



**Todd Martz**  
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## SENSING THE OCEANS – TOOLS OF THE TRADE

*How is the ocean changing?*

*How can scientists predict the future state of the oceans?*

The ocean is vast and seemingly endless. For marine scientists this creates mind-boggling challenges of finding new and innovative ways to discover how the oceans are changing. To study the oceans, scientists need the most crucial element of all: access.

To better understand and characterize the state of the ocean at a given time, look into the Scripps Oceanography laboratory of **Todd Martz**, Scripps' newest assistant professor of marine chemistry. Spatiotemporal processes are a fundamental area of study in the environmental and physical sciences and the oceans harbor one of the most active research topics.

Most of what is known about ocean chemistry comes from snapshots obtained by ships. Because the ocean is immense and time aboard a research ship is extremely costly, many locations have only been sampled one or two times, if at all.

Autonomous sensors now play an increasing role in ocean science by providing continuous, high-resolution, sometimes hourly, time series measurements of properties such as bio-optics, oxygen, and partial pressure of CO<sub>2</sub> as often as every hour. These measurements are gathered from a variety of platforms including moorings, volunteer observing ships, profiling floats, gliders, drifters, and AUVs. The goal of Martz and his science team is to develop chemical sensors for additional CO<sub>2</sub> parameters in order to fully characterize the ocean's CO<sub>2</sub> system.

Developing new methods and technologies for measuring dissolved carbon dioxide in the ocean and adapting these techniques for use on autonomous instrumentation, such as oceanic floats and moorings, is paramount for scientists and their students to continue their pursuits in understanding the state of the oceans.

*In order to advance their ocean sensor research, Todd Martz and his team of stellar graduate students require improved facilities and equipment:*



# WISH LIST

### **Experimental aquarium renovation \$50,000**

The most pressing need for the Martz laboratory at Scripps right now involves the experimental aquarium, a campus facility with large tanks of ambient and chilled seawater systems used for the studies of living plants, animals, and seawater. A large instrumentation test tank is needed exclusively for studies related to the aqueous CO<sub>2</sub> system (e.g. instruments for ocean acidification monitoring and a variety of other carbonate system studies), where they bring together a diverse set of instruments for an intercomparison or to simultaneously calibrate a large number of instruments.

### **Water purification system \$10,000**

For the large experimental aquarium test tank

### **System of overhead beams with block and tackle \$5,000**

For the large experimental aquarium test tank

### **Steel instrument frames \$5,000**

For the large experimental aquarium test tank



## TAKING THE PULSE OF THE PLANET

**Yui Takeshita**, a graduate student in marine chemistry and geochemistry with Todd Martz, is in his second year at Scripps Oceanography. In support of Martz's ocean sensing research, he is working on applications of autonomous pH sensors on moorings and underway pH and CO<sub>2</sub> measurement systems on ships. Yui conducts analyses of oxygen sensor data coming back from profiling floats in the Argo program. Argo is a global array of more than 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2,000 meters (6,561 feet) of the ocean. This allows, for the first time, continuous monitoring of the temperature, salinity, and velocity of the upper ocean, with all data being relayed and made publicly available within hours after collection.

*Securing donations to support Scripps students remains an ongoing priority.*