1145-76-2603 **Kaitlyn Hood*** (kthood@mit.edu), **M.S. Suryateja Jammalamadaka** and **A. E. Hosoi**.

Rake or Sieve: modelling flow past an array of rigid hairs.

The Navier-Stokes equations (NSE) represent a balance between viscous, pressure, and inertial stresses. While inertia is typically considered an obstacle to engineering flows, here we model a system that exploits inertia to achieve a desired flow. In particular, crustaceans have appendages with an array of rigid hairs covered in chemoreceptors, used to sense and track food. By changing the speed of flow past the hairy surface, and thereby manipulating the Reynolds number (Re) of the flow, crustaceans directly influence the flow behavior. Flow acts either as a rake – diverting flow around the hair array, or as a sieve – penetrating into the hair array. In our experiments, we uncover a third transitional phase: deflection – where the flow partially penetrates the hair array and is deflected laterally. We model the flow around a rigid cylinder in order to determine the depth of a boundary layer on a single hair, and find that as Re increases, the depth of the boundary layer decreases. From this model, we develop a design principle for constructing hair arrays that exhibit each flow phase. (Received September 25, 2018)