# CALIFORNIA STATE SCIENCE FAIR
## 2003 PROJECT SUMMARY

**Name(s)**
Alan D. Foreman

**Project Number**
**S0605**

**Project Title**
# Are Our Waters Clean? A Study of the Concentrations of the Pollutants Cadmium, Uranium, and Phosphate in Newport Estuary

**Abstract**

**Objectives/Goals**
The objective was to determine the concentrations of the pollutants Uranium, Cadmium, and Phosphate, and whether they stemmed from a point or non-point source within the Newport Estuary.

**Methods/Materials**
Using "clean" procedures, samples were taken in 15 locations in Newport Estuary, and each location was recorded using a Global Positioning System. Ocean water taken at a location off of Dana Point was used as a control for the experiment. Unwanted particles and organic matter were removed through filtration. The concentrations of the heavy metals Uranium and Cadmium were measured using an Argon Plasma Mass Spectrometer, and were calculated using the "Isotope Dilution" method. The concentration of phosphates was calculated using the molybdenum titre method. Salinity was calculated by measuring each sample's electrical resistance. For each sample, the concentration of each pollutant was plotted against the salinity of the sample.

**Results**
As salinity increased, the concentration of both Uranium and Cadmium increased conservatively as well. The concentration of phosphates decreased as salinity increased, but it significantly increased at the common entry of several runoff streams, before returning to its conservative decrease.

**Conclusions/Discussion**
This data suggests that in fact there are fewer pollutants coming into the estuary from the San Diego Creek than are coming in from the lower bay and that they mix conservatively. Thus there was no point source for either heavy metal. The concentration of phosphates suggested a point source located at the common entry of several runoff streams into the estuary, well downstream of San Diego Creek.

**Summary Statement**
My project determined that there was no point source for Cadmium or Uranium in the Newport Estuary, but I was able to identify a point source for Phosphate.

**Help Received**
Jeff Mendez, a post-doc at Caltech, helped me to filter and analyze the samples. My father helped me understand a large portion of the math needed to complete the project.