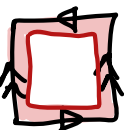# Surface trilogy
by Indira CHATTERJI

1. **Fluidity**
2. **Genus two**
3. **Twist**

These 3 short movies are about 3 very different phenomenas on surfaces. The first one, **Fluidity** is about a Klein bottle with a disk removed and a deformation when the disk enlarges to resemble a Möbius shtrip with a handle, also called Möbius' underwear. For this rather complicated deformation, the movie loops twice. Repetition is an important step in the process of understanding mathematics. The theme here is the lack of orientation.

The second movie, **genus two**, shows a decomposition of a genus two surface Σ_2, and while it is open, it shows a trivial loop, which is the only relator in the

presentation

$$\pi_1(\Sigma_2) = \langle a_1 a_2 b_1 b_2 \mid [a_1, b_1][a_2, b_2] \rangle$$

The theme here is the fundamental group of Σ_2, and how to see it on the surface.

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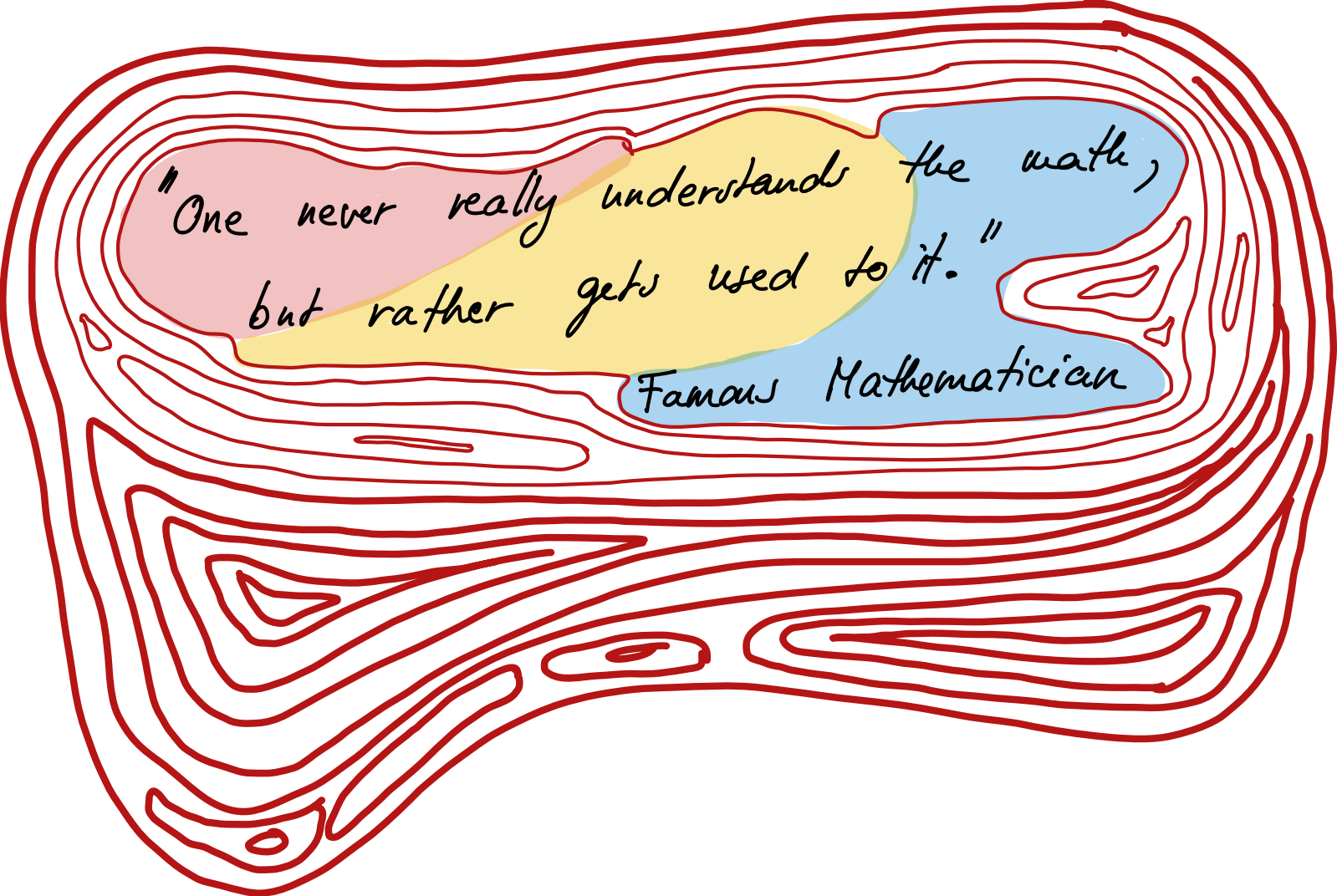The third move, Twist, shows a homeomorphism of the torus, which is a genus one surface. This class of homeomorphisms, obtained by twisting an annulus, can be performed on any surface, and a few of them only are enough to describe all the homeomorphisms of the surface, up to homotopy with the trivial map, also called "mapping class group".

In the torus case, this group is given by $SL_2\mathbb{Z}$, the group of matrices of determinant one and integer coefficients. A partial repetition allows to imagine what happens when the twist repeats.

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These 3 short movies are really separate, part of a 2-dimensional theme. They are meant to be enjoyed in a meditative state, separately, and regardless on how much of the math one really understands.

"One never really understands the math, but rather gets used to it."

Famous Mathematician