College of Life Sciences

Department of Food Science

Department of Aquaculture

Department of Bioscience and Biotechnology

Institute of Marine Biology

Doctoral Degree Program in Marine Biotechnology

Deportment of Food Science

    The Department of Food Science aims to develop the science and technology necessary to use agricultural and aquatic resources effectively and to train specialists and scientists in the food science field. The undergraduate program emphasizes fishey, food and life science, including biological and physical mechanisms, and introduces students to technology that is associated with numerous aspects of food science and biotechnology. Graduate students focus on integrating and broadening their basic food science knowledge by developing thinking and independent research skills. The 25 faculty members of the Department of Food Science teach and conduct a wide range of research and extension projects. For the near future, the department is aimed at providing an exceptional environment for the study and research of food science and biotechnology. The major research focuses are on food chemistry, processing, biotechnology, food microbiology, nutrition, and food engineering. Faculty members conduct research in well-equipped research laboratories in which students are also trained to use experimental techniques. Specified research topics include the following: (a) food biotechnology, (b) chitin and chitosan, (c) health foods and functional products, (d) fishery toxicology, (e) food enzymology, (f) usage of underused fish, (g) food nanotechnology and (h) new product development.

Deportment of Aquaculture

The Department of Aquaculture was established since 1974 and began offering a degree in Bachelor of Science. The Department of Aquaculture, since then offering graduate studies leading to the implementation of a degree in Master of Science in 1987 and Doctor of Philosophy degree since 1992.

The Department of Aquaculture holds a unique position in the educational system of Taiwan. As a respected research and teaching institution, it is committed to intellectual leadership, and to excel in developing new knowledge and conveying that knowledge to its students and to the public.

Areas of study that are available include aquaculture and ecosystem, aquatic biology, nutrition of aquatic feed and live feed, fish pathology and immunology, aquaculture management and system analysis, and molecular biotechnology. Emphasis is placed upon broad training in aquaculture science and specialized training in one of the above areas to prepare both undergraduate and graduate students for administration, research, management, teaching, industry, or extension activities.

Employment opportunities for aquaculturists exist at all levels of education. Careers are available as teachers and researchers in universities and institutes, as Scientists in a variety of governmental, medical, and industrial sectors and laboratories, and as professional managers and entrepreneurs in aquacultural businesses.

Deportment of Bioscience and Biotechnology

This department that offers bachelor, master, and doctoral degrees was born in 2013 after combing the Graduate Institute of Bioscience and Biotechnology established in 1993 and the Department of Life Sciences established in 2005. After finishing their base courses on chemistry, physics, biology and biostatistics, undergraduate students may explore all fields of Bioscience at molecular, cellular, physiological, and evolutionary levels by taking a group of well-designed advanced courses, including lecture and laboratory training according to their own interests.

The Department of Bioscience and Biotechnology requires students to actively engage in research by conducting independent research projects at a laboratory of their choices. Students are also required to join training seminars to increase their ability to present their thoughts.

Before earning their master or doctoral degrees, graduate students must conduct intensive independent research within the following four programs.

1. Molecular and cellular biology: This program is concentrated on immune cell activation, apoptosis and gene therapy, stem cell culturing and relevant applications, cancer, neuron-degeneration, metabolic diseases and inflammation. Research findings have been published in prestigious journals such as Transgenic Research.

2. Developmental biology: This program is focused on hypoxia, gene regulation, signal transduction and carcinogenesis, animal embryonic developments, transgenic fish model systems, and reproductive physiology. Research findings have been published in esteemed journals such as Cell Death and Development and Development Dynamics, and Molecular Carcinogenesis.

3. Chemical biology: This program is centered on cellular-methylation and DNA-repair mechanisms, biological anti-oxidation systems, environmental analytical chemistry, nano-biotechnology, and biomedical materials. Research findings have been published in distinguished journals such as *Biosensors and Bioelectronics, Journal of Nanomaterials Aquatic Toxiciology, Toxicology and Applied pharmacology and Free Radical Biology and Medicine*.

4. Functional genomics and proteomics: This program is concentrated on protein engineering, bioinformatics, gene regulation systems, molecular evolution, and bio-resource development. Research findings have been published in reputable journals such as the *Journal of Proteome Research, Plos One, and Briefing in Bioinformatics.*

The Department of Bioscience and Biotechnology graduate students have applied their multi-disciplinary learning and research abilities in the Center of Excellence for the Oceans (formerly Center of Excellence for Marine Bioscience and Biotechnology, CMBB), the Molecular Integrative Biology (MIB) program operated between NTOU at the Institute of Cellular and Organismic Biology at Academia Sinica in Taiwan. Therefore, the Department of Bioscience and Biotechnology is involved in the transfer of state-of-the-art biotechnology not only for marine and aquaculture research but also for technological innovations that can lead to further insights in all of the life sciences. By participating in project-oriented and hypothesis-driven experiments, students can hone their unique abilities and prepare themselves to become leaders in the bio-industry or academia.

