Working Group Reports

This summary report was prepared by the symposium secretariat from notes provided by the various working groups.

MARINE ENVIRONMENTAL EDUCATION

The group endorsed the concept of a floating university of marine science. It was agreed that an international approach to ship-based marine ecological education and research in the Pacific basin would be of mutual benefit.

The group endorsed the strengthening of existing marine educational programs throughout the region and noted that the program proposal "Strengthening the Development and Applications of Coastal Oceanography in Southern South America: Facing Global Changes and Environmental Protection," presented by Prof. J. Stuardo, is an important model in this area. The group also noted that needs for marine environmental education extend beyond university training of specialists and that university museums of science and natural history play an important role in this context.

The group endorsed the concept of an international cooperative effort to assess plastic pollution in the Pacific region through periodic, coordinated beach surveys. Involvement of pre-college students in such a program may increase knowledge of marine science and foster international awareness.

The group endorsed the proposal of the Russian Academy of Science and the Far Eastern State University to create an International Chair of Marine Ecology with the cooperation of UNESCO.

The group endorsed cooperative projects of student exchange among universities of the region and recommended development of a plan for mutual recognition of educational stages and standards to facilitate international transfer of students among academic institutions of the Pacific.

The group endorsed a call for the integration of social, cultural, and scientific information in resource management and for freedom from political interference in expression of opinions on these matters.

The group noted with interest the announcement of a seminar devoted to the environmental problems of Far Eastern seas to be held aboard ship for two weeks in September 1994 by the Far Eastern State University, Vladivostok, Russia.

SUSTAINING THE PACIFIC

The group endorsed a proposal to plan for joint research concerning the accumulation of radiological and synthetic organic toxins in marine food webs.

One primary focus of this joint research will be toxins that are associated with chronic disease in humans.

COASTAL AND HIGH SEAS MONITORING

The group endorsed the creation of scientific teams containing representatives of interested institutions. These teams would be devoted to the identification of regional issues and areas of concern, and would suggest methods of assessing and addressing these issues.

The group recommended exploring how the activities of the Conference of Asian and Pan-Pacific University Presidents relate to those of other scholarly bodies concerned with the Pacific region including PICES, the Space Agency Forum International Space Year, The Congress of Pacific Science Associations, and others that may be identified.

The group endorsed the continuation of the Conference’s work in the field of satellite monitoring of drifting buoys.

The group endorsed the formation of a team devoted to information processing and data exchange, both remote sensed and in situ, among interested institutions of the Pacific region.
Ecological Problems and Monitoring of the Far Eastern Seas

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The ecological problems of the Far Eastern Seas coastal zone are a result of both anthropogenic and natural processes. Pollution of these coastal waters takes place in the ports and nearby waters—regions of mining development, oil-extracting industries, and integrated pulp-and-paper mills (with the resulting waste discharge). Exploitation of sand for construction in coastal zones results in sediment shortage and increasing coastal erosion.

Natural hazards (i.e. volcano eruptions, earthquakes, and tsunami) make the ecological situation worse. During typhoons, the rise of water levels causes flooding of farming lands, roads, and railways. The increasing suspended load drainage basin and the changing hydrochemical regime result in degradation of biogenesis in the coastal zone. We should take into consideration the rising of the sea level.

The Coastal Research Center of Far Eastern University carries out coastal monitoring of twenty main locations on the shore of the Sea of Japan, the Sea of Okhotsk, and the Bering Sea. The project on LOICZ (Land-Ocean Interaction in the Coastal Zone) includes coastal monitoring as a part of its investigations. Cooperation in coastal monitoring will be planned in the Northern Pacific with Tokai University, Western Washington University, the University of Alaska, etc.

The Coastal Ecosystems of the ASEAN Region: A Vanishing Frontier?

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The seas of the ASEAN region comprise 8.9 million km² or 2.5% of the world's oceans. They form a part of the center of generic richness and maximum variety of species that compose the coastal ecosystems of the tropical world—coral reefs, seagrass beds, and mangroves. Unfortunately, regional efforts to improve the quality of life of its rapidly increasing population include massive industrialization and infrastructure development which is predicated upon environmental exploitation, not protection. With varying degrees, soil erosion has enhanced sedimentation in the coastal and marine ecosystems, making coral reefs particularly vulnerable. Pollution from land-based sources has impacted enclosed or semi-enclosed areas where mangroves and seagrasses occur, while reclamation and other development activities are causing the loss and destruction of the coastal habitats. This is exacerbated by destructive fishing methods (for example, dynamite and poison fishing) and overexploitation of many resource and endangered species from the ecosystems, such as sea cows, sea turtles, and giant clams from seagrass beds and coral reefs.

