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Modeling hydrodynamic effects on choanoflagellate feeding[1]
CHRISTIAN OAKES, DR. HOA HGUYEN, Trinity Univ, DR. MIMI KOEHL, UC Berkeley, DR. LISA FAUCI, Tulane Univ — Choanoflagellates are unicellular organisms whose intriguing morphology includes a set of collars/microvilli emanating from the cell body, surrounding the beating flagellum. As the closest living relative to animals, they are important for both ecological and evolutionary studies. Choanoflagellates have three unicellular types: slow swimmers, fast swimmers, and thecate (attached to a surface by a stalk). Each has different morphology and feeding rate. We use the method of regularized Stokeslets to simulate cell-fluid interactions of each type and show the hydrodynamic effects on the amount and directions of fluid flow toward the collar. After validating the swimming speeds of our models with experimental data, we calculate the rate of flow across a capture zone around the collar (flux). This sheds light on how each morphological aspect of the cell aids in bacteria capture during feeding. Among the three types, the thecate cells have the largest average flux values, implying that they take advantage of the nearby surface by creating eddies that draw bacteria into their collar for ingestion.

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Christian Oakes
Trinity Univ

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