

Nordwest-Verbund Meeresforschung e. V.

Marine Technology – Research and Transfer





Joining Know-How for the Future in Marine Technologies

The Northwest Marine Research Association in Germany (Nordwest-Verbund Meeresforschung e. V.) is an alliance of marine research institutions in the northwestern region of Germany, encompassing the federal states of Bremen and Lower Saxony. In order to foster the application of research results and the development of marine technologies the registered association also aims at planning and performing research and transfer projects jointly with the business sector.

The members of the association use state-of-the-art marine technologies for their research. Many technologies have been newly developed or adapted, partly in collaboration with partners from industry. The available technologies are used in coastal and deep-sea environments.

Special technology transfer workshops and information events are organized to enhance networking of diverse marine and maritime stakeholders from business sectors, government agencies, and research fields, and to instigate novel joint RTD approaches.

With this brochure, the members present their focal areas, especially their offers for collaboration. Direct contact persons are named with each technology or know-how shown.

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Nordwest-Verbund
Meeresforschung e. V.



University of Bremen



Carl von Ossietzky University Oldenburg



Jacobs University Bremen



Bremerhaven University of Applied Sciences



Alfred Wegener Institute for Polar and
Marine Research, Bremerhaven



German Maritime Museum, Bremerhaven



Hanse-Wissenschaftskolleg,
Institute for Advanced Study, Delmenhorst



Leibniz Center for Marine Tropical Ecology,
Bremen



Max Planck Institute for Marine
Microbiology, Bremen



Senckenberg am Meer, Wilhelmshaven

Within the University of Bremen, Geosciences and MARUM developed a wide array of measuring and sampling devices for the deep sea and the coastal zones. The know-how and technologies may be of direct use to companies and may be developed further in public-private partnerships.



University of Bremen & MARUM – Center for Marine Environmental Sciences

Scientific Aims

Research at MARUM aims at understanding the role of the ocean in the Earth system.

One of the overarching goals of this DFG Research Center/Cluster of Excellence is to develop and provide technologies and infrastructure for marine research in cooperation with industry.

The studies examine the ocean's significance in the framework of global change, quantify interactions between the marine geosphere and biosphere, and provide information for sustainable use of the ocean.

Sea Floor Drill Rig (MeBo)

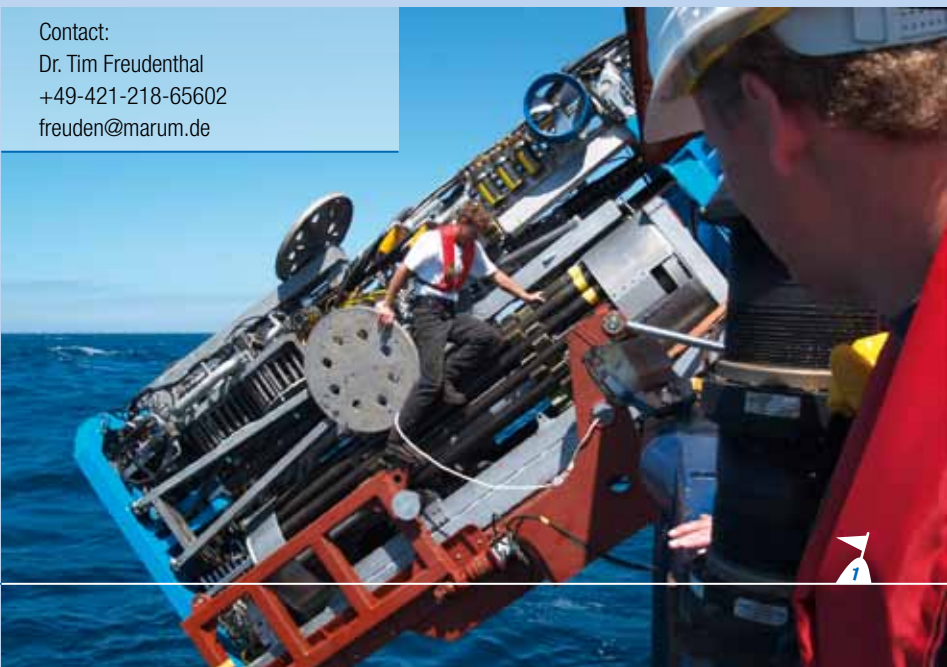
The MeBo is a portable drill rig for high-quality sampling of the sea floor. It is deployed on the seabed and is remotely operated from a research vessel. This drill can operate from shallow water down to 2000 m water depth and is capable of retrieving up to 70 m of hard rocks or sediments.

Offers for Collaboration with Industry

Through the development and operation of state-of-the-art underwater instruments, Bremen has established itself as a center for marine research technology in Germany. It is one of only eight research institutions in the world that deploys remotely operated vehicles (ROVs) in the deep sea and is therefore frequently asked to become a partner in international cooperative projects. MARUM operates one of three core repositories worldwide of the Integrated Ocean Drilling Program. An underwater drill rig, developed together with partners from industry, provides new possibilities for the retrieval of sediments and hard rocks from the seafloor. MARUM also operates the World Data Center for Marine Environmental Sciences (WDC-MARE).

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Remotely Operated Vehicles (ROVs)

MARUM provides expertise in the operation and tool development for two remotely operated vehicles: the 1000 m ROV CHEROKEE and the 4000 m ROV QUEST. These platforms enable targeted experiments and sampling in the deep sea.

