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**Fluid forces and flows in muscle's contractile lattice**[1] SAGE MALINGEN, University of Washington, KAITLYN HOOD, ANETTE HOSOI, Massachusetts Institute of Technology, THOMAS DANIEL, University of Washington

— Muscle cells are specialized for large, rapid shape change. Their contraction is powered by the collective action of molecular motors anchored to long protein filaments (thick filaments) that form a densely packed, fluid filled lattice. Molecular motors bind to thin filaments and pull them past the thick filaments. These motors are estimated to produce 5 pN forces. As filaments slide they shear with the surrounding fluid. Additionally, the lattice volume can change during contraction, causing flows that create axial and radial shear forces. With an inter-filament gap distance of only ˜30 nm surface-to-surface, viscous drag forces could be non-trivial and have not been measured. Using a finite element model (COMSOL) of the contractile machinery we estimate that viscous drag forces on single filaments are on the order of 10 fN. We estimate that the energy dissipated by viscous drag over all filaments is less that 1% of the energy used by the system. However additional proteins occupying the gaps between filaments, variable inter-filament spacing and viscosity values greater than that of water may influence this result.

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Sage Malingen
University of Washington

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