

**(U0480) ADATTAMENTI BIOCHIMICI ALL'AMBIENTE MARINO E
METODOLOGIE PER LA BIOREMEDIATION**

PROGRAM OF THE COURSE

Academic Year 2015-2016

Main Topics:

Marine environment. factors influencing biochemical processes and mechanism. Depth, temperature, salinity, etc.

Seas and Oceans. Seawater as habitat: chemistry, light and temperature, ocean currents, and carbon cycle in seawater

Some mechanisms of thermal acclimation and depth/ pressure adaptation in marine organisms.:

COUNTERCURRENT HEAT EXCHANGER- Subcutaneous Fats-Anti-freezing mechanisms.

The darkness in the seas. Bioluminescence. Luciferin, luciferase, photoproteins. ATP. FAD.

Biochemical bases of adaptation *Examples of adaptation at levels of proteins, nucleic acids and the lipid-protein assemblages of cellular membranes.*

Specific topics: Biological membranes and temperature. Homeoviscosity of biological membranes. Molecular architecture and biophysical properties of phospholipids during thermal adaptation in fish. Anti-freezing proteins. Heat Shock Proteins. Activation of new enzymatic pathways as a consequence of changed environmental conditions and others.

*Examples of enzyme adaptation: **Isozymes.** Specific topics: Molecular mechanism of adaptation to low temperature in marine poikilotherms. - Malate Dehydrogenases (MDHs) in marine organisms- LDH of a cold-adapted, deep-sea fish, *Coryphaenoides armatus*.- PRESSURE AND TEMPERATURE ADAPTATION OF CYTOSOLIC MDHs OF SHALLOW AND DEEP-LIVING MARINE INVERTEBRATES.*

Bioremediation. Introduction, definition and purposes.

Pollution: Sources and pathways – Types – Adaptation. *Specific examples will be discussed.*

Biochemical biomarkers in marine pollution. Pollutant biochemical effects on marine organisms. Algal biotoxins. Diatoms and domoic acid. Gelatinous blooms.

Coral reefs and climate changes.

Biochemistry of Marine Environment. The problem of biofueling.

Pollution by metals: Effect of heavy metals. Effect of metal ions in crustaceans. Perturbation of the proteasomes of two benthic crustaceans. Ubiquitination and proteasome.

Bioremediation Biotechnology.

Primary and secondary marine producers/consumers. Classification, cultures and growth, algal pigments, selected metabolic pathways.

Mechanisms of Bioremediation. *Specific examples will be discussed (Role of Microbial Enzymes in the Bioremediation of Pollutants. Mercury-resistant marine bacteria. Structure – function relationships in selected marine polysaccharides: alginate from brown algae and chitin/chitosan from crustaceans, with emphasis on biotechnological applications, and others).*

Specific topics: The potential application of HSPs as biomarkers. Bioremediation with bacteria and fungi. Phytoremediation – Microalgae and biosorption. Cadmium accumulation and biochemical responses in S.aurata.