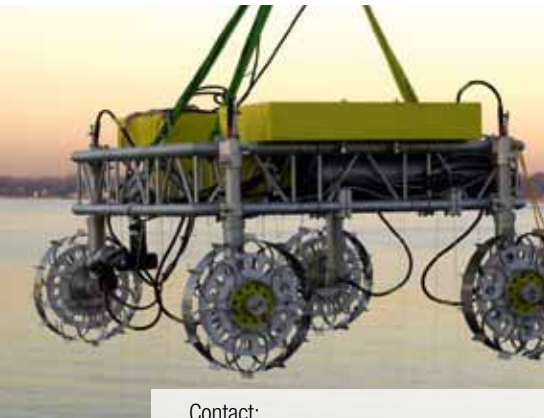


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Mobile Lander (MOVE!)

The mobile instrument platform MOVE! is a wheeled underwater vehicle for exploring the seafloor in shallow and deep-water settings.



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Bi-Directional Satellite Telemetry

MARUM has developed and tested real-time data transmission from buoys in the open ocean to land-based stations. The bi-directional telemetry system has proven its long-term stability over several years.



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Marine Heat Flow Survey and Lance Insertion Retardation Meter (LIR)

The University of Bremen offers consulting services in exploration-related marine heat flow studies jointly with a company. These studies can be combined with time-efficient surveys of shear strength with a tethered robust LIR probe. Furthermore, thermal properties of marine sediments along planned cable or pipeline routes can be characterized.



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Marine science from the coast to the shallow sea – that is the scientific scope of ICBM, the only university-based institute for marine science in the federal state of Lower Saxony. Coastal tidal flats are particularly emphasized in the research work. Since its foundation in 1987, ICBM has developed a number of technical tools for shallow-sea and coastal-zone research, from a pore-water sampler to a semi-autonomous time-series station in the Wadden Sea.



ICBM – Institute for Chemistry and Biology of the Marine Environment at the University of Oldenburg

The Wadden Sea is the transition zone between the North Sea and the coast. How can we describe the processes in one of the most productive ecosystems on Earth? What about the anthropogenic influence today and in the future? Bringing together the fields of geo-chemistry, microbial ecology, and modelling, ICBM scientists try to answer these questions.

ICBM uses an interdisciplinary scientific approach to improve the knowledge on complex

relationships in tidal flats as part of the Earth system. The analysis as well as the theoretical description and modelling of the ecosystem are the main elements of the fundamental research activities of the institute.

The investigation of the shallow marine area with respect to increasing pollution and global and regional climate change is another scientific field of work. In addition, the working groups develop technical equipment for marine research and monitoring.



Marine Measuring Techniques

The ICBM has been running an autonomous research station for several years. The platform is located in the tidal inlet between the East Frisian Islands Spiekeroog and Langeoog. It provides real-time, high-resolution data for environmental monitoring, thus contributing considerably to the institute's Wadden Sea and climate research. In addition to routine measurements of meteorological, hydrographical and chemical parameters, in cooperation with manufacturers and operators, new sensor technology is tested and successfully applied on this platform. These are, for example, optical sensors for determining seawater turbidity (suspended matter) or oxygen concentration.



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Integrative Modelling

Marine research produces data: gathered in the field, explored by satellites, or calculated with the help of complex mathematical models. It is the task of integrative modelling to focus this wealth of information in order to tie models together and to evaluate scenarios. Computer science and environmental sciences cooperate to develop concepts for marine information systems.

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Logistics for Marine Research

ICBM provides high-performance logistics for scientific purposes. The institute's technical staff operate three vessels up to 13 m in length, which were specially constructed for the Wadden Sea area. The logistics section of ICBM in Wilhelmshaven develops and constructs technical equipment to address specific scientific questions.



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Chemical Analytics

ICBM operates a modern laboratory for bulk and molecular analysis of organic matter and for isotope and trace element analysis. In particular, it runs a variety of different mass spectrometers. The highlight is an ion cyclotron resonance mass spectrometer with a 15 Tesla magnet, which can measure the exact mass of single molecules in highly complex organic mixtures. From these data molecular formulas can be calculated.



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Within the Jacobs University Bremen, software and instrument systems for the deep sea and the coastal zones have been developed. They can be of direct use to companies and organizations. Joint further developments are also an option.



Jacobs University Bremen – Marine Science and Technology

Scientific Aims

Autonomous underwater vehicles are among the most challenging for robotics research. Jacobs University scientists engage in this area with work on perception, mapping, and cooperative robot teams.

Jacobs University's OceanLab investigates marine areas from shallow waters down to 4000m. Major sub-topics are the carbon cycle especially including methane, anthropogenic impacts, risk assessment, and CO₂ reduction. The Marine Geophysics and Geographic Infor-

mation Systems (GIS) group at Jacobs focuses on understanding and modeling of fluid flow, seismic interpretation, and geoinformatics.

