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An experimental and numerical study of fluid flow generated by a single nodal cilium XINGZHOU YANG, Center for Computational Science, Tulane University, LISA FAUCI, Department of Mathematics, Tulane University, ARSHAD KUDROLLI, Department of Physics, Clark University — A rotating nodal cilia is said to generate fluid flow in the node of a developing embryo by posterior tilt leading to the left-right asymmetry of the mammalian body. In order to develop a physical understanding of the flow generated and the effect of the enclosing chamber, we perform scaled-up fluid-mechanics experiments and numerical simulations using the method of Regularized Stokeslets for zero Reynolds number. Important mechanical parameters, such as the geometry of the rods, dimensions of the tank, and the ratio of viscous to elastic stresses can be scaled to match typical cilia and cell. Digital imaging and tracer particle tracking techniques are used to measure the location and shape of the rods and the fluid flow. We will discuss the nature of the hydrodynamic velocity fields which are found to be more complex than anticipated by previous studies.

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