

About the Cover

If Escher Had a Computer

Gary Singh

Born in 1954, Rinus Roelofs chose sculpture as his preferred medium because he just needed the third dimension. Because of his exceptional math points in secondary school, his teachers persuaded him to study applied mathematics at the Technical University of Enschede, Holland, which didn't last long. He wound up at the Enschede Art Academy, taking a degree in sculpture instead. With a keen interest in structure and a proclivity for abstract thought borne from his math studies, he was destined to incorporate computers in his design process.

Rhino as a tool of choice

Nowadays, to Roelofs, even attempting to design a sculpture without the use of a computer is "like trying to draw without a pencil." After a decade of searching for the perfect program to suit his needs, his tool of choice is Rhino by Rhinoceros, a NURBS modeling tool for designers that runs on the Windows platform. He modeled the cover image as well as Figures 1 and 2 with Rhino and rendered them with Flamingo 3D, a ray-tracing and

radiosity package from Robert McNeel & Associates.

A major portion of his math studies involved computer programming. When Roelofs began to work as a sculptor, he naturally started looking for a way to use the computer as a design aid. In the mid- to late-1980s the most common design program was AutoCad by Autodesk, but it didn't suit his needs. Roelofs usually begins his creative process with just an idea—not an object—and he often starts drawing without any specific finalized product in mind. This particular thinking and sketching process simply didn't work in AutoCad.

In 1990 he found D3D, a DOS-based program written in Turbo C by Leen Ammeraal and included on two floppy disks as part of his book *Interactive 3D Computer Graphics* (John Wiley & Sons, 1988). Even though, for the first time, Roelofs could see his sketches in perspective mode on the screen, it "still didn't do much." He had to wait seven more years.

When he first downloaded the beta version of Rhino in 1997, everything changed. Rather than spending weeks toiling over a physical model based on some abstract concept that may not turn out how he expected, he could now visualize any idea that he had. "Now there was a step in-between," he explained. "I go straight from the idea in my head to the digital model in Rhino. And mostly after just a few hours, I can see a 3D realization of my idea on the screen. After that, I can decide if I want to go on with a physical model."

Interwoven structures

The cover image reflects Roelofs' interest with interwoven structures, especially those of M.C. Escher and Leonardo da Vinci. "Escher would have loved to work with Rhino," Roelofs said. "Maybe then he would have worked more with 3D instead of 2D."

A moebius strip can be left- or right-turning, and given his predilection for intertwined constructions, Roelofs' first step was to find an arresting combination. After creating the first strip he mirrored the basic construction



1 Doubleskin torus.

lines and points to create the second strip (Figure 3). He noted, "I did this by splitting up the strip in square blocks, dividing them in two sets, and using one set for the left-turning strip and the other set for the right-turning set."

Roelofs also pondered the following question: What kind of shape would you get if you widen the actual moebius strip? Using the scripting powers of Rhino, he started a growing process by adding more squares. Thus, the model gradually transformed from a moebius strip into something that can be called a moebius "surface" and then finally into the cover image.

For the cover image's background, Roelofs used another example of interwoven structures. He recreated one of Escher's periodic prints (No. 133, *Interlaced Hexagon*) in Rhino and then developed it with three-layered lattice constructions of square and octagonal holes resulting in the 3D interwoven background. Escher's drawings and ideas play a significant role in Roelofs' models. "Our common interest is one of structure," he explained.

Doubleskin torus

Roelofs has also done extensive modeling of torus figures. His doubleskin torus (Figure 1) was one of three winners at Intersculpt 2001: Deuxième Concours International de Sculpture Numérique (2nd International Digital Sculpture Competition) in Paris (see <http://www.intersculpt.org/is2001/dsc2001/dsc2001-comp.htm>). The competition's organizers will be making a rapid prototype of the model. "The doubleskin torus has the same effect as a moebius strip and is a good example of the advantage of the use of a computer," Roelofs explained. "It's a very unusual shape in the sense that you have to walk twice around to get back at the starting point yet somehow it's not a moebius strip. The effect is the same, but the realization is entirely different." Using Rhino, it only took him a few hours to make the first drawing. "Without a computer I wouldn't have known how to start. It's a very complex shape to turn into a physical object."

He creates these models purely for artistic reasons. "If my ideas can be helpful for CAD purposes, I'm happy, but it's not my first goal." His work will be shown in the Digital Sculpture exhibition at the Palthehuis Museum in Oldenzaal, Holland, from May 2002 onward and at St. Joseph Galerie in Leeuwarden, Holland, from 31 August through 28 September 2002.

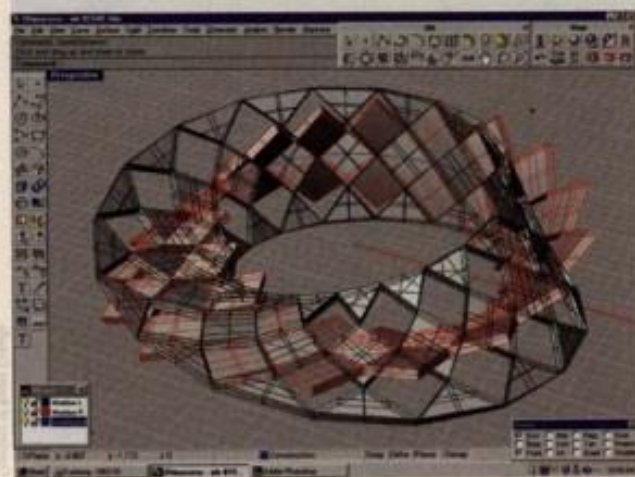


2 Double moebius.

Several of Roelofs' da Vinci and Escher-esque polyhedral models created in Rhino are available on his Web site at <http://www.rinusroelofs.nl/index.html>, including several torus and double moebius style structures (Figure 2).

The future

Roelofs has plans to animate his ideas, using the scripting possibilities of Rhino (many of his complex models are also available as animated images on his Web site). "I want to explore the different ways that one can come from a Rhino design to a physical object, or other ways of presentation," he explained. In fact, he recently presented his polyhedra animations at a symposium titled "The Future of Mathematical Research in the Netherlands" in The Hague on 18 April 2002. With Rhino, Roelofs can expand his ideas into a more process-oriented approach as opposed to just thinking in shapes and structures. For him, this artistic design and presentation process is as much an intertwined labyrinth as any Escher drawing. ■



3 Screen shot from Rhino.