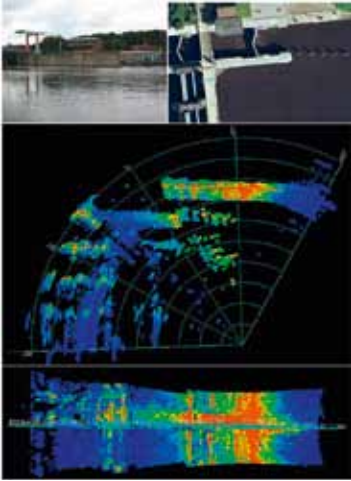
Offers for Collaboration with Industry

The Jacobs Robotics group offers special equipment like a 3D sonar as well as expertise in developing autonomous intelligent software. The OceanLab develops marine instruments and technologies, including internet-operated underwater vehicles.



3D Perception and Mapping

The Jacobs Robotics group has a wide range of expertise related to 3D sensing, perception and mapping. From range data, e.g. from a stereo camera or from a 3D sonar, 3D models of objects or of the environment can be automatically generated, e.g. from a lock gate.



The group also provides expertise to make use of these 3D models, e. g. for visualization or autonomous control of the robot. Intelligent behaviour modules are offered to detect, classify, and localize objects.

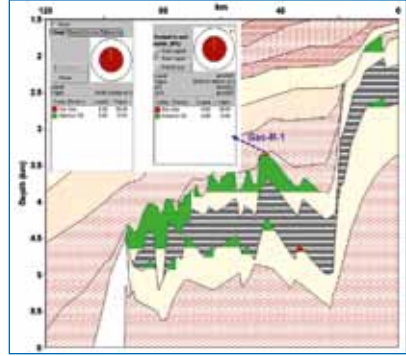
Furthermore, the group develops new approaches that allow several underwater vehicles to engage in complex missions despite the severe underwater sensing and communication conditions.



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Marine Geophysics and GIS Laboratory

This lab provides state-of-the-art software for geomodeling and simulation of petroleum systems, seismic interpretation, geo-visualization, GIS mapping and analysis. Also access to a variety of geophysical equipment as well as computing facilities is available. Currently the group is working on software development for real-time environmental monitoring in biologically sensitive marine environments.



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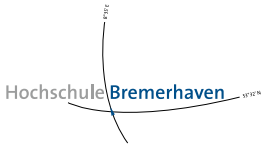
Crawler

The OceanLab has developed internet-operated vehicles for offshore monitoring, research, or remote surveillance. Crawlers are designed to carry out real-time studies and to monitor the seafloor. Equipped with a pan-tilt camera system and carrying a variety of sensor systems (max. 120 kg), the crawler can be operated via the internet. A Bremen-based company sells them, with consulting services available from the Jacobs University.



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Innovative, modern and maritime – these are the characteristics of the Bremerhaven University of Applied Sciences. Research activities and curricula are geared towards actual needs of practitioners. Know-how and scientific results are produced and jointly applied with companies, e. g. in the Laboratory for Maritime Technologies.

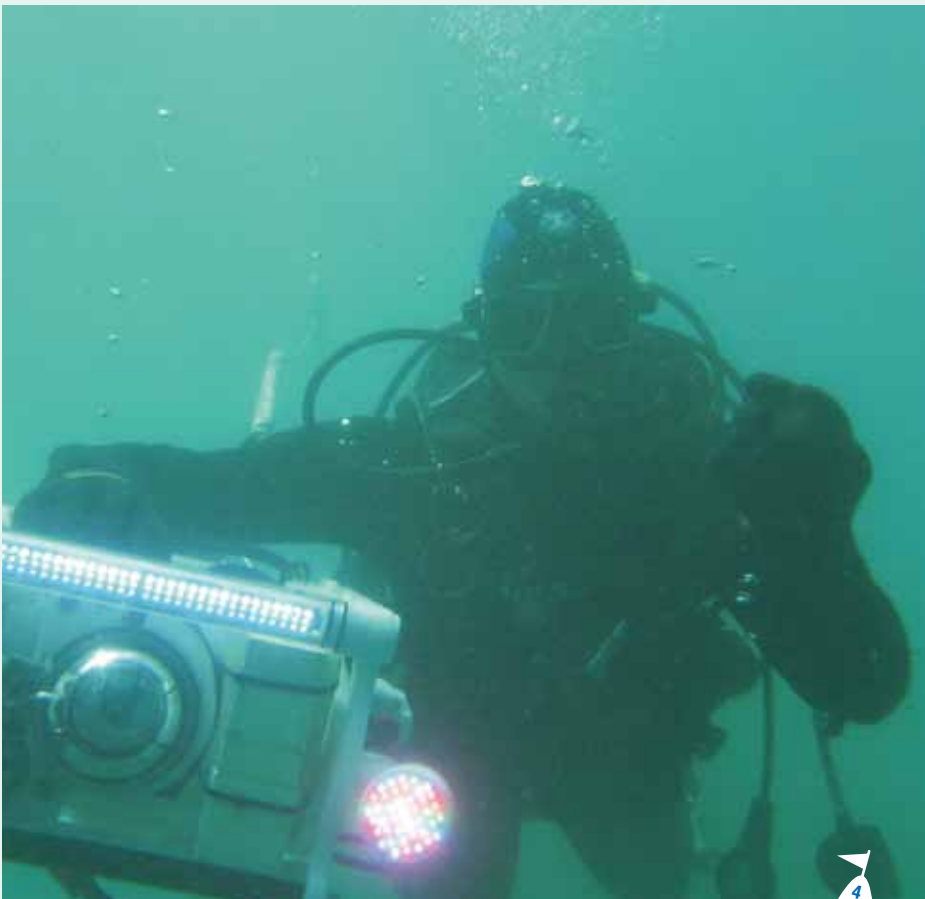


Bremerhaven University of Applied Sciences – Maritime Studies and Research

Scientific Aims and Offers for Collaboration with Industry

In the near future the world's oceans and seas are gaining importance in the development and application of high technology for the economy. In the degree programme Maritime Technologies (MAR) the Bremerhaven University of Applied Sciences is educating future engineers in the promising areas biotechnology, wind-energy engineering, and marine technology.

