REBECCA TYSON, University of British Columbia Okanagan

Modelling the swimming behaviour of the nematode

How does a given aquatic organism's wiggling result in propulsion? This has been well investigated in fish and in microorganisms such as bacteria where the viscous or inertial terms of the fluid equations can be ignored. Less has been done at intermediate Reynolds' Number, and furthermore, the actual interaction between the organism's musculature and the surrounding fluid is not well understood. In this talk we focus on the swimming behaviour of the nematode, a roundworm.

The immersed boundary method lends itself very well to the study of organism locomotion in fluid. Movement of passive nematode-like structures has been successfully modeled in complex flows. Active swimming of small organisms has also been successfully modeled when the restlength of each muscle segment is prescribed, and an energy minimum for organism configuration obtained. We are interested in modelling the development of swimming motion from rest, when motion is generated by the contraction of innervated muscle segments.

We have developed a three-dimensional model for the body structure of the nematode, which explicitly models the organism's musculature. The immersed boundary method is then used to communicate between the nematode body and the surrounding fluid. This model allows us to study how the nematode musculature and surrounding fluid interact to create propulsion of the nematode. It also gives us the ability to pursue fundamental questions about how organism structure affects the swimming motion obtained and the fluid/muscle forces generated.