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Flow and movement of organisms through protective layers

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Microscale filtering and protective layers appear in a variety of places throughout the biological world, with examples including both internal physiological examples (extracellular proteins, microvilli, cilia) and external biological structures (trichomes, swimming legs, bristled wings). In this talk, I describe an agent-based framework built for exploring the biological environment created by these structures and its potential effect on small, lightweight organisms. Using implemented analytical models (e.g. Brinkman) or input from CFD packages to specify the flow field, the framework can simulate a large variety of behaviours in both 2-D and 3-D time-varying environments as a testing ground for population-level theory. Preliminary numerical results will be shown demonstrating some of the capabilities of the approach as well as future directions.

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