Know-how from leading research institutions is directly integrated into the curriculum. The Bremerhaven University of Applied Sciences liaises strongly with the Alfred-Wegener-Institute for Polar and Marine Research, the Institute for Wind Energy (fk-wind) and the Institute for Marine Resources (IMARE). Through this exceptional constellation, the Bremerhaven University of Applied Sciences offers incomparable expertise which includes not only students and scientists but also companies.



Marine Environmental Measurement Techniques

Sensors and sensor systems are crucial to study and monitor marine ecosystems and economic zones. They facilitate the long-term control of important water constituents in large geographic areas using diverse measuring platforms.

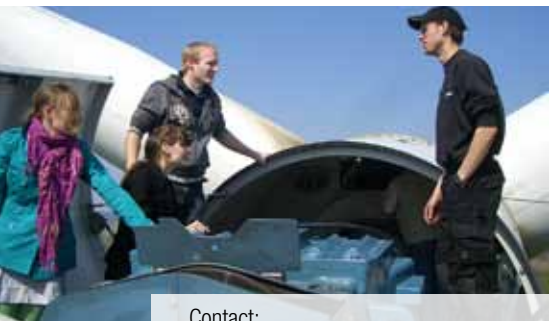
Based on long-standing expertise in marine monitoring and surveillance with optical sensors, sensor systems, and observation platforms, novel measurement techniques are being developed and existing systems optimized. Furthermore, services are provided in research, development, and consulting.



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Load Monitoring of Offshore Wind-Energy Facilities

Wind-energy facilities offshore are exposed to a multitude of short-term and permanent loads which can lead to signs of fatigue of the construction material. Bremerhaven University of Applied Sciences considers these facilities as an integrated system and offers expertise in planning, in operating, and for optimization.



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Marine Aquaculture

Marine aquaculture, or mariculture in short, mainly focuses on coastal zones and land-based flow-through- or recirculation systems. At the Bremerhaven University of Applied Sciences modern culturing techniques for marine aquaculture are developed. The expertise offered includes the design of innovative facilities, location selection, the choice among different types of collectors, know-how on settling of cultivable target organisms, as well as on their physiology and ecology.



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Remotely Operated Vehicle (EdVaRD)

Professional, innovative and with a small budget – these are the requirements of the MAR students, who are developing „EdVaRD“. This remotely operated vehicle was planned, constructed and built by a student working group and can be used for operations down to 100 m water depth.



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Although being primarily dedicated to basic research on climate development, ecosystem functioning in polar and marine systems, and research logistics, the Alfred Wegener Institute also markets innovations and sustainable technologies for the benefit of both, local industries and the environment.



The Alfred Wegener Institute for Polar and Marine Research

Primary Task: Basic Research

With its three scientific divisions, Geo-, Bio-, and Climate Sciences, the Alfred Wegener Institute for Polar and Marine Research (AWI) hosts most relevant scientific disciplines to address questions on polar and marine ecosystems as well as on climate changes in the past, present, and future. Embedded in the Program „Earth and Environment“ of its mother organization, the Helmholtz Association of German Research Centers, the AWI contributes multidisciplinary research tasks to address pressing societal questions.

Public-Private Cooperation

Working in extreme environments such as the Arctic, the Antarctic, and the deep sea, the AWI runs a variety of large research infrastructures, including observatories, which are made available for the scientific community at large. The close cooperation with highly specialized private companies is the key to the efficient operation of such platforms. Furthermore, public-private partnerships are of increasing importance for the transfer of innovations and R&D results from the AWI to commercial applications. This transfer aims at contributing to structural strengthening of marine and maritime industries as well as distributing environmentally sound technologies.



Payload for Underwater Systems

The AWI provides expertise in the operation of, and payload development for underwater systems such as deep-sea landers, remotely operated and autonomous underwater vehicles (ROVs and AUVs). Besides profilers and chamber systems, the AWI engineers have recently developed a water sampling module for AUV deployment.



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Software Tools for Efficient Data Management (ODV) and Expedition Planning (PERPLEX)

With the program Ocean Data View the AWI offers powerful software for the evaluation and visualization of oceanographic data sets. PERPLEX is a tool facilitating efficient ship time planning. It is targeted at cruise leaders, fleet managers, and scientists.

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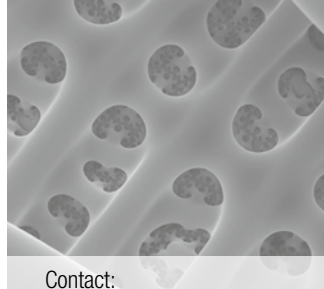
Salinity Calibration System (SuperSAL)

The AWI developed and patented a new technique to perform efficient salinity sensor calibration with high precision (SuperSAL). The system was licensed to a company and is now commercially available on the market.