Regional efforts to reverse these trends include watershed and coastal zone management, pollution control, environmental impact studies, protected areas, adherence to the provisions of wetlands and world heritage conventions, and legislation. Whether these efforts will succeed depends largely upon a reversal of the prevailing regional view that "nature does not pay, but coral, fish, and logs do."
Environmental Influences on Salmon Migration in the Northeast Pacific
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Computer simulations have been performed to investigate the influence of ocean currents on the migration of adult sockeye salmon toward the coast of British Columbia. Surface currents are obtained from a superposition of daily wind-driven flows and an average geostrophic circulation. Results show important interannual variations in latitude of landfall of up to 550 km and variations of time or arrival of up to two weeks at the coast. These results will be interpreted in terms of features of the surface circulation of the Alaska Gyre and in the light of other effects responsible for the variance in observed characteristics of the migration process.

Spring Sea Ice Conditions from SAR Images Near the Alaska Coast of the Chukchi
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Sea ice in the Chukchi and Beaufort seas has been a major subject of interest, with emphasis on aspects of environmental forecast, offshore engineering, and navigation. Less effort has been put on its relation to marine life inhabitants, including whales. Indeed, sea ice is a major determinant of distributions in time and space of living marine organisms in these areas. Native people of the Arctic associate the distribution and movements of marine species with sea ice characteristics or conditions. They deal with the hazards of sea ice while hunting for ice-inhabiting species such as seals, walruses, seabirds, and particularly bowhead whales.

The bowhead whale inhabits the Arctic/subarctic regions, principally in or near the sea ice zone of the continental shelf and oceanic water of less than 1000 m depth. One of their principal migration routes in springtime is from the Bering Sea northward to Point Barrow along a flaw lead zone of sea ice at the eastern Chukchi Sea, and via offshore leads to Banks Island, Beaufort Sea. Observations show a strong effect of sea ice lead and sea ice thickness on the bowhead whales’ migration.
China’s Environmental Problems and Fudan University’s Research Programs in the Environmental Sciences

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The Issue of Overpopulation

During the past decade, like many other developing countries, China has felt the great pressure of population growth, even though it has achieved great success in its economic development. It is well known today that our planet holds more than five billion people, of which about 1.1 billion are Chinese. It is expected that the world population might be doubled in the next century, with 90% of the growth occurring in developing countries where the population outgrows the national resources in providing the necessary housing, fuel, and food. Forests have been excessively cut for fuel, meadows overgrazed by livestock, and farmlands overtilled by desperate farmers. As a result, the whole ecological system has been seriously disturbed.

To tightly control population growth, the Chinese government has carried out a “one family, one child” policy which aims at limiting the population to 1.2 billion by the year 2000. The implementation of this policy has been quite successful in the urban areas, but it has not been very effective in the rural areas where manual labor is in great demand. The total population might reach 1.25 billion by the end of this century. Therefore it should be the duty of educational institutions of all levels to educate their students and general public about the importance and significance of population control.

The Hazard Caused by Pollution and Overexploitation of Natural Resources

As a consequence of rapid economic development and fast population growth during the past decades, China is now confronted with many serious environmental problems:

1. Pollution by coal burning. Coal consumption was estimated at about one billion tons in 1989. This is a major source of air pollution in many big cities of China and it contributes significantly to global warming.
2. Water pollution from factory waste disposal and other sewage.
3. The conservation of forest, soil, and water has been neglected during recent years of economic development. Although measures have been taken in building up forests in the northwestern area, the percentage of forest coverage is still diminishing. The degradation of farmland into desert is becoming a serious problem.
4. Residents in urban areas become victims of noise pollution.

In order to protect the environment, various laws and environmental protection regulations have been issued, and administrative agencies for managing environmental issues and monitoring pollution have been established; however, problems still remain for the effective implementation of all the necessary regulations.

