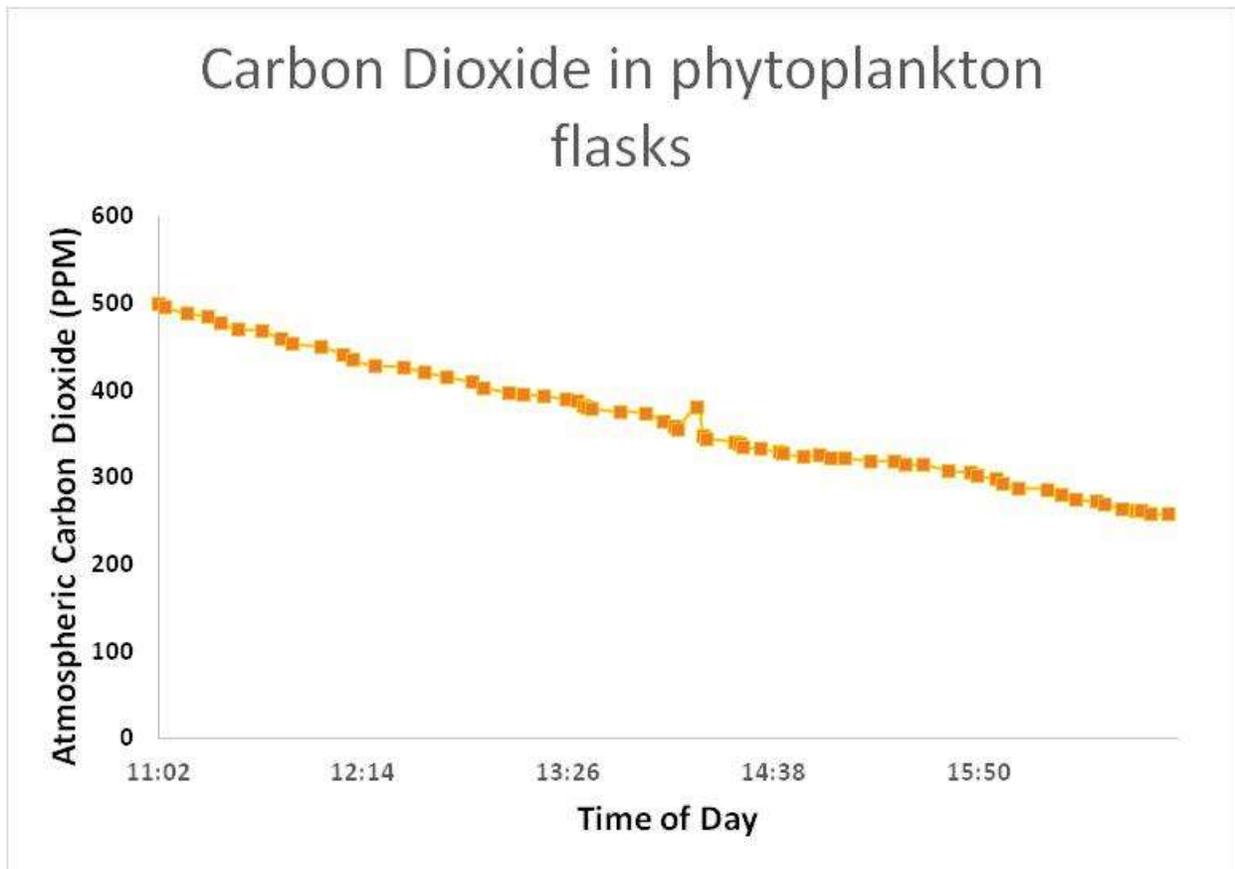
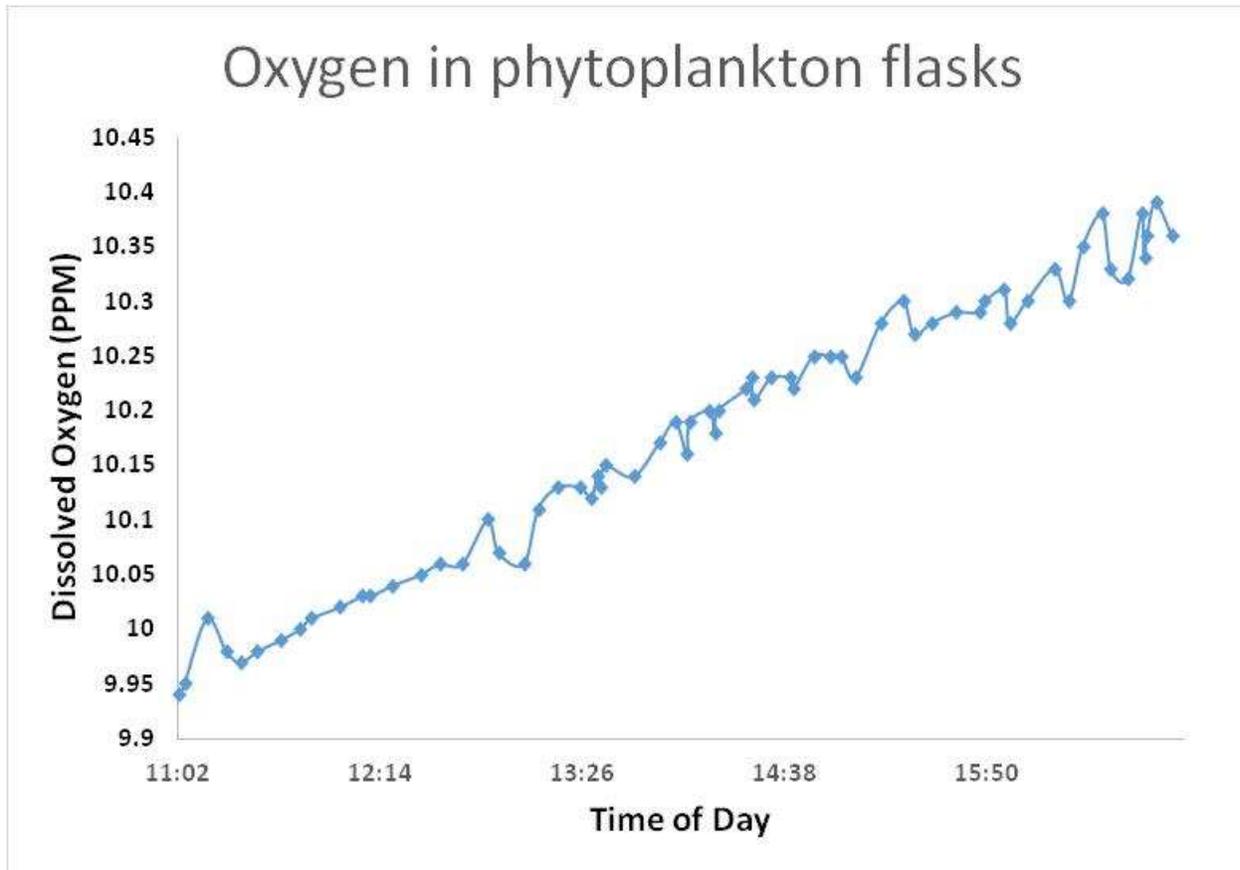