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Evolutionary Lightweight Structure Engineering (ELiSE)

The AWI has gained expertise in the field of diatom research. This know-how can be utilized technologically for bionic deduction of stable lightweight structures in automotive and medical technologies as well as for the construction of offshore structures and ships' parts.



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Sustainable Production of Caviar

The AWI has established a method to produce high-quality caviar from ovulated, unfertilized fish eggs. Compared with conventional aquaculture plants, this method offers large economic advantages while simultaneously making sense in terms of protecting endangered species.



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The German Maritime Museum (DSM) is one of the eight research museums of the Leibniz Association. Since 1971 it is a leading source of scientific expertise in the field of maritime archaeology and since the late 70s a well-known institute for wet-wood conservation and conservation research.

Deutsches
Schiffahrts
museum

DSM – Competence Center for Maritime Archaeology and Conservation Research

Scientific Aims

Research into the maritime history of Germany, the collection and preservation of its remains, as well as their presentation to the public are aims of the German Maritime Museum.

Offers for Collaboration with Industry

Due to long-time research work in the field of wet-wood conservation, the German Maritime Museum has the expertise and the technical standard to realize maritime archaeological projects from excavation to exhibition. The German Maritime Museum is one of only a

few research institutions worldwide dedicated to the improvement and development of conservation techniques. At the present stage of development, especially the conservation of huge ship finds is a material and time-consuming exercise.

Besides the improvement of existing conservation strategies, the department Wet-Wood Conservation/Maritime Archaeology strives to optimize methods using innovative materials. Cooperation projects with industry could lead to new approaches in the field of heritage preservation.



Object Care On-Site

Consultation and support for the first treatment of ship finds on archaeological excavations are part of our service for other institutions. We offer assistance with the scientific documentation and analysis by modern digitalization methods and give advice on the recovery and first-aid for finds on-site.



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Conservation Research

High costs for maintenance and materials are often the most urgent problem regarding the conservation of archaeological finds. A main focus in our research work is therefore the improvement of techniques and the investigation of new sustainable approaches in the conservation of organic and inorganic marine archaeological materials.



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Object Analysis

With reference to the planning of individual conservation programs for ship finds, samples are analysed by means of physical-mechanical strength tests, chemical analyses, microscopy, spectrology, and determination of the drying and shrinkage behaviour.



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Conservation and Restoration of Archaeological Ship Finds

Our work includes the conservation of outstanding shipwrecks and associated finds as well as the planning and maintenance of conservation projects for other institutions. Ongoing conservation projects are continuously assessed by spectrometric sample analysis and monitoring of treatment solutions to determine the conservation program.



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As an *Institute for Advanced Study* the Hanse-Wissenschaftskolleg (HWK) offers outstanding scientists the opportunity to focus on research projects without distraction from the daily routine and to cooperate with colleagues in northwest Germany. One of the four fields of research promoted by the HWK is Marine and Climate Research.



Hanse-Wissenschaftskolleg
Institute for Advanced Study

Hanse-Wissenschaftskolleg – *Institute for Advanced Study*

Profile

The Hanse-Wissenschaftskolleg (HWK) is an independent, international and interdisciplinary research institute established as a non-profit foundation of the German federal states of Bremen and Lower Saxony and the city of Delmenhorst. It combines theoretical work with experimental research within its four research areas: Marine and Climate Research, Neurosciences and Cognitive Sciences, Social Sciences, and Energy Research.

Fellow Program

As an Institute for Advanced Study the HWK Fellow program is internationally recognized giving external scientists the opportunity to cooperate with colleagues at the neighbouring universities and research institutions by means of guest visits (Fellowships). Thus, the HWK strengthens northwest Germany as a center of scientific research.





Workshops and Conferences

In addition to the Fellow program, another principal task of the HWK is the organization and execution of national and international workshops and conferences with up to 80 participants. Thus, the HWK allows not only intense scientific exchange but also networking of local scientists with colleagues around the world. With its conference program and lecture series for the general public on socially relevant issues and cutting-edge scientific questions, the HWK also presents itself as a place of intellectual debate.



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Cooperation with Industry: Foundation Fellowships

Companies may also cooperate with the HWK on the promotion of special guest scholarships (Foundation Fellowships). Outstanding scientists are selected jointly by the HWK and a partner from the business community. This Fellowship is named after its sponsor and is widely recognized externally.

The Foundation Fellow stays for about one week at the HWK. During this time he or she gives a public lecture at the HWK or another location agreed with the sponsor. In addition, the HWK organizes a workshop which deals intensively with current trends in the specific scientific field of the Foundation Fellow.



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Promoting Young Talents to Regional Business: Junior Fellowships

The HWK offers Junior Fellowships especially for younger scientists to attract more young talents to the region. Junior Fellows are encouraged to use the HWK as a platform to develop their scientific and business networks. This supports basic research and practical applications by bringing together younger scientists with potential employers from the regional scientific and business communities.

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Increasing urbanization, unsparing use of natural resources, and global climate change have dramatic effects, especially on tropical coastal ecosystems and seas. The ZMT, a member of the Leibniz Association, provides the scientific foundation for the protection and sustainable use of tropical coastal ecosystems through its activities in research and training.

