

Abstract Submitted  
for the DFD14 Meeting of  
The American Physical Society

**Viscous flow within an embedded serpentine channel as a mechanism to create time-dependent deformation patterns of elastic beams<sup>1</sup>**

YOAV MATIA, AMIR GAT, Technion - Israel Institute of Technology — We analyze the time dependent interaction between the flow-field and the elastic deformation-field of a viscous liquid within a long serpentine channel, embedded in an elastic beam. The channel is positioned asymmetrically with regard to the midplane of the elastic beam. We focus on creeping flows and small deformations of the elastic beam and obtain, in leading order, a diffusion equation governing the pressure-field within the serpentine channel. The deformation of the beam is then related to the propagation of pressure within the channel. We thus obtain a viscous-elastic equation governing the deformation of the beam due to the viscous flow within the serpentine channel. This equation enables to design complex time-dependent deformation patterns of beams with embedded channel networks, relevant to soft-robotic applications. Our theoretical results were illustrated and verified using numerical computations.

<sup>1</sup>Israel Science Foundation 818/13

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Date submitted: 29 Jul 2014

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