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Rheosensing by impulsive cells at intermediate Reynolds numbers ARNOLD MATHIJSSEN, SAAD BHAMLA, MANU PRAKASH, Stanford University — For aquatic organisms, mechanical signals are often carried by the surrounding liquid, through viscous and inertial forces. Here we consider a unicellular yet millimetric ciliate, *Spirostomum ambiguum*, as a model organism to study hydrodynamic sensing. This protist typically swims at moderate Reynolds numbers, $\mathrm{Re} < 0.5$, but upon stimulation it surges to $\mathrm{Re} > 100$ during impulsive contractions where its elongated body recoils within milliseconds. First, using high-speed PIV and an electrophysiology setup, we deliver controlled voltage pulses to induce these rapid contractions and visualise the vortex flows generated thereby. By comparing these measurements with CFD simulations the range of these hydrodynamic "signals" is characterized. Second, we probe the mechano-sensing of the organism with externally applied flows and find a critical shear rate necessary to trigger a contraction. The combination of high Re flow generation and rheosensing could facilitate intercellular communication over large distances. Please also see our other talk "Collective hydrodynamic communication through ultra-fast contractions".

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