Problem Description: Understanding/controlling aquatic microbial population development

Scientific Goals

- Understanding ecology of aquatic microorganisms.
- Developing better tools for studying them.

Technology/Applications Goals

- Detection and prediction of harmful events involving proliferation of aquatic microorganisms, e.g., algal blooms.
- Intervention to mitigate the consequences of harmful events.

Experimental studies in laboratory test bed

- Artificial stimulation of a ‘brown tide’ (bloom of Aureococcus anophagefferens) in a thermally stratified column, and demonstration of predation effects.
- Monitoring the daily vertical migration of a red tide dinoflagellate in a thermally stratified column.

Microorganism sensing, identification, enumeration

- Development of a novel biological detection method for the harmful brown tide alga (BTA): immuno-based flow cytometry. Now used routinely in our labs for detection and counting of BTA.
- Development of methods for attaching BTA-directed antibodies to surfaces. This is useful for functionalizing the tips of AFMs that are used in force sensing, functionalizing other sensors, etc.
- Identification of BTA immobilized on a surface by using force-distance curves obtained with an AFM with a functionalized tip. This detection technique is sensitive to a single cell.
- Fabrication of nanowire and carbon nanotube sensors.
- Demonstration of nanowire sensing principles for BTA.

Future directions

- Emphasize field deployment:
  - James Reserve fresh water Lake Fulmor
  - Santa Catalina Island Thompson’s fresh water reservoir
  - Long Island, NY coastal lagoons
- Continue lab work in support of field deployment.
- Discontinue detection and identification research using AFMs and nanowires because they will not be applicable to field deployments in the near future.