The Santa Clara Valley and the California Los Padres Sections of the American Chemical Society Present a Joint Meeting
at the
Monterey Bay Aquarium Research Institute, MBARI.

3 pm., Saturday, May 2, 2009
MBARI
7700 Sandholdt Road
Moss Landing, CA

"Measuring Climate Change in the Oceans"

Ken Johnson, Ph.D.
Senior Scientist, MBARI

The event will include a tour of MBARI beginning at **3 pm.**
A reception (including light appetizers) at **4 pm.**
and Dr. Johnson's presentation at **5 pm.**

The cost for the reception will be **$15** per person.

***CALPACS** will be arranging bus transportation from Ventura, Santa Barbara, and SLO pick up sites to MBARI for an additional cost of **$20 per person**. Snacks will be furnished on the bus. Bring your own bag lunch for the ride up. (Further details and pick up schedule will be coming soon.)*

Directions to MBARI can be found at **http://www.mbari.org/about/directions/directions.html.**
(Note that this event is at **MBARI** and ***NOT*** THE MONTEREY BAY AQUARIUM.)

Please make your reservations by **Wednesday, April 29, 2009**, by emailing calpacs@chem.ucsb.edu. More information can be found at www.chem.ucsb.edu/~calpacs, or by calling James Pavlovich at 805-893-4252.

Abstract: The ocean and its organisms play a major role in regulating the flow of carbon dioxide through the tmosphere. Atmospheric CO_2 concentrations would be nearly double pre-industrial levels without biological uptake of CO_2 during photosynthesis at the sea surface and export of these particles to ocean depths. Further, the ocean has absorbed about one half of all anthropogenic CO_2 emissions, an ecosystem service that is worth hundreds of billions of dollar per year at current prices for carbon credits. However, the fraction of anthropogenic CO_2 that enters the ocean each year is decreasing and the mechanisms (physical or biological) that might drive such a decrease are not well understood.

Monitoring the flow of carbon through the ocean, and understanding the processes that regulate this flow on a global scale, both require new methods of chemical sensing that don't involve scientists with conventional laboratory instruments that are carried to sea on ships. There are never enough ships or personnel to obtain an annual assessment of biogeochemical processes over the three quarters of the planet's surface covered by the ocean. Developments in the past decade have enabled a remarkable shift in measurement capabilities that are now revolutionizing our ability to observe ocean biogeochemistry on a global scale. Arrays of chemical and biological sensors can be deployed in the ocean on profiling floats and they return data with little detectable drift in sensor response over multiple year periods and with no direct human intervention. These systems are becoming sufficiently affordable that it is possible to envision biogeochemical sensor networks with hundreds of nodes or more, similar to the current Argo network of 3000 profiling floats that monitors ocean temperature. This will allow the development of ocean basin-scale and, ultimately, global-scale observing systems.

In this talk, I'll describe work in the Chemical Sensor Laboratory at MBARI to develop the sensors needed for these autonomous observations of ocean chemistry. Examples from sensors operating in remote areas of the North Pacific, in the Southern Ocean and the tropics and the lessons that are being learned will be presented.

Ken Johnson received a B.S. in Chemistry and a B.S. in Oceanography from University of Washington in 1975. He then moved to Oregon and received a Ph.D. in Oceanography from Oregon State University in 1979. He is Senior Scientist at the Monterey Bay Aquarium Research Institute. His research interests are focused on the development of new analytical methods for chemicals in seawater and application of these tools to studies of chemical cycling throughout the ocean. Dr. Johnson and his group have developed a variety of analytical methods for metals present at ultratrace concentrations in seawater using flow injection analysis with chemiluminescence and fluorescence detection. These methods have been used in a variety of studies of metal cycling in the ocean.

Analytical methods for iron, an essential micronutrient, have been used in the IRONEX experiment to map iron as it was added in the equatorial Pacific and to study iron in coastal ecosystems. Methods sensitive to metal speciation have been used to study copper complexation in polluted harbors and to study the physical chemistry of metal oxidation. Over the past 15 years, a variety of sensors and analyzers that operate in situ to depths of 4000 m have been developed. These instruments have been used to study processes ranging from the distribution of sulfide in deep-sea hydrothermal vent systems to nitrate in coastal ponds surrounded by intensive agricultural activities.