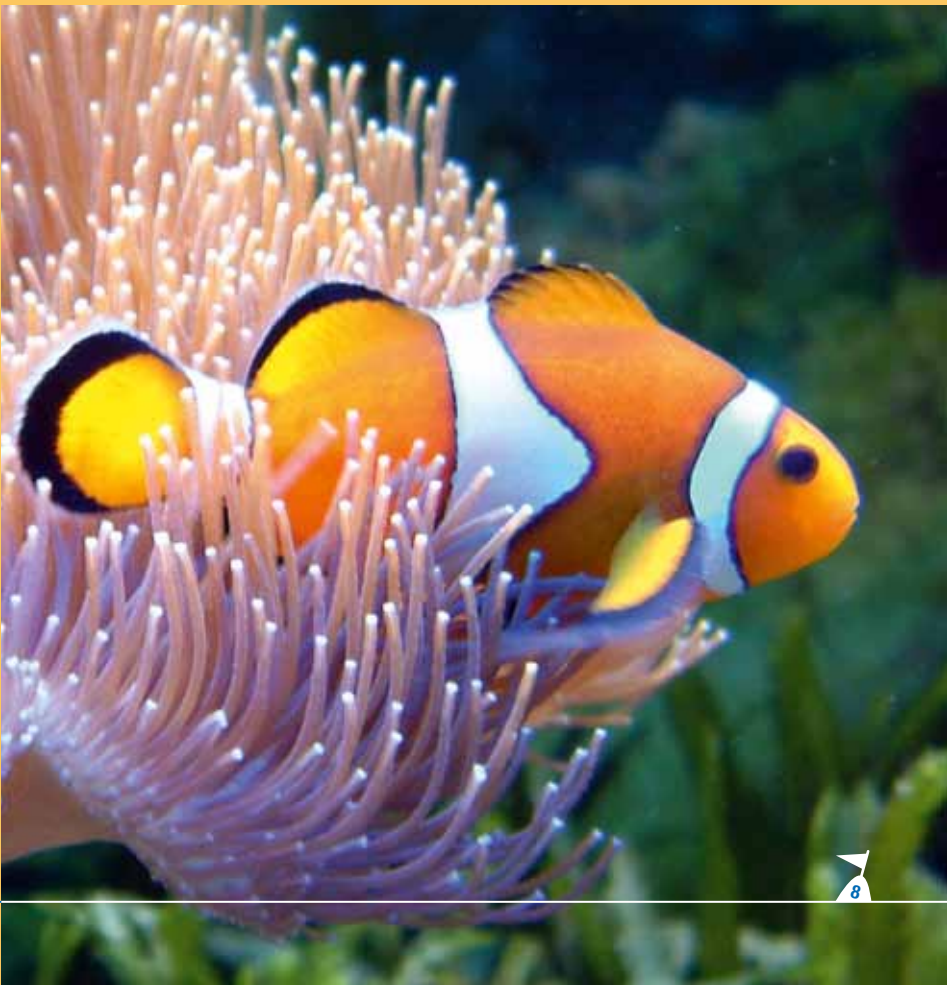


Leibniz Center for Tropical Marine Ecology (ZMT)

Scientific Aims

Tropical coastal ecosystems are among the biologically most diverse habitats on Earth, not to mention their economic and ecological importance. In close cooperation with partners from tropical countries, the ZMT conducts interdisciplinary research projects. Focal areas are the structure and functioning of tropical coastal habitats and their response to human

activity and natural changes. In the 18 years since its foundation, the institute has built a dense network of contacts in Germany and abroad. Cooperation agreements exist with research institutions in Southeast Asia, southern Africa, and South America. The institute acts as a focal point for the exchange of expert knowledge for science, as well as for business and politics.



Culture of Marine Ornamentals

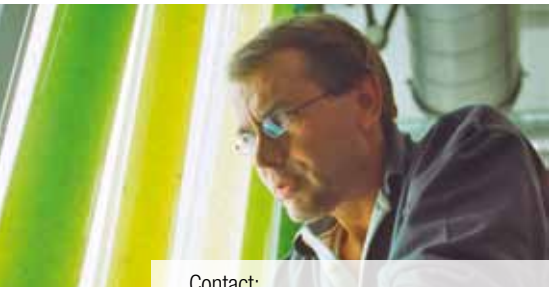
In the last 10 years, the ornamental fish trade has reached global dimensions with a trade volume of more than 15 billion US\$ annually. At the same time coastal systems, and especially coral reefs, are increasingly damaged by the wild capture of these organisms. Research at the ZMT contributes to reducing the capture of wild stocks through the development of breeding and rearing methods for selected species. The institute maintains a closed-circulation system that replicates the conditions of life in the sea for experimental purposes. Specific expertise includes the maintenance of water quality of the system and of the parent stock of cultured organisms as well as optimizing feeding. A main focus of the research is the development of robust techniques and low-cost equipment for small mariculture facilities.

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Production of Algae

Few other foods contain as many nutrients, fatty acids, vitamins, proteins, minerals, and trace elements as microalgae. Above all, their polyunsaturated fatty acids (PUFA) are essential in the human diet for healthy development. Marine organisms that feed on microalgae accumulate these fatty acids. Also, unsaturated fatty acids are used by chemical and cosmetic industries for a variety of products. The ZMT offers expertise on the optimization of environmental and production conditions of aquaculture to increase the concentration of PUFA in microalgae.



