



Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by **Battelle** Since 1965

Coastal Sciences Division
Energy & Environment Directorate

MARINE BIOTECHNOLOGY

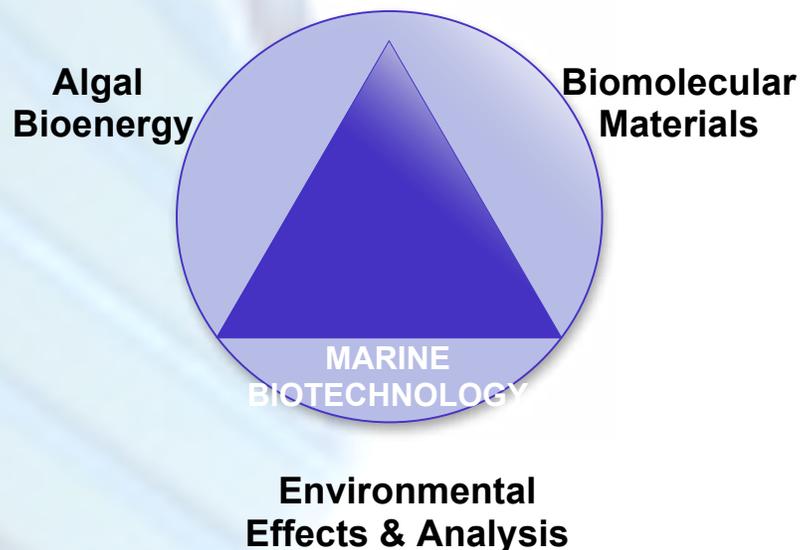
Capabilities

- Microbiology
- Genetic Engineering & Synthetic Biology
- Physiology/Biochemistry
- Invertebrate Biology/Taxonomy
- Developmental Biology
- Molecular Toxicology
- Cell & Molecular Biology
- Ecotoxicology
- Acoustics
- Environmental Monitoring
- Biostatistics
- Ecological Community Analysis

Research Areas

- Algal Bioenergy
- Environmental Effects & Bioremediation
- Physiological Indicators
- Acoustics Effects
- Stress Biology
 - Marine Hydrokinetics
 - Hydropower
 - Off-Shore Wind Power
- Biomaterials
- Biosensors
- Catalysis

Vision: Advancing Science and Technology to Meet Today's Environmental, Energy, and National Security Needs.



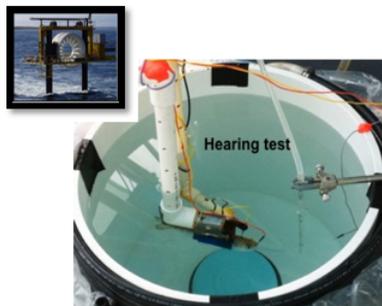
Marine Biotechnology at Pacific Northwest National Laboratory is based on a tripartite plan grounded in the Laboratory's mission priorities in environment, energy, and national security. Research in marine biotechnology is conducted for federal and non-federal governmental agencies and the private sector.

Goals:

- Detect environmental and national security threats using advanced biotechnological approaches.
- Discover and develop biomolecular materials produced by marine species.
- Discover and develop paths to clean bioenergy and reduce impacts on the environment resulting from energy generation.

ENVIRONMENTAL EFFECTS & ANALYSIS

Several lines of research are analyzing the environmental effects of anthropogenic activities due to developing energy technologies.



Acoustics test chamber designed by PNNL staff used to expose marine species to altered acoustic environments potentially generated by marine hydrokinetic or off-shore wind power devices.

Research Topics

- Using new approaches in biotechnology to understand the potential environmental effects produced by energy-generating structures.
- Determining effects of endocrine-disrupting chemicals on aquatic animals.
- Improving tracking methods for individual fish and marine mammals.
- Developing microbial biosensors for detecting environmental and national security threats.
- Understanding the role of microorganisms in bioremediation.

BIOMOLECULAR MATERIALS

Marine organisms possess structures that have potential to be developed into useful applications.



Scientists use a variety of biological sources from bacteria to diatoms to develop novel biomolecular materials.

In addition, genetic engineering is used to confer new functions to existing biomolecular structures, resulting in a path to "Green Synthesis" of novel biomaterials such as sensors for national security, immobilized enzymes for catalysis, and immobilized chelators for sequestration and remediation.

Research Topics

- Functionalization of diatom biosilica with immobilized, application relevant proteins.
- Biologically-mediated extraction of carnalite from seawater.
- Enhanced detection of chemical and biological agents

ALGAL BIOENERGY

The United States has production targets for replacing petroleum with renewable biofuels through the Energy Independence and Security Act of 2007.



Indoor raceways for intermediate scale-up of microalgae cultures for biofuels research.

MSL is conducting research on the advanced biofuel potential of microalgae and macroalgae.

Research Topics

- Identification of high-lipid producing microalgae.
- Environmental characterization of growth conditions.
- Resource assessment for macroalgae production in the U.S.

**For more information, contact
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