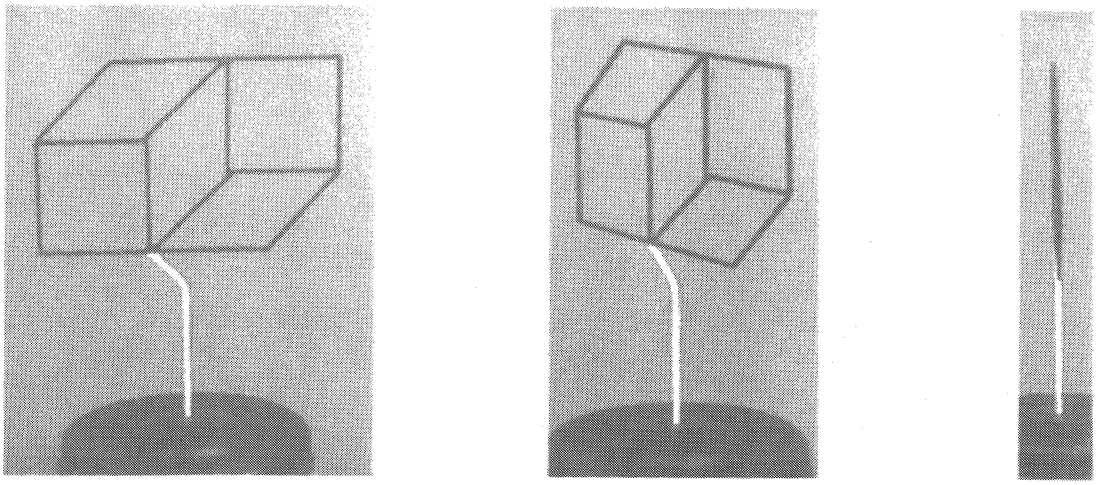
Anomaly 2



Anomaly 3, (three views)



Anomaly 4, (three views)



Anomaly 5, (three views)