Möbius strip

More Details

Nine ants, an intertwined strip, and numerous astonished faces! This is how the famous picture by M. C. Escher (1898-1972) can be described using only a few words (Fig. 1). The graphic art fascinates people to this day and still raises exciting questions: how do the ants get from the inside to the outside? And why do they only return to the starting point after two laps? The answers to these questions can be found in the mysteriously intertwined strip on which the ants slowly make their way. It bears the name “Möbius strip” and was discovered in 1858, among others, by the mathematician August F. Möbius (1790-1868).

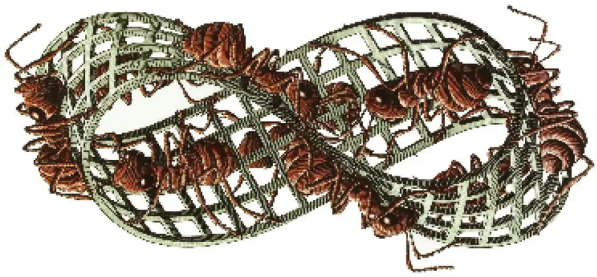

Fig. 1: Möbius strip II by M. C. Escher.

The Möbius strip is a fascinating mathematical surface due to its amazing properties: it consists of a single side and only has a single edge. In contrast to a ring, where you can simply point to the outside and the inside, with the Möbius strip, “both” side surfaces coincide. One cannot distinguish between top and bottom, even when it seems like one sees both. Interestingly, the Möbius strip is not the only surface with such extraordinary properties! Our exhibit “Inside Out” shows a “Klein bottle”: a bottle hiding its neck on its inside. But does the

interior really exist? Or is this just an illusion? See for yourself by climbing into the metal mesh bottle.

It is very easy to make a Möbius strip yourself: take a narrow paper strip, twist one end 180° and tape together both ends. That's it! If you now run your finger alongside the strip, you can experience the amazing features. Suddenly, your finger glides from the inside to the outside and back in again without ever going over the edge. If you try the same with the edge, you can reach every point of the edge without crossing the surface. Imagine the edge of the Möbius strip as a thread. What does it look like? It's a simple closed loop. In mathematics, this is called an unknot or trivial knot.

Even if mathematicians were only able to describe the Möbius strip with the help of formulas in 2010, it has been in practical use for years: it serves as a conveyor belt at the airport or as a V-belt in machines and was once even used as a typewriter ribbon. It has the great advantage that it can be used "on both sides". Möbius strips can also be found in nature, for example in the proteins of plants, or in chemistry as a specific molecular knot. Last but not least, it has also inspired numerous artists. In addition to painters and graphic designers, such as M. C. Escher, mainly fashion designers and sculptors impress with their artistically crafted Möbius strips.

Annegret Siemens from Wolfsburg has turned handiwork into mathematical art: she knits scarves in the shape of Möbius strips in one piece (Fig. 3) – without sewing together the ends (e.g., as with the paper strip mentioned above). In her work, she uses various patterns and materials but always sticks to the topological basic shape. If you want to try it yourself, you can find inspiration at: http://www.100strickanleitungen.de/moebius-stricken.html

Fig. 2: Knitted Möbius strips.