ORAL PRESENTATION

FROM MICRO TO MACRO: DETERMINING HYDRODYNAMIC PROPERTIES OF STALK FORMING DIATOMS

Joshua G Stepanek[1], Robert Janisch[2], Matthew L Julius[1]

[1]Phytoplankton Laboratory, St. Cloud State University, St. Cloud, MN USA
[2]Center for Microscopic Imaging and Analysis, St. Cloud State University, St. Cloud, MN USA

Diatomists have disproportionately used frustular morphology in taxonomic and systematic studies. While frustule shape has been used to distinguish coarse and fine taxonomic levels, little attention has been given to the selective pressure and evolutionary forces driving morphometric changes and functional optimality. Hypotheses which have been suggested, include regulation of sinking rates, resistance to predation, and nutrient uptake efficiency. These explanations have largely focused on planktonic "centric" diatoms, with little attention paid to pennate diatoms and the unique pressures experienced with a predominantly attached life style. Pennate diatoms spend the majority of their life cycle out of the plankton, attached and growing on a variety of substrates within the photic zone. This necessarily exposes these diatoms to forces created by flowing water, including both stream flow and wave action. This pressure is experienced most acutely by the stalk forming pennate diatom forms, as their high vertical profile moves them out of the viscous boundary layer into a higher flow environment. This investigation examines the hydrodynamic implications of stalk forming pennate diatom morphologies. Due to the diatoms microscopic size, hypotheses regarding hydrodynamic qualities have been historically difficult to test with any reliability. Through the use of atomic force microscope imaging and macro scale three dimensional rendering, diatom morphologies may now be subject to detailed hydrodynamic analysis never before possible.