Carbon dioxide and oxygen are two important atmospheric gasses. Most organisms, including humans, consume oxygen through respiration, and produce carbon dioxide as a waste product. Furthermore, carbon dioxide is also produced through many human activities, and is an important greenhouse gas which contributes to global warming, as well as ocean acidification.

Like land plants, phytoplankton (microscopic algae which float in the water) photosynthesize. They get their energy from the sun to make their own sugars and other biological molecules. Also like land plants, these algae form the base of the food chain – even the largest animals on earth, blue whales, eat krill, which in turn eat phytoplankton.

We wanted to know how photosynthesis by phytoplankton affects both oxygen and carbon dioxide. We sampled water from the San Francisco Bay on the morning of discovery day, and gave it plenty of light to encourage photosynthesis. We had discovery day attendees measure the carbon dioxide and oxygen concentrations in our samples, and produced the following plots.





What do these plots tell us?

During photosynthesis, plants and phytoplankton use carbon dioxide to make carbohydrates and other molecules, and produce oxygen as a waste product. We can see this in our experiment – throughout the day the oxygen increased as the carbon dioxide decreased. This suggests that during discovery day, there was more photosynthesis than respiration in our flasks.

The earth was oxygenated by similar organisms, doing the same process. In fact, phytoplankton currently produce about $\frac{1}{2}$ of the oxygen in the air. Environmentally, this also helps mitigate some of the effects of global warming. Some of the carbon dioxide used by phytoplankton eventually sinks to the seafloor, where it can be sequestered for millions of years.

These tiny organisms have an overwhelming effect on the global environment, and even help to balance human carbon emissions!