

# Investigating the Uptake of Inorganic Particulate Iron for the Pennate Diatoms *Phaedactylum tricornutum* and *Thalassiosira pseudonana*

Kayla Rae Farrell<sup>1</sup>, Elizabeth Shoenfelt, M.A.<sup>2</sup>

<sup>1</sup> Barnard College, New York, NY, <sup>2</sup> Columbia University, New York, NY

Currently, bioavailable iron (Fe) controls CO<sub>2</sub> uptake in about half of the world's oceans. Furthermore, Fe fluxes to Fe-limited regions have been responsible for phytoplankton blooms and global cooling in the geologic past. The uptake process of Fe from fluxes of various speciation and solubility is not well known, but highly critical. The study of inorganic particulate Fe and its interactions with phytoplankton is ongoing, as particulate Fe is possibly bioavailable to diatoms, but the mechanisms have yet to be determined. I investigated the possibility that the marine pennate diatom *P. tricornutum* can take up inorganic, particulate basalt, hematite, and ferrihydrite through surface interactions. Prior research suggests that *P. tricornutum* can utilize both soluble basalt and less-soluble hematite particulates, but only when surface interactions and sufficient mass-to-cell ratios are permitted. These results led to the conclusion that there is some mechanism occurring on the surface of *P. tricornutum* that renders inorganic particulate Fe bioavailable. To further study Fe uptake in diatoms by a wider range of more naturally-relevant particulates, I exposed cultures of *T. pseudonana* to glacial and non-glacial sediment samples. The cultures in which glacial sediments were added exhibited higher growth rates than the cultures in which non-glacial sediments were added. The Fe from the glacial sediment supported the growth of the diatoms in a manner comparable to that in a control to which a high concentration of soluble Fe is added. The Fe of the non-glacial sediment lead to similar growth patterns as a control to which no Fe was added. The reason for the higher number of cells/mL counted in the samples to which the glacial sediments were added is likely associated with the fact that glacial samples have more Fe<sup>II</sup>, which is reduced and the more soluble form of Fe. Fe<sup>II</sup> is thus the form that is more readily bioavailable for diatoms, compared to oxidized and more insoluble Fe<sup>III</sup>, which was more plentiful in the non-glacial sediments.