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Deformation of an Elastic beam due to Viscous Flow in an Embedded Channel Network YOAV MATIA, AMIR GAT, Technion - Israel Institute of Technology — Elastic deformation due to embedded fluidic networks is currently studied in the context of soft-actuators and soft-robotic applications. In this work, we analyze the time dependent interaction between elastic deformation of a slender beam and viscous flow within a long serpentine channel, embedded in the elastic structure. The channel is positioned asymmetrically with regard to the midplane of the elastic beam, and thus pressure within the channel creates a local moment deforming the beam. We focus on creeping flows and small deformations of the elastic beam and obtain, in leading order, a convection–diffusion equation governing the pressure-field within the serpentine channel. The beam time-dependent deformation is then obtained as a function of the pressure-field and the geometry of the embedded network. This relation enables the design of complex time-dependent deformation patterns of beams with embedded channel networks. Our theoretical results were illustrated and verified by numerical computations.

Yoav Matia
Technion - Israel Institute of Technology

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