

ORAL PRESENTATION

A SIMPLE METHOD FOR CALCULATING VALVE CURVATURE

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Many diatoms are differentiated by simple, discrete morphometric differences such as length, width, and striae counts. In addition, the curvature of the valve can also be a distinguishing morphometric character. Curvature calculation is an intermediate technique between simple, direct measurements (i.e., length, width) and more formal shape analysis. The goal of this work is to develop a simplified shape analysis to measure diatom curvature.

The curvature (or the inverse radius) is estimated by measuring the length of a chord (a line that intersects a circle at two points) and the sagitta (the longest distance between the chord and the arc). These measurements correspond to the diatom valve length and valve deflection in an arc of a diatom. These measurements are incorporated into the equation: $c = 2b(a^2 + b^2)^{-1/2}$ (where c = curvature, a = half of the chord length, and b = sagitta). Why calculate the curvature rather than the radius? We chose curvature because a straight line has an infinite radius but zero curvature and many diatoms tend to be relatively straight. This equation has been utilized to estimate the curvature of the valve margin and of the center line. In addition, this analysis can also be applied to smaller sections of the valve (i.e., valve inflation, apices, and central striae). This method can also be used to estimate the diameter of centric diatoms when only part of the valve is present.

We present two examples of using curvature measurements to determine morphological differences among taxa.

1. Valve margin curvature:

The curvature of the center-line of diatoms can be used to differentiate species of bent taxa. For example, species within the genus *Hannaea* exhibit different amounts of curvature; calculation of a curvature metric can be used to distinguish among species.

2. Measuring the (a)symmetry of diatom valves: This technique is useful for taxa with variable symmetry within the genus such as *Cymbella*, *Encyonema*, and *Eunotia*. If a diatom is symmetric, the difference in curvatures of both margins will be near zero. If a diatom is asymmetric, differences in curvature of both margins will not be near zero, which indicates some degree of valve asymmetry.