**ABSTRACT:** The laws of equilibrium statistical mechanics impose severe constraints on the properties of conventional materials assembled from inanimate building blocks. Consequently, such materials cannot exhibit spontaneous motion or perform macroscopic work. Inspired by biological phenomena such as Drosophila cytoplasmic streaming, our goal is to develop a new category of soft active materials assembled from the bottom-up using animate, energy-consuming building blocks such as kinesin molecular motors and microtubule filaments. Released from the constraints of the equilibrium, these internally driven gels, liquid crystals and emulsions are able to change-shape, crawl, flow, swim, and exert forces on their boundaries to produce macroscopic work. In particular we describe properties of an active fluid that upon confinement transitions from a quiescent to a spontaneously flowing state. We characterize the properties of the emergent flows as well as how the transition to a flowing state depends on the properties of the confining geometry. Our results illustrate how active matter can serve as a platform for testing theoretical models of non-equilibrium statistical mechanics, developing new microfluidic applications and potentially even shedding light on self-organization processes occurring in living cells.

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**BIO:** The research interests of Zvonimir Dogic and his group lie in elucidating rules that govern self-assembly of materials, with a particular emphasis being placed on the role the particle’s shape and chirality play in these assembly processes. The emphasis is placed on creating very simple model systems in which precise control is possible over all the relevant parameters. This enables a rigorous and detailed comparison with theoretical predictions. Zvonimir Dogic is currently an Associate Professor of Physics at Brandeis University. Before joining Brandeis he was a research fellow a Rowland Institute at Harvard. He has pursued postdoctoral studies at University of Pennsylvania and he has obtained his graduate degree from Brandeis University.