



# Universal response curves for the constrained elastica

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Date	<b>June 3, 2026</b>
Time	<b>11:30</b>
Room	<b>R2, DICAM, Mesiano</b>

The confined Elastica is a model problem for several engineering applications such as bore-well drilling or endovascular surgery. As an Elastica is buckled into a rectangular cavity and bends into a series of folds, horizontal and vertical reaction forces work against the corresponding imposed displacements. The number of folds and the reaction forces exhibit complex bifurcations and snapping transitions, and multistability as well as hysteresis occur in this nonlinear problem. We show here that, despite this complexity, there exist universal curves for the reaction forces, the number of folds, and the bending energy of the Elastica. These analytically derived curves provide upper and lower bounds for the response of the system to the imposed confinement. Moreover, we introduce a homogeneous solution to this packing problem, which describes the average behavior of the confined Elastica and allows us to understand, beyond the complex details of the problem, the overall response of the system as the confinement is increased.

S. Neukirch is a senior CNRS professor at Sorbonne University, Paris, France. He is working on the stability of elastic structures, sometimes applied to biology, industry, or computer graphics. A list of publications, talks, and research interests can be found on his vintage web page: <https://www.ida.upmc.fr/~neukirch/>.

Biosketch:

1973 birth, Paris, France

1998 PhD from the University Pierre and Marie Curie (ancestor of Sorbonne University).

2004 CNRS junior professor at d'Alembert Institute, Sorbonne University.

2009 Habilitation (Sorbonne University).

2011 CNRS professor at d'Alembert Institute

2040 retirement

The seminar is organized by the Solid and Structural Mechanics Group [D. Bigoni, F. Dal Corso, L. Deseri, D. Misseroni, M.F. Pantano, A. Piccolroaz, N.Pugno, R. Springhetti]