The Dilemma Between Ecological Protection and Resource Availability

It is very easy to pollute the environment, whereas it is extremely expensive to get rid of pollution and bring laws for environmental protection into full implementation.

The greatest challenge for the government is to exert effective control on the protection of environment while maintaining a sustainable economic growth so the living conditions of future generations improve.

Sometimes drastic measures should be taken, such as moving some of the factories to the suburbs or shutting down those that cause serious pollution, even at the expense of affecting the production for a time. Management and monitoring systems should be improved.
The Role of the University in Environmental Protection

The basic solution of population and environmental problems lies in upgrading the education level of the people. It is the consensus of both government leaders and educators that institutions of higher learning must play an important role in saving our environment from further pollution. In order to meet this urgent need, the Institute of Environmental Science was established in 1985 at Fudan University, with the purpose of bringing faculty members and students from various departments such as biology, chemistry, physics, and mathematical mechanics, as well as those from social science departments such as economics, law, and business administration to carry out research and develop curricula in certain aspects of environmental science relevant to the expertise of the university. All participating faculty members and students remain in their respective departments. The Institute coordinates the multidisciplinary research programs that are relevant to environmental science and offers courses forming an interdisciplinary curriculum.

The Institute's major goal is to study the strategic policies on population control, the correlation of population control and environment, and to raise the environmental consciousness of faculty members and students who take part in the Institute-sponsored research programs. It is hoped that the results of our research work will draw the attention of government agencies at all levels.

The Institute also cherishes the idea of international cooperation on issues concerning our global environment.

There are six divisions in the Institute:

- Environmental Ecology. This division is interested in the effects of environmental pollution on the aquatic and terrestrial ecosystem and problems concerning ecobalance which might be helpful in promoting the growth of agricultural products.
- Environmental Economics. The major interest is the relationship between economic growth and environmental pollution as well as to carry out research work concerning the assessment of environmental quality and managemental protection for the urban areas.
- Environmental Law. This division is responsible for carrying out research work on laws, regulations, and policies concerning environmental protection and environmental management.
- Environmental Mechanics. This division deals with the transport and distribution of pollutants in the process of industrial waste treatments based on both experimental and theoretical studies.
- Environmental Monitoring. The major role of this division is to conduct research in the qualitative and quantitative analysis of environmental pollutants based on basic principles in physics and chemistry.
- Environmental Chemistry. This division consists of four research groups: water chemistry, atmospheric chemistry, environmental radiochemistry, and environmental biochemistry.

As for the relationship between population control and environment, the Institute works in close cooperation with the Institute of Demography of Fudan University.

At the moment the Institute is staffed by 150 full-time and part-time faculty members; among them are about 40 professors and associate professors. About 20 courses on environmental sciences are given to both undergraduate students and graduate students of the university.
Pollution of the Coastal Zone in the Japan Inland Sea

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Sedimentation rates of suspended substances in Tokyo Bay and Osaka Bay were 0.15–0.23 cm/yr and 0.12–0.61 cm/yr, respectively. These were higher than the values in other bays of Japan.

Sediment samples were collected by the piston corer in Tokyo Bay. Vertical distribution of concentrations of copper, lead, nickel, zinc, and chromium was studied with the date of sedimentation by the $^{210}$Pb method in bottom sediments. The analyzed metal contents all had been increasing from 1880 to 1970 when most marked changes were found; but since 1970, metal content has gradually decreased. This is attributable to the fact that the waste discharged from inland areas into seawater was reduced in compliance with the Marine Environmental Protection Law concerning inland seawater.

The oxygen deficiency of water in the bottom layer of eutrophic inland sea is exerting adverse effects on marine organisms. One of the causes is the blooming, death, and decomposition of phytoplankton. In recent years, the eutrophication of the inland sea has been inhibited by the water quality regulation of waste waters.

However, oxygen deficiency in the bottom layer continues and the productivity of marine organisms is on the decline.

