Biologically Essential Elements:

Learning Oceanograph

If you take a boat out on the ocean and dip a fine mesh net into the water, you probably would not be able to catch a fish. You would scoop up a bunch of phytoplankton (algae). If you bring this algae back to the lab at school and remove the water from inside the algae, and then analyze the elemental composition of the dehydrated algae, the top three elements would be carbon, nitrogen, and phosphorus (C, N, P). Interestingly enough, among the big three elements are an approximate constant molar or atomic ratio of 106:16:1. Oceanographers call this the Redfield Ratio. A professor at Harvard University named **Redfield discovered that** in addition to algae exhibiting this ratio, bioavailable nitrogen (mainly nitrate) and phosphorus (mainly phosphate) in deeper ocean water all over the world surprisingly also shows similar ratios of 15:1 to 16: I. As nitrate and phosphate are the major limiting factors for phytoplankton growth in the ocean, the ratios are of great use in estimating material

cycling in the ocean.



