BEAKMAN JAX

by jok church

myQuestion@beakman.com

Dear Beakman,

What is a Mobius strip? And what is a Klein bottle?

Daniel Koropeckyj-Lox
Gainesville, Florida

Beakman or Jax
1130 Walnut Street
Kansas City, MO 64106
Questions, name & address

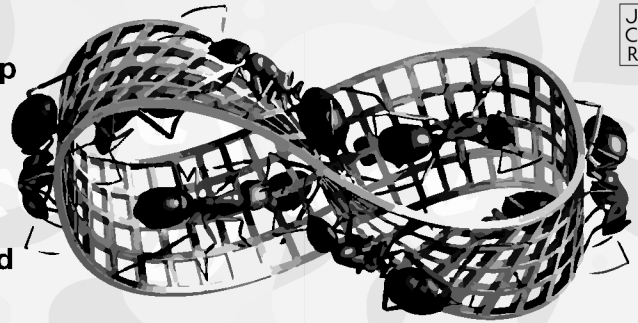
Google: **M.C. Escher**

Dear Daniel,

They're more proof of how arithmetic can take a leap and turn into something that gets really cosmic really quickly – *mathematics* (maa-the-MAA-tix).

We keep track of things like who and where we are in ways that can be explained with math.

When we check where things are, we compare, and that is called *orienting* (OR-ee-en-ting). When you compare different parts of you, you know where your hand is compared to where your foot is. You are "orientable." Möbius strips are not. One cannot compare one part to another.



Beakman

Beakman Place

:STUFF TO DO:

A

B

Cut a strip of paper about 2 inches by 11 inches. With tape, you can make a loop. And that loop has 2 sides, and 2 edges – it's self-orienting.

B

A

But if you give that strip a half-twist, connect the A corner to the other A corner, and B to B, and use tape again, you have made a *non-orientable* object. Use a pencil to draw a line all the way around the loop, keep drawing and you'll see you cannot compare one side to another because it has only 1 side and only 1 edge.

This non-orientable object was discovered in 1858 by 2 different German mathematicians working without contacting each other, August Ferdinand Möbius and Johann Benedict Listing. Möbius' name stuck and Listing's kind of faded.

A Klein bottle gets even more cosmic because it cannot exist in our universe, one with 3 dimensions. It was described in 1882 by the German mathematician Felix Klein, who seems to have called it a *surface* and not a bottle. It's an idea instead of an object – best thought of in our universe as a bottle with no inside or outside.

P.S. from Jax: A 20th-century artist named M.C. Escher did a lot of art, like the ants above, that feature non-orientable spaces.