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Management of Water Quality

River effluents strongly influence the water quality of coastal waters and thus, the life in coastal ecosystems. In terms of the amount of input of sediments and nutrients into the coastal zones the tropics are unique. With help from automated measuring devices, water constituents can be regularly analyzed over long time periods. As an experienced partner, the ZMT offers research and consulting services concerning the development or adaptation of water-quality monitoring systems to tropical conditions.



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Capacity Building

Through its long-term research in areas that are considered hot spots of global environmental problems, the ZMT has acquired broad scientific and methodological expertise. Through this experience, the institute is specialized in assisting the development of expertise in the area of tropical marine ecology and sustainable coastal management. The ZMT offers qualification training for specialists and executives as well as advanced training courses that are tailored to the specific needs of each partner.



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They are invisible to the naked eye, only a few thousandths of a millimetre small. However, by being major producers and degraders of biomass, marine microorganisms play an essential role in all ecosystems. Scientists at the Max Planck Institute for Marine Microbiology (MPI) in Bremen study these tiny organisms that influence the global biogeochemical cycles in ocean waters and marine sediments.



**Max Planck Institute
for Marine Microbiology**

The Max Planck Institute for Marine Microbiology – a Multidisciplinary Approach to Marine Science

Research at the MPI Bremen

The Max Planck Institute for Marine Microbiology (MPI) in Bremen investigates microbial processes and the diversity of the involved bacteria in order to understand the basics of life in the sea. Research activities focus on processes in sediments as well as in the water column, as both of these are highly interesting and important compartments for transformations of organic substances.

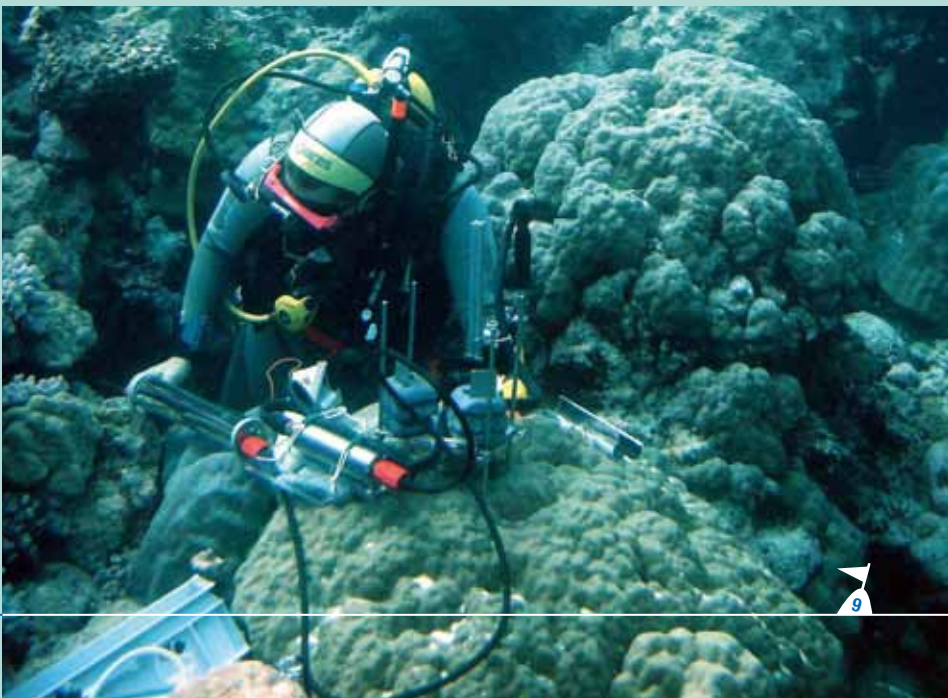
The unique feature of the MPI research is its multidisciplinary approach to task and problem solving through close cooperation between microbiologists, molecular ecologists, biogeochemists, mathematicians, physicists, bioinformaticians, and engineers. The three departments and ten research groups at the MPI

study prokaryotic communities and microbial processes found in habitats that range from coastal areas to the deep sea.

Technological Highlights

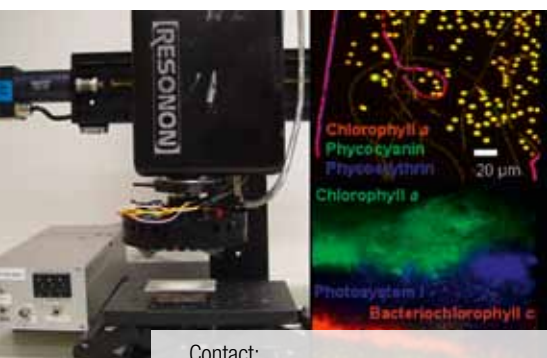
The scientists and engineers at the MPI develop and refine novel techniques and methodologies: High spatial resolution and non-invasive measurements show chemical gradients, analyses with radiotracers and stable isotopes reveal activity of single cells (see NanoSIMS). Molecular approaches include sequence analyses, *in-situ* hybridizations, as well as flow cytometry, and confocal laser scanning microscopy.

The MPI is leading in the development of analytical methods and production of precise microsensors for targeted deployment during *in-situ* measurements.



Microsensors

The Microsensor Group develops and optimizes electrochemical and optical sensors, measuring systems and techniques, applicable with a micrometer-scale resolution in one or two dimensions. The most recent developments include microsensors for radioactivity, nitric oxide (NO), carbonate ions, and diverse imaging techniques. In addition to hardware, software tools for measurement automation and data analyses are also developed.



