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**Microfluidic flows of complex suspensions: from flexible polymers to swimming bacteria**

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The flow of complex suspensions is ubiquitous in nature and industrial applications. Their non-Newtonian character is due to flow-induced orientation, rearrangement, or deformation of microscopic objects suspended in simple fluids. Linking the microstructure on the particle level to the macroscopic response under flow is one of the fundamental scientific challenges of soft matter physics. Here, we present two examples of flows of complex suspensions in chosen microfluidic geometries which allow this link to be established. First, we use a solution of flexible polymers, where normal stresses are known to arise when the polymers undergo a coil-stretch transition under flow and we characterize the onset of elastic flow instability in a serpentine channel as a function of its curvature. The calibrated serpentine channel can then be used as a sensitive rheometer to detect even small normal stresses in unknown suspensions. Second, we employ a Y-channel, a powerful rheometer for measuring shear viscosities, to study the viscosity of active suspensions of e-coli bacteria. In this way we link the activity of the bacteria to the measured non-Newtonian effective viscosity for the first time.