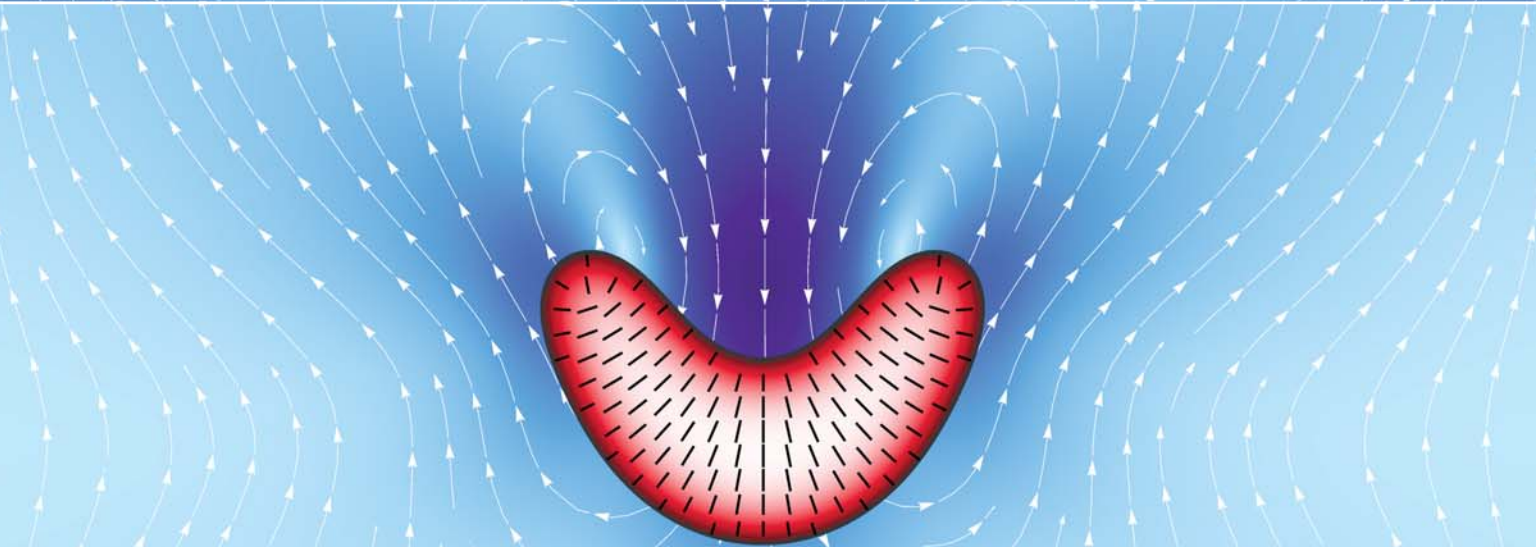
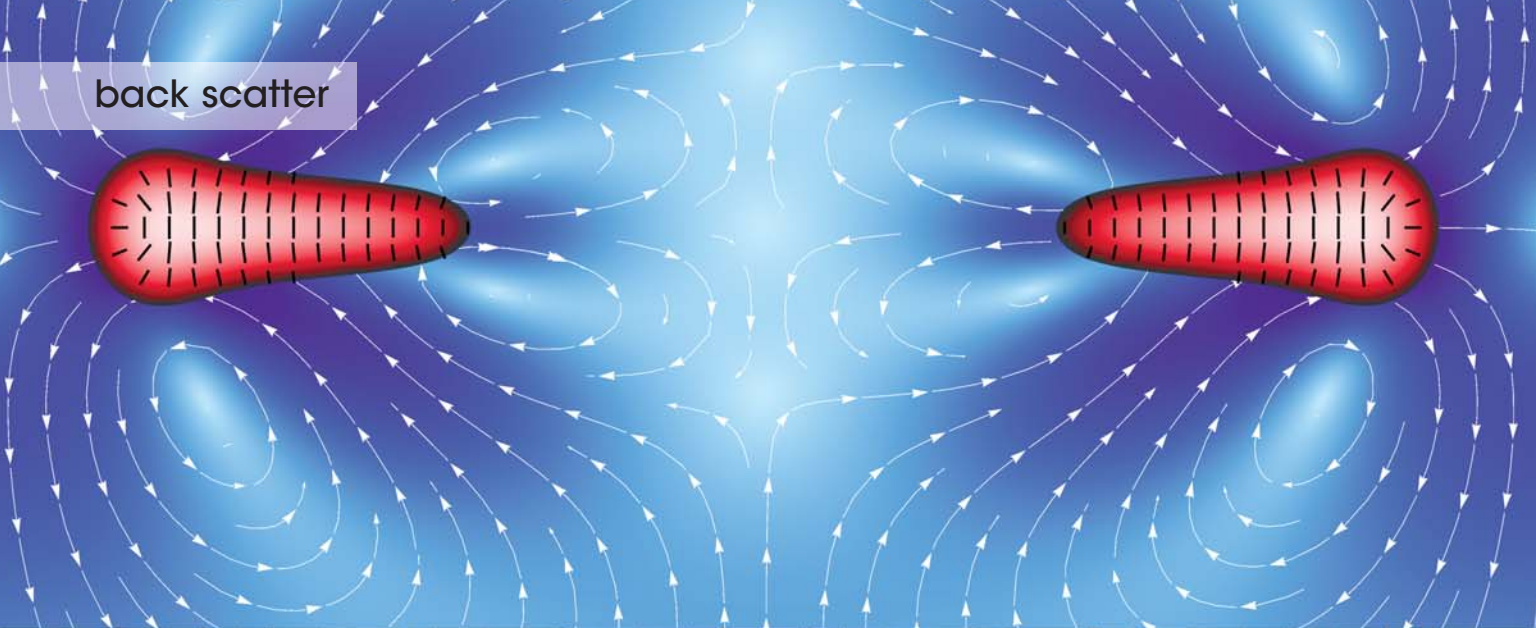




Mimicking cell mechanics

A surprisingly broad range of biological systems—from flocks of seagulls down to bacterial colonies and the cytoskeleton (described in *PHYSICS TODAY*, February 2010, page 60)—can be effectively portrayed as nonequilibrium assemblies of anisotropic components that are “active,” able to convert stored or ambient energy into systematic movement. The interactions that the constituents have with each other and with the environment give rise to highly correlated collective motion, in a direction determined not by external factors but by the components’ orientational order. Models of such active matter have had notable successes over the past decade in describing cellular motility, transport, and other mechanical and statistical behavior.

In new numerical simulations, Luca Giomi and Antonio DeSimone have shown that a simple two-dimensional system can mimic two fundamental properties of living cells: spontaneous division and motility. They considered a droplet of active material immersed in a normal, Newtonian fluid. The droplet’s rodlike components prefer so-called nematic ordering, and the interplay between the active stresses and geometric constraints leads to three distinct behaviors. For low activity (bottom panel), the droplet elongates under the effect of the induced fluid flow (white arrows). Above some activity threshold (middle), the droplet will spontaneously deform and start to move at a constant velocity. At sufficiently high active stress (top), the elongating droplet breaks before it has a chance to splay. Though it’s a simple model, the researchers note that many aspects should carry over to 3D systems; moreover, certain common cellular biomolecules could form the basis of experimental tests. (L. Giomi, A. DeSimone, *Phys. Rev. Lett.* **112**, 147802, 2014.)

To submit candidate images for Back Scatter, visit <http://contact.physicstoday.org>.