The relationship between the distribution of red tide phytoplankton in coastal water and the accumulation of organic substances in the sea bottom was also considered. If dissolved oxygen in seawater is entirely consumed by the decomposition of marine organisms, the resulting anoxic condition creates a poisonous hydrogen sulfide.
The Role of Data Acquisition from Satellite-tracked Drifting Buoys

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Seventy percent of the surface of the earth, which is also called the “aquaplanet,” is covered by water, giving life to its animals and plants. This is a contrast to the other planets. Animals and plants receive energy radiated by the sun and each maintains its life in its own way. The sea absorbs and stores solar energy, helping to maintain a good terrestrial environment. The world’s weather conditions depend on the complex relationship between the continents and seas. In particular, the seas exert an important effect upon climate. Oceans such as the Pacific—which occupies almost 50% of the earth’s area—seriously affect not only weather conditions but every living thing. Since the dawn of history, humans have enjoyed the benefits of the sea, but we have failed profoundly in our duty toward the environment. From the latter part of the eighteenth century to the present, humans have unceasingly contaminated the sea, taking advantage of its mighty ability to purify and produce.

Difficulties have already shown themselves in various phenomena. Accumulation of waste plastic materials, for example, is creating what will eventually become a heap along the Alaska coast, while years of irresponsible fishing has destroyed a considerable portion of the ocean’s food resources. Further, the matter is growing worse because those accidents, including large-scale eflux of petroleum and the dumping of chemicals in the sea, are straining local as well as global resources.

The biological condition of the Pacific Ocean must be maintained unmarred to assure our own social welfare, economic prosperity, and public peace, not only in this area but throughout the world. Challenges of enormous importance and daunting difficulty will decide the destiny of future generations.

In August 1991, the Third International Symposium of the Conference of Asian and Pan-Pacific University Presidents was held in Vladivostok. Most of the discussion centered on environmental questions at the global level, including sea contamination in the North Pacific area. Dr. Tatsuro Matsumae, President of Tokai University, said, “We are destined to bear responsibility for protecting the sea, because our life originated in and was fostered by our mother sea.” He then proposed “environmental surveys in the North Pacific area to be operated via artificial satellites to cope with contamination of the global environment, seeking the counsel of many universities, without regard to international boundaries.” The result was a decision to carry out a study to determine the true nature of water currents in this area. In January 1992, the first meeting was held at Tokai University Pacific Center in Hawaii. Presidents and students of Alaska, Hawaii, and Canadian British Columbia universities gathered to debate implementation of the decision. According to the plan, 100 ARGOS buoys were to be dropped off the coast of Okinawa on the western side of the Pacific. They were expected to float across the Pacific on currents from the west, down to the eddy northeast of Hawaii. Three kinds of buoys were prepared with drogues attached underneath to sense the varying conditions at levels corresponding to surface, sub-surface (0–10 m), and central (10–20 m) currents.

On October 7, 1992, a series of buoys was dropped off Okinawa, Ensyunada, Izu, and Sanriku to ride the currents. In January 1993, some buoys reached almost 165°E. They were expected to reach the eddy during the summer of 1993. It was estimated that 30% of the buoys would arrive there.
Biochemical Monitoring of Bowhead Whales Caught off Barrow, Alaska: Serum Protein and PCB Levels

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Observing important biochemical markers such as serum proteins and immune function can provide long-term documentation of acute and chronic effects of exposure to pollutants on the health of wild populations of mammals. Gel electrophoresis of total serum proteins was used to resolve the protein pattern into multiple zones. These zones were quantitated by densitometry and total protein in the sample was measured by the Bradford method. Total serum protein of the bowhead whales ranged from 9.0g/100 ml to 11.7g/100 ml with a mean of 10.5g/100 ml ±SD of 0.84. For 18 bowhead whales, the relative concentrations of serum proteins present in the different electrophoresis zones was:

(SD)
albumin, 31.1% (5.9); α1, 11.2% (2.5); α2, 17.0% (3.6); β1, 10% (3.8); β2, 9.7% (3.0); γ, 21.6% (3.6). PCB levels in red blood cells were below detectable levels of 0.5 ppm.

Underground Nuclear Explosions and Global Nuclear Fallout: Impact on Yakutia

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The main sources of radioactive pollution in Yakutia are the prospecting of uranium deposits, radioactive pollution from the underground nuclear explosions, and global fallout. In collaboration with Kurchatovsky Institute (Moscow) and the Radium Institute (Saint Petersburg) the laboratory of radioactive ecology at Yakutsk State University does research work in radioactive ecology. Two scientific expeditions and a number of local investigations were carried out near the underground nuclear explosions.

