BRIDGES
Mathematical Connections
in Art, Music, and Science

Sliceform Sculptures - a Bridge between Art and Mathematics

John Sharp
20 The Glebe, Watford, England, WD2 6LR
email: 101503.432@compuserve.com

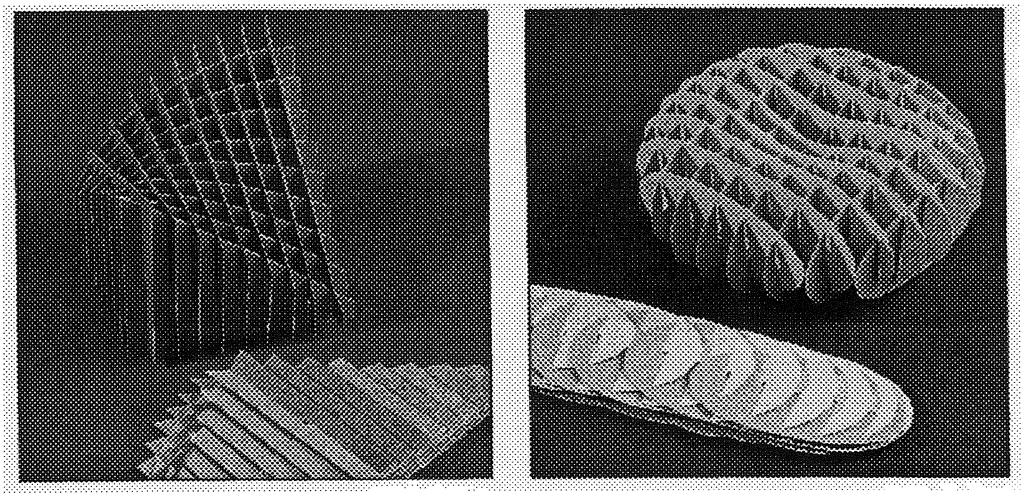
Abstract

At the end of the nineteenth century, mathematicians created many models of geometrical surfaces which were beautifully crafted. They are as artistic as the many mathematical computer graphics created at the end of this century. Following the Great Exhibition of London in 1851, a museum was set up to display the arts and sciences. In 1876 this held an exhibition of scientific apparatus which included a large section on mathematical models. As a result of this exhibition, the Science Museum separated from the museum of the decorative arts (the Victoria and Albert Museum).

One of the exhibits in the 1876 exhibition was a group of models of quartic surfaces constructed as sets of circular slices. They were slotted together in such a way as to continuously deform. They were discovered by a mathematician called Olaus Henrici and are often seen described in books on mathematical models [1] and three dimensional geometry [2]. The models that were displayed were by the German A Brill.

It is thought that the Russian constructivist artist Naum Gabo saw these models in Munich around 1910. He then used them as inspiration for his sculptured heads which are now in the Tate Gallery, London's museum of modern art. [3]

Mathematically, the idea does not generally appear other than as illustrations of quartic surfaces. I have developed it in many ways both to create models of standard mathematical surfaces and to create collapsible paper sculptures which I have called Sliceforms [4].



Pictures and displays of Sliceform models do not show their full beauty. Only by making and physically handling the models can their true dynamic qualities be fully appreciated. Their three-dimensional forms and surfaces are defined or suggested by two intersecting sets of parallel slices. These intersections act as a multitude of hinges and as a consequence each model can be made to collapse flat in two different ways. Between these two extreme positions the surface passes through a host of different but related shapes. By using different colours for the slices in each direction, the patterns generated as the model is manipulated can be very attractive and unexpected. The play of light on them and the shadows they create as they are moved also offer more insights into the interplay of art and mathematics.

Designing and constructing the sculptures offers insights for both artists and mathematicians. They can also be used as a starting point for other types of sculpture such as plaster casting since the gaps between the slices form hollow tubes.

There is to be an exhibition of "Strange Surfaces" at the Science Museum in London late in 1998. Some of my Sliceforms will be exhibited along with the ones that inspired them, created a century ago.

References

[1] H M Cundy and A P Rollet, *Mathematical Models*, Oxford University Press 1960

[2] W H McCrea, *Analytical geometry of three dimensions*, Oliver and Boyd, Edinburgh 1953

[3] Steven Nash and Jörn Merket, *Naum Gabo, Sixty Years of Constructivism*, 1985. A catalogue of a touring exhibition which began at the Dallas Museum of Art and ended in the Tate Museum in London,

[4] John Sharp, *Sliceforms*, Tarquin Publications, Stradbroke, Diss, Norfolk, England, 1995