DOES BREAKING STRENGTH CONSTRAIN VARIATION IN VALVE MICROMORPHOLOGY AMONG COSCINODISCOIDS?

Virginia M. **Card**
Metropolitan State University, St. Paul MN 55406

The morphology of diatom valves varies distinctly among taxa in overall shape and size as well as in the internal structure of the siliceous cell wall. The high breaking strength of diatom valves may benefit cells by increasing their resistance to predation. If so, then maintenance of valve strength may act as a constraint on the variation of valve structure among taxa. To provide the same resistance to breakage, the valves of a larger cell of the same shape must be made of stronger cell wall. This study focused on members of the *Coscinodiscales*, which have an interesting 3-layered cell wall composed of a relatively thick central honeycomb core layer with large chambers (areolae) and two relatively thin face layers of porous solid (cribrum and basal layer). The mechanical properties of such sandwich panel structures vary based on the geometry of the layers. The hypothesis was tested through measurement of scanning electron micrographs (SEMS) of valves and valve fragments from several coscinodiscoid taxa from the UTEX Culture Collection of Algae. Valves ranged in diameter from small (18-22μm) to large (220-270μm), and core layers varied from 51% to 72% of the total wall thickness in the smallest cells to the largest cells (respectively) and basal face layers varied from 30% to 14%, in concordance with the hypothesis; however, the total thickness of the cell walls and the porosity of the core and basal layers did not vary consistently with cell diameter. These results suggest that valve strength alone is not the dominant factor affecting differences in valve structure among these taxa. It is also possible that the mechanical properties of the constituent composite material biosilica are different among the different taxa. Other factors that may be of even greater importance in determining valve structures for this group include the role of porosity and valve thickness in determining nutrient uptake rates and the role of pore size in protecting cells from attack by parasites such as watermolds and viruses.