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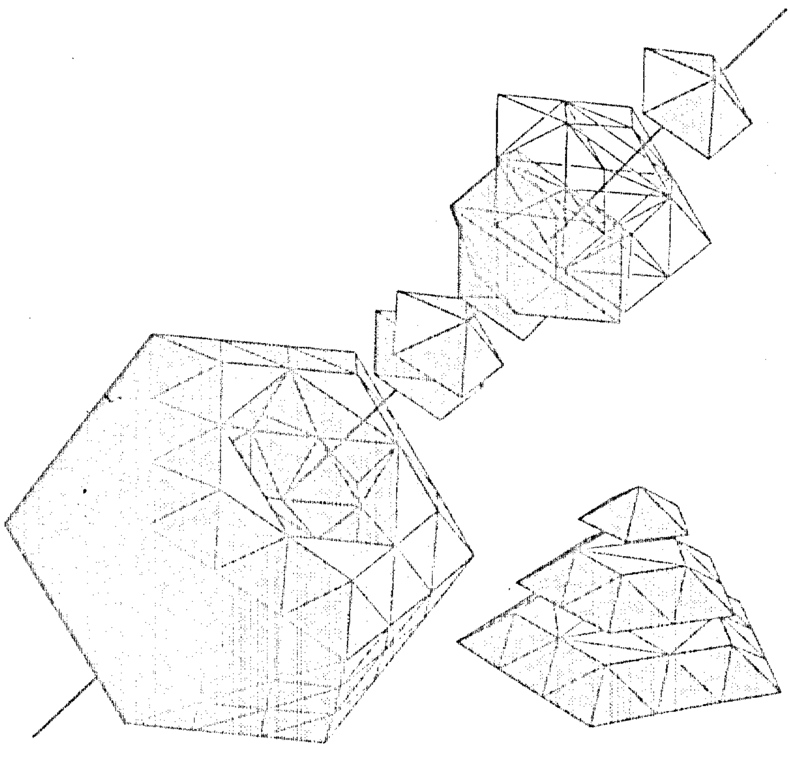

POLYHEDRAL MODELING AS A PREPARATION FOR THE CREATION OF VISUAL MUSIC

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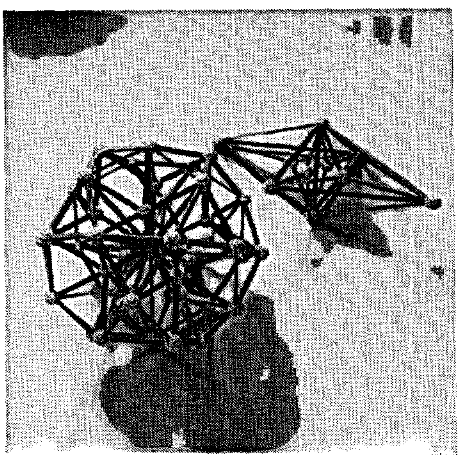
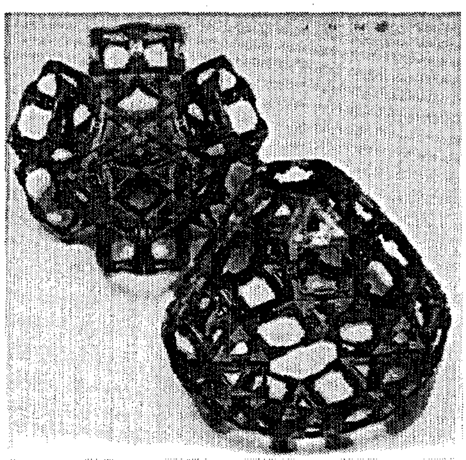
As used here the term 'visual music' will be used to denote a sequence of images that transform from one to another with the passage of time. It may or may not be accompanied by conventional aural music and the performing musician may be enjoying aural or visual feedback, or both from his essentially kinesthetic input. Computer graphics is the medium that currently could facilitate its unfoldment. To enable this to take place in real time, the system of image generation will need to be user friendly to the performer, and economical in the information used to describe aesthetically acceptable images in order to be affordable. What is required is an organizing principle comparable to the function of scale selection in aural music. Useful scales are in fact subsets of all possible frequencies, as selected by particular organizing principles. The imagery that would appear most suitable from the twin viewpoints of simplicity, and efficiency of generation, could be selected from those shapes that are both highly symmetrical, and not removed by too many steps from simplicity itself, as represented by the undifferentiated sphere and its most symmetrical progeny, the Platonic solids, followed by Archimedeans and their duals.

These thirty-one shapes together with the prisms and antiprisms could be extended by the addition of the ninety-two convex polyhedra made up of regular polygons, and the uniform polyhedra, and the possibility of further additions from the transpolyhedra of included shapes. Another group of shapes worthy of inclusion could be the holohedrally symmetrical convex polyhedra of constant edge length. These retain 2, 3, 4 or 5 fold symmetry at their familiar positions but as 4, 6, 8 or 10; or 6, 9, 12 or 15; or 8, 12, 16 or 20 sided polygons, do not necessarily have to be regular polygons. many of these polygons can be illustrated or constructed at the workshop, but I do not yet know how many polyhedra qualify for this category. They can be broken down to subgroups of polyhedra sharing the same kind of faces which can have different shapes depending on where they meet each other. Such members of subgroup are all connected to each other through an operation I term *edge insertion* or *edge subtraction.*

When we take all the members of the families of shapes referred to above, the vertices, and points where faces are tangential to a sphere, consist of a surprisingly small number. It should be possible to compute them all, and with the help of a simple color coding system ascribe a unique name to each in a language and vocabulary with which we are already familiar. Furthermore the name itself would immediately designate the approximate locality that we should expect to locate the point, whether it represented a vertex, the center of a face, or a mid-edge. We can accomplish this by locating these, landmark as it were, within the context of what Buckminster Fuller describes as the lowest common denominator triangles of the tetrahedron, octahedron and icosahedron. A variety of coordinate systems could accomplish this including Cartesian coordinates applied to axes through the center point of a rhombus (square in the case of the tetrahedron), polar coordinates from the same point, or the specification of the two angles. By ascribing a primary color to each vertex of the L.C.D. triangle, we can then assign a unique mix of primary colors to each point within the L.C.D. triangle. At this point we can adapt our terminology from the available names used to describe shades of the color spectrum. The perimeter of the triangle would consist of the colors of the spectrum, while all points within the triangle would have some of all three colors and consequently a component of white. What is proposed is that we designate two fold axes in blue. three fold axes in green, and any third kind of axis whether 3, 4, or 5 fold in red. This largely corresponds to existing usage by two of the major manufacturers of polyhedral models, Googolplex and BioCrystal, with the variation that green would need to substitute for yellow to be compatible with R.G.B. system suitable for computers. Perhaps if this symposium could endorse these proposals, it might encourage manufacturers to make available the necessary components.

Colors would apply to directions parallel to radii emanating from the center of an object, and also to the planes of the great circles derived from such radii. Points on the surface of a sphere would derive their color from the intercepting radius, and would extend their influence to planes tangential to such points. This is going to create substantially different appearances between the a face or plane defined system, such as Googolplex, and an edge and vertex defined system such as BioCrystal whose node system makes available only three types of edge direction, but whose nodes could occupy an infinite variety of directions relative to the center of a symmetrical polyhedron. Each of these directions within the L.C.D. triangle could command its own color, although in practice yellow, magenta, cyan, and white would allow us to designate the vertices of the Archimedeans with the exception of the snub polyhedra.





Models by John Gibbon