Field semiconductor spectrometry determined that the level of accumulated $^{137}$Cs on the surface soil downstream of the Lena River makes up 2 KBK/m$^2$, half of which was caused by the Chernobyl disaster. Downstream of the Vilyuj River, the background makes up 4 KBK/m$^2$. The most nuclear contamination was discovered in the samples from the regions that suffered from the underground nuclear explosions near the villages Udachny and Taas-Yuryakh. The level of pollution makes up 40 KBK/m$^2$ on $^{137}$Cs and 3.5 KBK/m$^2$, five times more than the corresponding data near the Chernobyl accident.

There are two places of nuclear underground explosions with intensive radioactive contamination and several places with low radioactivity background. It is imperative to organize an international laboratory on radioactive ecology with the aim of carrying out investigations on the influence of local radionuclides on the environment and the way they transfer to the Pacific region.
Natural and Anthropic Impacts and Disturbances on the Central and Southern Coasts of Chile

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The west coast of southern South America, one of the most productive areas of the southeastern Pacific, presents a set of environmental characteristics, combining climatic conditions determined by latitude, a distinct pattern of oceanic circulation and orogenesis. In fact, diastrophism in the area continues to occur with major changes due to tectonic movements in the earth's crust configuring the coast, and comparatively minor but recurrent local fault adjustments (earthquakes).

In turn, the increase of coastal populations and related socioeconomic development is determining changes, mostly unfavorable to nature, many of which are detected only when the effects threaten human welfare or reach the public eye. Unfortunately, regulations to prevent and counteract them are not embodied in only one set of legislation.

A general discussion of the main positive and negative impacts and disturbances is presented, including:

1. **Natural impacts**, such as local uplifting or sinking of the coast and ensuing tsunamis; changes in oceanic currents impinging on the coast of Chile; seasonal upwelling of equatorial subsurface waters; river input of sediments, nutrients, and pollutants; and red tides.

2. **Anthropic impacts**, such as land and wetlands utilization; effluents and dumping due to urban development of coastal population and industrial development involving hydroelectric power, pulp and paper mill, timber and forestry (sawdust, chips, wood); oil refining; fish processing and fishing; and aquaculture.
Analysis of Drifting Buoy Experiments in the North Pacific Ocean

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Tokai University deployed twelve ARGOS floats in the Kuroshio region in the south and the east of Honshu, the main island of Japan, from September to November, 1992. All of them drifted along the Kuroshio for one or two weeks after their deployment, but some of them diverged from a strong current path when they entered the Kuroshio Extension.

In this paper, two groups of drifters, which never diverged even on the Extension at least to the west of the dateline, are used to show characteristics of the divergence field of the current along the western portion of the Kuroshio Extension.

One group was composed of three drifters and another was composed of four drifters. The divergence of the current field was estimated by time and/or space derivatives of areas of the triangle and the square.

Results showed that the magnitude of the divergence estimated by the first group was uniform over our oceanic region, and a mean time derivative of the area (i.e. eddy diffusivity) was $2.1 \times 10^9$ cm$^2$/sec. But the second group shows a large space and/or time variation in the magnitude of divergence. To the west of 170°E, the mean time derivative of the area was $1.4 \times 10^9$ cm$^2$/sec; nevertheless it turns out to be negative as $-1.8 \times 10^9$ cm$^2$/sec in late spring 1993, or in the east of 170°E.

Why these different divergences were estimated is still not clear, but it is possible the Ekman drift may have changed in the east of 170°E in spring 1993. It is desirable to check the recent wind field around the latitude of the Kuroshio Extension. We are making efforts to get sea surface wind data in late winter and spring.
National Parks of Yakutia?
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The Republic of Sakha (Yakutia) currently lacks national nature parks, though there are several areas designated as animal refuges or animal species breeding areas. At the same time, areas of environmental degradation are increasing with dangerous rapidity.

Establishment of national nature parks is considered an urgent and necessary measure to ensure environmental conservation and preservation of the traditional utilization of the environment by the aboriginal populations.

National parks, with controlled access, will also permit development of tourism, for sport, recreation, and education.

Yakutia has designated two proposed national park areas: Lena Pillars, in the watershed area between Lena and Buotoma rivers, and the Moma Valley, within the Indigirka River basin depression in the southeast of Yakutia.

