CAN DIGITAL IMAGING FLOW CYTOMETRY REPLACE MICROSCOPE MEASUREMENTS OF DIATOM CELL DIMENSIONS?

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Size analysis of diatom populations is a potentially powerful tool for understanding diatom life histories, population dynamics and phylogenetic relationships. However, measuring cell dimensions on a light microscope is a time consuming process. An alternative technique has been developed using digital flow cytometry on a FlowCAM® (Fluid Imaging Technologies, Inc.) to capture hundreds, or even thousands, of images of a chosen taxon from a single sample in a matter of minutes. Up to thirty morphological measures may be quantified through post-processing of the high resolution images. We evaluated FlowCAM size measurements, comparing them against measurements from a light microscope. We found good agreement between measurement of apical cell length in species with elongated, straight valves, including small *Achnanthidium minutissimum* (11-21 *µm*) and *large Didymosphenia* geminata (87-137 *µm*) forms; however, a taxon with curved cells*, Hannaea baicalensis* (37-96 *µm*), showed differences of ~4 µm between the two methods. Discrepancies appear to be influenced by the choice of feret or geodesic measurement for asymmetric cells. *Using examples from the three test species, both the benefits and limitations of this new technology will be discussed*. The increased speed of data acquisition through *use of imaging flow cytometers like the FlowCAM is an essential step for advancing studies of diatom populations.*