Polyhedra in "Polyart" Style

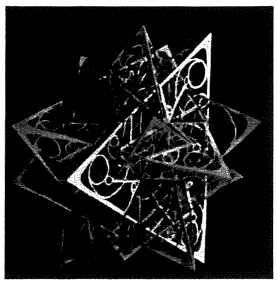
Ulrich Mikloweit
Goebenstraße 5
45139 Essen, Germany
E-mail: polyart@cityweb.de

Paper is a pretty material to construct polyhedron models. It can be cut and coloured and pieces can be glued to each other easily. For my work, another characteristic of paper is important: the sheets are rather thin. Why is this important?

My interest in polyhedra was aroused in the 1970's by a math professor in one of my chemist lessons at the university in Münster; he told us that the diagonals of the faces of a cube form two intersecting tetrahedra. This was a thing I could not imagine at all, so I made a paper model of it. But now, I still could not really understand how the tetrahedron faces intersect because parts of them were hidden. Cutting holes into the exterior faces was a good idea, because now, both surfaces of the polyhedra – the outer ones and the inner ones – became visible. But this didn't really solve the problem because the inner triangles (the faces of the octagonal core of this "stella octangula") were missing completely. This was the beginning of my "polyart style". I constructed a new model like an onion: the core as a first layer and the triangular pyramids as a second layer, each face having holes to give an insight.

Influenced by images of M. C. Escher, I made some more models like the compounds of 3 cubes or 3 octahedra. Years later, I found Magnus Wenninger's book, "Polyhedron Models," and since then this has been my "polyhedron bible". I learned that this procedure is called "stellation" and that there are 75 uniform polyhedra, most of them nonconvex. I decided to construct them all and began my task using a pocket calculator, Pythagoras's theorem and the angle functions.

Some years later, I constructed models where ten or more "layers" cover each other. It became more and more difficult to keep a sufficient precision. This is why I use only thin paper sheets for my models. Today, I construct my nets with a vector graphics program. The nets are printed on typewriter paper, cut with scissors and knives and the pieces are glued together. There are some more programs I use to find the shapes and the lines of intersection of the faces. They can all be used by hobbyists without any sophisticated mathematical knowledge: "Hedron" by Jim McNeill [1], Vladimir Bulatov's "stellation applet" [2] and "Great Stella" by Robert Webb [3]. These tools have accelerated my work very much. Up to now, I have completed 54 of the uniform polyhedra. Knowing that the most complex ones are still coming, I estimate that I will need still ten more years to complete the whole set. You can visit my website to see what is already done: http://www.polyedergarten.de. There, you may find other models including compounds and facetings of uniform polyhedra.



[1] http://www.physics.orst.edu/~bulatov/polyhedra/
[2] http://web.ukonline.co.uk/polyhedra/
[3] http://home.connexus.net.au/~robandfi/Stella.html