



# The Department of Marine Biology



אוניברסיטת חיפה  
University of Haifa



**F**rom its perch overlooking the Mediterranean, the University of Haifa's Department of Marine Biology has a clear view. Ideally situated minutes from the sea – and within the interdisciplinary Leon H. Charney School of Marine Sciences – the department enjoys a unique position. Devoted to top-notch research and teaching, it is poised to be a leader in educating the next generation of scientists, academicians and decision-makers.

# A **Mirror** to our **Planet's Past,**

## THE DEPARTMENT OF MARINE BIOLOGY

As Israel's only department of marine biology, University of Haifa students and faculty have adopted a unique multidisciplinary approach. Research here probes the tiniest details and the broadest issues. It ranges from genes and proteins, through to organisms, and on to complex marine communities and ecosystems. The Department of Marine Biology interacts with other departments, such as Marine Geosciences and Maritime Civilizations to provide a holistic, multidisciplinary view of life in the oceans.

In its endeavors, the department's Haifa location gives it a strategic advantage. Sitting on ancient trade routes where civilizations met, the department focuses on the Mediterranean Sea and the life it contains. The city of Haifa hosts several of Israel's leading academic, governmental and industrial research centers, providing opportunities for scientific cross-fertilization. The Mediterranean is bordered by many different countries and cultures, and scientists work with peers from Europe, Africa and the Middle East, as well as further afield such as the US and Australia, making it a nexus of collaboration.

## THE CRITICAL ROLE OF MARINE BIOLOGY IN OUR FUTURE



**Science** Covering over 70% of the earth's surface, our oceans contain an enormous amount of life, from plankton invisible to the human eye to 125-foot-long whales, the world's largest mammals. Marine biology is a wide area devoted to the study of these organisms. Committed to understanding the secrets of life in water, marine biologists explore the basic functions of cells and organisms. How do unicellular algae capture sunlight and convert it to energy? How does this energy nourish plankton, fish, sea-mammals and ultimately humans? How do marine organisms survive the harsh conditions of the deep, dark, abyssal ocean? Collaborating with chemists, physicists, computer scientists and oceanographers, marine biologists aim to provide a holistic view of life in the sea.

**Technology** The oceans, teeming with life, represent a treasure trove which can feed humanity, provide energy and medicines for future generations. Although the oceans may seem huge and eternal, they are changing as the result of human activity. Climate change, overfishing, pollution, marine traffic and

# Present and Future

industrial overuse all take their toll. Marine biologists monitor the current state of the oceans, study hints of the past hidden in ocean sediment, ice and coral skeletons, and model potential effects of climate change on future oceans and their ecosystems. With the oceans serving as barometers for the health of the planet, marine scientists aim to set a course whereby humanity can make use of the oceans while conserving them for future generations.

**Conservation** Marine biologists must fully assume their mandate as stewards of the sea - monitoring the oceans, understanding how they are changing, and guiding citizens and decision makers on how to preserve our natural marine heritage. As Israel's only department of Marine Biology, we are ready to stand up to this challenge.

## RESEARCH AT THE DEPARTMENT OF MARINE BIOLOGY

**Climate Change and its Impact on Marine Life:** Human activity is changing the oceans, raising water temperatures and, causing large-scale coral destruction. Together with increasing atmospheric CO<sub>2</sub> levels, which cause ocean acidification, these changes may lead to the growth of toxic algae and may affect global carbon and nutrient cycles. Research in the Department of Marine Biology led by Dr. Tamar Lotan and Dr. Dan Tchernov focuses on the effects of rising temperatures, acidity, and heavy metal toxicity on the life cycle of corals and sea anemones, and on the widespread emergence of their close relatives, jellyfish.

**Buried Treasure:** Marine organisms, such as single-celled microbes, deep sea sponges, reef corals and coastal anemones, produce numerous “bioactive” chemicals, used to catch their prey and protect themselves from predators and pathogens. The research group led by Dr. Daniel Sher studies these organisms and the substances they produce, focusing on novel compounds with potential for biomedical research, anti-microbial and anti-cancer drugs, and industrial applications. In Mediterranean and Red Sea reefs and deep sea expeditions, our marine biologists explore hidden coral and sponge gardens – the sources of novel chemicals produced by never-before-seen live forms.

**Deep Seeps:** In the deep regions of the eastern Mediterranean, methane gas seeps from below the sea floor to the open waters. These vents, or “cold seeps”, feed rich communities of previously unseen organisms that utilize methane gas to make energy. A collaborative consortium of researchers from the Departments of Marine Biology and Geosciences aims to understand how these life forms make energy from methane, and how they affect the release of this important greenhouse gas into the environment.