National park establishment faces severe problems due to:

1. Lack of Russian and Yakutian laws regulating the establishment and maintenance of national parks.
2. Apprehension on the part of the aboriginal peoples that park administrations will be agents of oppression.
3. Inflation and consequent lack of funds for planning, establishment, and—later on—park personnel.
4. Open opposition on the part of various bureaucratic agencies which exploit natural resources, primarily industries engaged in mineral and timber exploitation and in fur procurement.

Unless these problems are solved, the establishment of national parks in Yakutia, no matter how urgently needed, remains highly problematic.
Sustainable Development for the Pacific Region: The Contribution of UNU Research Programs

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One of the focal areas of the United Nations University’s research program is environment and sustainable development. An independent academic body under the United Nations, the university (UNU) operates through an international network of scholars. Headquartered in Tokyo, much of UNU’s research is focused on the Pacific area.

UNU’s program features sustainable marine development at two levels. First, UNU promotes studies into international ocean governance. Sustainable use of marine areas and prevention of pollution requires sufficient legislation as well as institutional structures for implementation and monitoring of international treaties and agreements. The Pacem in Maribus conference on Ocean Governance: National, Regional, Global: Institutional Mechanisms for Sustainable Development in the Oceans addressed these issues. Other efforts in this area have focused on regional approaches to management of the East Asian seas.

Second, UNU promotes studies into coastal pollution and its ecological, societal, and health effects. With UNU’s assistance, the International Mussel Watch Program monitoring coastal pollution is being extended to the Asia-Pacific region. Collaborative studies on the Minamata case of methyl mercury poisoning in southern Japan, and related cases elsewhere, aid our understanding of the links between marine pollution and human health.

The Pacific Rim demonstrates the need for regional and international cooperation towards sustainable development. UNU research programs promote international collaboration to this end.

A Floating International University of Marine Science in the Tropics

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The tropical waters of the Philippine archipelago abound with the widest variety of marine life and aquatic resources. These treasures for all mankind are now endangered by misuse.

A floating international university is proposed, linked to two local educational/research networks: first, three Philippine universities with institutes or centers on marine science, fisheries, and aquatic resources; and second, two international research institutions based in the Philippines—the ICLARM and SEAFDEC.

Aside from extending basic knowledge of tropical marine science and aquatic resources, the presence of a community of scholars and scientists in Philippine seas, under the auspices of Asian and Pan-Pacific university presidents, would have a salutary effect on the efforts of local officials to protect and conserve such endangered resources.
The Department of Marine Sciences at Chulalongkorn University

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Founded in 1917 by H.M. King Vajiravudh (Rama VI), Chulalongkorn University is the oldest university in Thailand. It was named in honor of King Rama V for it was in his reign that modern education in Thailand began to develop. In succeeding years, Chulalongkorn University, or Chula as it is more commonly known, has grown to be a full-sized university offering over 270 study programs and producing over 100,000 graduates in various fields of specialization, one of which is marine science offered at the Faculty of Science.

Chulalongkorn University established the Department of Marine Science in the Faculty of Science in 1968, offering the B.S. degree for studies in marine biology and fisheries or in chemical and physical oceanography. Five years later, a M.S. program was established. Up to now, there have been 204 B.S. and 104 M.S. graduates. A Ph.D. program is in preparation, in which cooperative programs with foreign universities are planned.

International cooperation in marine science can be conducted under the coordination of either the Office of International Affairs, Chulalongkorn University, or the Ministry of Science, Technology, and Environment. The Ministry's National Research Council serves as a contact point for the Intergovernmental Oceanographic Commission (IOC) of UNESCO, whose regional body for the Western Pacific will soon be established in Bangkok. In addition, the Office of the Environmental Policy and Planning serves as a contact point for the UNEP and ASEAN Marine Science Program. At present, CU is engaged in more than ten international cooperative projects in marine science.

As part of its policy of internationalization—one of its priorities—Chula welcomes the possibility of broadening the scope of its cooperation with foreign institutions, thereby enhancing its academic expertise and intellectual capabilities in accordance with international standards of quality. This can be achieved under agreements through various forms of cooperation such as academic exchanges and joint research projects. Hopefully, these cooperative efforts will not only be mutually beneficial, but will also contribute to the worldwide body of knowledge.
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