Quigg, A., Finkel, Z., Irwin, A. et al. The evolutionary inheritance of elemental stoichiometry in

marine phytoplankton. Nature 425, 291–294 (2003)

This research looks at the different ways that phytoplankton evolved. Fossil records were utilized to look at how two distinct plastid superfamilies developed. The green superfamily dominated Palaeozoic oceans but a shift that is not well understood caused the red superfamily to become dominant. This schism was not seen as profoundly in terrestrial plants.

The research was undertaken to understand what caused this shift and also to look at the evolutionary inheritance of these two groups of pelagic autotrophs. The study utilized elemental composition of the major macronutrients but also extended the analysis to include trace elements. The study design utilized 15 species of eukaryotic phytoplankton which were grown under controlled, experimental conditions. One interesting thing that they did was extend their compositional analysis to include trace elements including Fe, Mn, Zn, Cu, Cd, Co and Mo. Based solely on elemental composition the researchers were able to distinguish between the two superfamilies 85% of the time.

By analyzing complete genome sequences of both of these groups they found that 50 core protein-coding genes were shared amongst groups whereas 14 were only found among red plastids. By examining the elemental composition of chlorophyll-b and chlorophyll-c they were able to test their “plastid” imprint hypothesis. One interesting finding was that trace elements in phytoplankton did not resemble sea water composition but more closely seemed to match the Earth’s crust. The research suggests that changes to the redox state of the ocean played an important role in how these photosynthetic organisms evolved into these two distinct groups.

This research was both complex and specific focusing primarily on trace element analysis. If my research utilized this method or genomic analysis it would be useful. I am interested in computational biology so will keep this study if my research goes into either of those areas.