**Green Fuel from the Sea:** Photosynthesis – the process in which sunlight is converted into organic material – is the foundation of all “green fuels”. The research group led by department head Dr. Dan Tchernov studies this process, conducting research that may lead to new algae-based fuels. They ask, for example, how do symbiotic algae in deep-sea corals utilize the faint light that reaches 70 meters down? How do other algae deal with rapid changes in light intensity? The answers to these questions and many more may, ultimately, prompt the shift to environmentally-friendly, carbon-neutral energy.

**From Seaweed to Sunscreen - The Promise of Algae:** Having evolved for millions of years under harsh environmental conditions, microscopic ocean algae have developed special means of defense. A collaborative team of the department’s marine biologists have identified one such mechanism: compounds that block out UV light. This discovery holds great promise for the healthcare and cosmetics industry. Potential products include “naturally” UV-absorbing and anti-aging sunscreen.

## GIFT OPPORTUNITIES

### I. Naming of the Department of Marine Biology

\$ 4 M

### II. Establishing a Deep Diving Center

\$ 1.5 M

Many research projects require working at depths of 45-100 meters, below the depths accessible using usual diving techniques. The **Scientific Technical Diving Facility** will support a team of six divers with the appropriate training and diving equipment, enabling them to safely and effectively study organisms in “deep reefs.”

### III. Departmental Research Labs

#### **The Collaborative Equipment Laboratory**

Top-notch research often requires sophisticated and expensive equipment, usually housed in specialized collaborative laboratories and made accessible to many different research groups. The collaborative equipment laboratory will include high-speed centrifuges, sensitive tools to measure photosynthesis and respiration rates and a mass-spectrometer used to identify minute quantities of organic molecules and peptides.

#### Naming the Collaborative Equipment Laboratory

\$ 1 M





#### IV. Research Equipment

**Confocal Microscope** - essential for advanced biological studies; used to penetrate tissue and create three-dimensional images.

\$ 750,000

**Electron Microscope** - used in groundbreaking studies of marine viruses and enables the study of cell substructure and the ability to follow delicate changes in biological properties of organisms.

\$ 1.5 M

**Mini-submarine** - capable of reaching a depth of four kilometers; equipped with photographic and sampling capabilities. The mini-submarine is manned by up to three researchers and specializes in short scientific excursions. The mini-submarine and the ROV (described below) will be used to study deep-sea communities and collect samples for chemical analysis in the lab.

\$ 2.5 M

**Remote Operated Vehicle (ROV)** - a specially designed robot capable of exploring the deeper sea in extreme temperatures; equipped with a camera, robotic arm and other sensors for collecting scientific data pertaining to light, temperature and salinity.

\$ 2 M



## V. The Human Component

**The Department of Marine Biology** aims to recruit the highest caliber of scientists from around the world, including biological oceanographers, marine microbiologists, and marine ecologists. The department is seeking the following fellowship support:

1. MSc students: \$5,000 per year x 24 students	<b>\$ 120,000</b>
2. PhD students: \$15,000 per year x 16 students	<b>\$ 240,000</b>
3. Postdoctoral students: \$25,000 per year x 8 students	<b>\$ 200,000</b>

“My vision is to provide students with a broad academic base in marine biology as well as the ability to employ ‘translational knowledge’ – recognizing and implementing practical aspects of their acquired knowledge. The Department of Marine Biology aspires to be an academic home for our researchers and a place to be original, to create and take initiative.”

Dr. Dan Tchernov, Head of the Marine Biology Department



**Dr. Dan Tchernov with Mr. Shimon Peres,  
President of the State of Israel**



## About the University of Haifa

The University of Haifa is the largest comprehensive research university in northern Israel. It supports a wide range of interdisciplinary programs and cooperative endeavors with academic institutes around the world. As a thriving academic center marked by multiculturalism and tolerance, the University of Haifa is a growing institution with internationally recognized faculties. With some of the world's most renowned professors, several of whom are recipients of the prestigious Israel Prize, the country's highest civilian accolade, the University is one of Israel's foremost institutions of higher education.

The University houses six faculties (55 departments and 60 research centers): Humanities; Social Sciences; Natural Sciences; Law; Social Welfare and Health Sciences and Education; and numerous schools including the Graduate School of Management, Social Work, History, Public Health, Political Sciences, the Graduate School of Creative Art Therapies and the Leon H. Charney School of Marine Sciences.



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