

Method Development for Chemical Analysis of Seawater

The development of Programmable Flow Injection (PFI) methodology for the analysis of aluminum, silicate, and phosphorous in seawater.

The development of new analytical methods for seawater analysis is an important step toward the furthering of our understanding of the oceans geochemical cycles. Programmable Flow Injection (PFI) is a method of chemical assay wherein reagents and samples can be combined and allowed to react through the varying action of pumps and holding coils within a machine. (Figure) The development of methods of chemical assay through this system will allow for the analysis of seawater samples in a much quicker timeframe and through the use of smaller amounts of sample and reagent, and thus with the creation of less waste product. The reduced size, reagent input, and sample input into these systems make them capable of conducting shipboard assays, and eventually automated assays through the use of a programmable micro-controller, such as an Arduino or a Raspberry Pi.

The chemistry for these systems will be based on established methods of chemical assay that have been created and optimized for other systems such as batch chemistry and Flow Injection Analysis (FIA). The work being done at the Moss Landing Marine Laboratories Chemical Oceanography lab, involves taking these established methods and altering them for the pFI system. Upon the development of the new methodology for pFI based chemical assay, these systems will be deployed within the Elkhorn Slough and eventually, the ocean in order to answer important biogeochemical questions.

Potential biogeochemical questions to be answered by these projects include: an analysis of seasonal variability of aluminum within the Elkhorn Slough; an examination of silica's biogeochemistry in the Monterey Bay region; and an examination of bromoform emissions from kelp. These projects will all utilize the development of new methodology to answer these



Figure. A miniSIA-2 device used for programmable Flow Injection Analysis.

important biogeochemical questions. The Chemical Oceanography lab is searching for undergraduate assistants to aide us in the lab and in the field as we continue to explore the development of these methods and embark on a variety of new projects in and around the Monterey Bay.

As an undergraduate student you will be able to work on:

- Assisting in the development and deployment of new methods of chemical analysis in seawater.
- The preparation of buffers and other reagents that are necessary for the analysis of various chemicals in seawater.
- The development of Python code and a micro controller to work on the automation of analytical systems.

Things you will learn/be exposed to:

- Analytical chemistry method development
- Field work in and around the Elkhorn Slough and Monterey Bay
- Buffer and reagent preparation
- Spectrometry
- Data handling and analysis

You need to be able to:

- Follow safety guidelines
- Work for up to 4 hours at the Chemical Oceanography Lab at Moss Landing Marine Laboratories.
- Assist in the development and implementation of new methodology.

Looking for someone who is:

- Enthusiastic
- Focused
- Honest
- Patient
- Resilient