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NanoSIMS

With the help of the NanoSIMS (Nanometer-scale Secondary Ion Mass Spectroscopy), cell structures and the metabolic activity of single microbial cells can be studied with a spatial resolution of approximately 50 nanometers. The chemical and isotopic composition of biomass can be determined at the sub-micron level.



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DOMS

The MPI technicians and engineers collaborate closely in order to fit measuring apparatus and equipment to novel experimental methods and unusual research locations. Lander equipment and its electronic measuring system have been engineered and new *in-situ* technologies developed such as the diver-operated motorized microsensor profiler (DOMS).

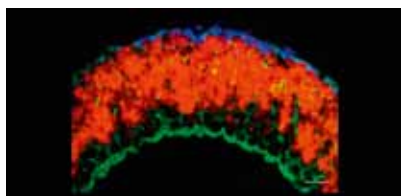


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Molecular Ecology

Diversity analysis is a prerequisite to gain fundamental insights into the life and interactions of marine microorganisms as well as to detect new microorganisms for (bio)technological applications. Fluorescence-*In-Situ*-Hybridization (FISH) in combination with phylogenetic analyses are the best tools to shed light into the black box of microbial ecology.



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Microbial Genomics and Bioinformatics

Genomics is now widely used, with a focus on metagenomics (environmental DNA) and bioinformatics, to gain further insights into deciphering the genetic potential and gene expression of uncultivable marine bacteria.

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Located in Wilhelmshaven, the marine section of the Senckenberg Institute has wide ranging expertise in deep and shallow-water research. Long-term data series, taxonomic services, underwater remote-sensing techniques, and expertise in benthic environmental analyses are available for deep-sea, shallow-sea, and coastal-zone surveys. Multiple measuring and sampling equipment can be operated simultaneously by a 30-m research vessel and smaller working boats.

senckenberg

forschungsinstitut und naturmuseum



Senckenberg am Meer – Research Institute for Marine Science and Biodiversity

Scientific Aims

Since 1928 Senckenberg am Meer (SaM) focusses on research in marine geology and marine biology. One major topic is the integrated comparison of ancient and modern marine facies and ecosystems on different spatial and temporal scales. Since 15 years studying the biodiversity of deep-sea ecosystems has become another important task. SaM also provides services such as expert training courses, support, and consultancy for governmental and commercial projects. The scientific studies at SaM contribute to a better understanding of the natural and anthropogenic impacts on marine environments and provide important information for sustainable use of the coastal zones as well as the open ocean.

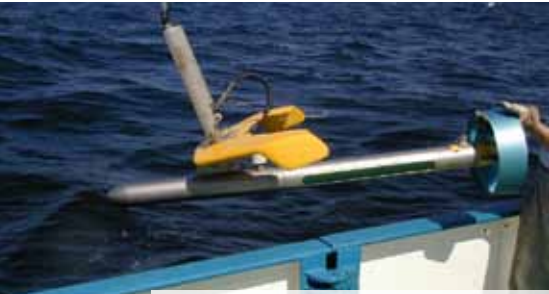
Offers for Collaboration with Industry

Through the long-term research of bio- and geological processes in low and high-energy regimes, SaM became an expert for shallow open-water systems, especially for tidal-driven systems. The fully integrated multidisciplinary use of modern technology coupled with several decades of experience in operating own research vessels results in close cooperation with federal, governmental, and commercial partners. Biological and geological surveys have been conducted during the last 20 years to support offshore windfarms, marine exploration, and underwater construction work. With the establishment of the German Centre for Marine Biodiversity Research (DZMB) in the year 2000, SaM extended its expertise to taxonomic services, also within global biodiversity research programs.



Underwater Remote Sensing and Acoustic Seabed Classification

For a decade SaM deals with the integration of multiple hydro-acoustic devices (single and multibeam echosounder, sidescan sonar) to standardize acoustic seabed classification strategies for future governmental monitoring activities and environmental impact studies. Recently, specific guidelines and recommendations are being worked out using acoustic systems on shallow-water habitats.



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Taxonomic Services

The DZMB offers professional assistance for marine expeditions, coordination of logistics, and technical support. Samples are sorted in constant high quality and archived. Sampling gear is available (box-corers, Van-Veen-grabs, epibenthos-sledges, dredges, multi- and mini-corers). Taxonomic expertise is provided for marine organisms belonging to the meio- and macrofauna, plankton, and pelagic.



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Benthic Environmental Expertise

SaM has North-Sea-wide expertise in benthic taxonomy and ecology. Benthic long-term series in different areas of the North Sea reveal changes in benthic diversity and environmental parameters in relation to climate and anthropogenic impacts such as fisheries, mud extraction, and dredging. The combination of hydro-acoustic devices and modeling approaches for future benthic monitoring activities and environmental impact studies is under development.



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Coastal Dynamics and Biosedimentary Systems

SaM provides expertise in the survey of sedimentary sequences of continental shelves and coastal regions with respect to coastal dynamics and sea-level changes. It has broad experience in the analysis of biosedimentary systems by an integrated approach of sedimentological and biological methods. Large-scale tracking of bioinvasions and their impact on native ecosystems is a main focus of current activities.



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