

PETER HORNING (TU DRESDEN, GERMANY)

NARROW RIBBONS IN NONLINEAR THREE-DIMENSIONAL ELASTICITY

In the 1930s Sadowsky showed the existence of a developable Moebius strip. He proposed that the configuration assumed by such a strip can be computed by minimizing the bending energy. He further argued that the bending energy density is proportional to the square of the mean curvature of the surface, i.e., its Willmore energy density.

Wunderlich later formally justified the energy functional proposed by Sadowsky. His analysis showed that the Sadowsky functional can be recovered under an assumption of non vanishing curvature of the centerline of the strip.

First, we provide a rigorous derivation of the limit energy of such an inextensible, isotropic, elastic strip as the strip width goes to zero. Our analysis makes no a priori assumptions on the curvature of the centerline. The functional obtained in this way agrees with the classical Sadowsky functional, but only when the curvature of the centerline of the strip is large enough.

Then we present a derivation of this modified Sadowsky functional starting from three dimensional nonlinear elasticity. We discuss some of the difficulties which arise due to the absence of a hard isometry constraint in the original three dimensional model.

This is joint work with L. Freddi, M.G. Mora and R. Paroni.