The Department of Bioscience and Biotechnology has been awarded a research excellence fund by the Center of Excellence for the Oceans for 6 years has been actively conducting a study on environmental adaptation under the umbrella of global environmental change. The Department of Bioscience and Biotechnology will continue to provide crucial contributions in these fields to solve contemporary challenges by conducting high-level research and by teaching.

Institute of Marine Biology

The Marine Biology Institute was established in August 1991, and consists of ten faculty members who specialize in the complementary fields of marine taxonomy and ecology. The goals of the institute involve maintaining a high level of marine biology education for students, strengthening basic research in Taiwan, and assisting the government with tasks related to efficiently using and protecting marine resources.

Doctoral Degree Program in Marine Biotechnology

Doctoral Degree Program in Marine Biotechnology (DPMB) with the main objective of developing marine biotechnology-related industrial applications, is proposed because: (1) biological resources of the ocean have been and will be the main targets for biotechnological applications, (2) there is a dire need in industry for researchers with a marine biotechnology background, and (3) multi-disciplinary collaboration is encouraged between principle investigators (PIs) of National Taiwan Ocean University and Academia Sinica. The Ministry of Education has approved the enrolment of PhD students in 2015. PIs from both institutions will be jointly responsible to supervise the students on projects related to aquatic biotechnology. Aiming at the following five key research areas, this program offers professional and innovative courses on marine resource development and application so as to encourage students to transform the knowledge obtained from the courses into practices. DPMB emphasizes crosstalk and collaboration between research and industry, expect to achieve ultimate goal of sustainability of marine bioresources.

1. Fish Molecular Physiology : This research area is to investigate the effects of climate change and global warming on reproduction, development and growth of marine species (fish, crustacea, shellfish and coral) at molecular, cellular, tissue and organismal levels. Research areas include fish reproductive strategy, effects of endocrine hormones produced by the brain and reproductive organs on sex development of fish, pH homeostasis of aquatic organisms, gene expression and signal transduction of fish embryo by chemical changes in aquatic environment.

2. Ecology and Evolutionary Biology: This research area is to investigate temporal and spatial change of marine organisms using field observation and molecular techniques. Research areas include relationships between marine organisms and environment with the emphases on distribution, abundance, community, diversity, ecosystem functioning and evolution phylogeny).

3. Extreme Environment And Extremophiles: Kueishan Island, situated on the north eastern side of the Taiwan Island, is surrounded by hydrothermal vent systems which nurture unique organisms. This research area is to explore the organisms inhabiting this habitat, and to investigate their biochemistry and the bioactive substances produced by these organisms, including decoding the genome of the crab Xenograpsus testudinatus and development of degradative enzymes of the bacterium NTOU1.

4. Diseases prevention of Marine Animals and Vaccine Development: This research area brings together expertise of immunology, virology, molecular biology, aquaculture, bioinformatics and mechanical engineering from National Taiwan Ocean University and Academia Sinica to develop strategies and vaccines for disease prevention based on gene manipulation and function. Research focus includes development of rapid detection kits, vaccines and antibiotic peptides of aquatic diseases and high-quality aquaculture breeds with high growth rate, physiological adaptability and disease resistance.

5. Marine Bioresource and Material Development: This research area brings together expertise of isolation, structure purification, chemistry, bioinformatics, bioengineering, function assessment, toxicology and sustainability of marine bioactive substances to discover new drugs, health products and animal feeds for related industry. Research topics include effects of global warming on change of marine bioresources, new applications of marine bioresources, effective usage of marine bioresources, chemical engineering of new drugs, development of alternative energy, and isolation and analysis of bioactive compounds.

圖片說明:

HPLC(High Performance Liquid Chromatography) experiment is taken place in Lab 301.

Biochemistry experiment.

Shrimp broodstock maintained in culture.

The schematic representation of (a) the preparation of antibody-conjugated gold nanoparticles (Ab-Au NPs), and (b) their use in the analysis of bacteria by employing laser desorption/ionization mass spectrometry (LDI-MS)
Schematic representation of the reversible inhibitory function of TBA15pc/TBA29pc-P8T15-antibody-conjugated gold nanoparticles (Ab-Au NPs) by using irradiation of near-UV light.

Predicted protein 3D structure of BIChiáG419 using a (PS) 2 server: A. secondary structure; B. molecular surface.

Zebrafish hsc70 and hsp70 expression and heat shock effect dectected by whole mount in situ hybridization.

We re-discovered the biological meaning of protein-interaction networks by annotating the protein interaction motif, using the molecular function of each node in the network.

A phylogenetic analysis of the marine ascomycetes Nimbospora spp. 1. Ascospore of N. effusa with a sheath and a tuft of fibrillar appendages attached to one side of the septum. 2. Ascospore of N. bipolaris with a sheath and two tufts of fibrillar appendages attached to both sides of the septum. 3&4. Ascospores of N. octonae with a sheath which swells in sea Water.