

DEPARTMENT OF MATHEMATICS AND STATISTICS
MISSISSIPPI STATE UNIVERSITY

COLLOQUIUM

Mathematical and Computational Modeling of Ciliary Beating

DR. XINGZHOU YANG

Center for Computational Science
and
Department of Mathematics
Tulane University

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Allen 14

Abstract. Cilia are microscopic hair-like organelles projecting from the cell surface. The study of the motility of cilia and flagella is of great importance in biology and medicine, as they perform essential motile and sensory functions. The coordinated beating of motile cilia is responsible for ovum transport in the oviduct, transport of mucus in the respiratory tract and is the basis of motility in many single-celled organisms. One of the great discoveries was that symmetry breaking on the left-right axis in mammalian embryos is dependent on the flow caused by nodal cilia. In fact, defects in any kind of cilia lead to a surprisingly wide range of clinical problems. There remain a variety of open questions in ciliary beating: What are the mechanisms governing multiciliary wave forms? What governs the activation of the internal molecular motor mechanisms to produce the wide variety of flagellar and ciliary waveforms observed? What is the precise nature of the spatial and temporal coordination of these individual dynein motors? In this talk, I will present the computational models we built for simulating the fluid mechanics of multiciliary beating, mucociliary transport, as well as directional flow by nodal cilia and the related numerical results.

Dr. Yang is a candidate for a position in our department. There will be a reception for him in Allen 467 at 3:00 pm preceding his talk.

Contact Len Miller, miller@math.msstate.edu or (662) 325-7138, for additional information.