

Expert Guide

Marine Research 2018

Flanders Marine Institute (VLIZ)



The Expert Guide Marine Research 2018 is part of the Compendium for Coast and Sea initiative: An integrated knowledge document on the socio-economic, ecological and institutional aspects of the coast and sea in Flanders and Belgium. The Compendium is the result of a collaboration between numerous research groups, administrations, societal organisations and consultation platforms with regard to the coast and sea. This initiative is coordinated by the Flanders Marine Institute (VLIZ).

The Compendium for Coast and Sea can be consulted online at: www.compendiumcoastandsea.be

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Citation:

Mees, J., Verleye, T., Dauwe, S., Pirlet, H., Devriese, L., Lescrauwaet, A.K., Janssen, C. (Eds.), 2018. Expert Guide Marine Research 2018. Flanders Marine Institute (VLIZ), Ostend, Belgium, 164 pp.
ISBN 978-94-920435-7-3

Chief editor:

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8400 Ostend
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Graphic design:

Cayman bvba (Bruges) and the VLIZ Policy Information Division

Photography:

Photo cover: Cayman bvba (Brugge)

Photos were submitted by the respective research groups, except the photos on pages 16 (VLIZ), 17 (Roos et al. 2002), 18 (Hein Scott J. 2002), 19 (D'Hamers Erik 2010), 21 (www.ub.edu), 22 (School Photo Project), 29 (Van Ginderdeuren Karl 2009), 36 (Fischer and Gustafson 2016), 42-43, 46 (VLIZ), 49 (Wikipedia Commons), 50 (NOAA/NCCOS/CCFHR), 54 (Lankhout, Den Haag), 56 (<http://mcdougald.blogspot.be>), 62 (VLIZ), 64 (Wikipedia), 67 (Bodnar Wanda), 70 (Helder Hans, Lab. of Nematology, Wageningen Univ.), 76 (pixabay), 80 (Ghent University Wetenschap en Verbeelding MNEMOSYNE 2013), 84 (www.cefas.co.uk), 85 (VLIZ), 90 (Van Ginderdeuren Karl 2010), 91 (VLIZ), 96 (Deckers Pieterjan), 97 (Decler Misjel 2006), 98 (VLIZ), 107 (Andrés Rigual-Hernández, Macquarie University), 109 (BMM/MUMM), 116 (Martin L. Carey, US Navy), 119 (Blaise et al. 2010), 120 (Van Ginderdeuren Karl 2008), 121 (VLIZ), 124 (van de Zee and Chou 2005), 125, 127, 133, 135 (VLIZ), 136 (Beckers et al. 2006), 138 (Delhez and Wolk 2012), 139 (Wikipedia Commons), 140 (Verkempynck Marc), 141 (VLIZ), 143 (Van Ginderdeuren Karl 2008), 144 (van Hengstum et al. 2009), 145 (Boulvain et al. 2009), 149 (VLIZ), 152 (Decler Misjel), 162 (Flickr), 163 (K. Vanneste, KSB), 164 (Flickr).



The Expert Guide Marine Research 2018 is part of the Compendium for Coast and Sea initiative. This Expert Guide, aims to disclose the Belgian research groups that focus on marine/maritime, coastal, and/or estuarine research topics (subsequently referred to as 'marine' research). The publication maps the marine expertise on the level of individual marine research groups (MRGs) and aims to actively promote the expertise both in Belgium and abroad. Furthermore, it intends to improve the communication and collaboration between the MRGs.

The marine research groups mentioned in this expert guide comply with the following criteria:

- Located in Belgium;
- A marine research focus. In case of doubt, the output of the group is decisive (more than one peer-reviewed publication in the past 5 years with a first author affiliated to the research group);
- The research group receives regular funding from the government (via management agreements, covenants or arranged on another legal basis);
- Groups which do not belong to a university association are included in the list of recognised institutes for scientific research as included in article 5 of the *royal decree of 22 August 2006 tot wijziging van het KB/WIB 92 op het stuk van de aangifte in de bedrijfsvoorheffing* and subsequent amendments.

The criteria mentioned above imply that institutes such as administrations, museums, organisations with educational purposes, companies, etc., which may also conduct marine research, are not included in the Expert Guide. For more information on the latter, we refer to different cluster initiatives such as the [Blauwe Cluster](#) (inclusive [Flanders Maritime Cluster](#)), [Belgian Offshore Cluster](#), [Belgian Offshore Platform](#) en [IBN Offshore Energy](#). If your institute complies with the aforementioned criteria but is not included in this guide, please contact the secretariat of the Compendium for Coast and Sea (compendium@vliz.be).

The MRGs can be classified into four types of institutes: the 'Flemish university associations', 'the Flemish scientific institutes', 'Universities and graduate schools of the Wallonia-Brussels Federation' and 'Federal scientific institutes'. In this guide, institutes and their affiliated research groups are discussed alphabetically. In addition to the description of individual MRGs, this publication also discloses interfaculty marine research clusters. These clusters are discussed prior to the description of the individual MRGs belonging to the respective university.

The publication presents the following information for each MRG: name of the research group, IMIS-ID (see below), website, institutional hierarchy, point of contact, research domain and discipline, abstract and address. The MRGs are also disclosed online in the VLIZ Integrated Marine Information System (IMIS) (www.vliz.be). In this database more detailed information about the research group can be consulted, such as the current staff, an overview of the publications affiliated to the respective group, projects in which the group participated and datasets (if relevant). The IMIS-ID of each MRG is visualised in the upper right corner of every MRG-sheet. It is a numeric code referring to the webpage of the MRG within IMIS and corresponds with the digits at the end of the URL of the webpage (<http://www.vliz.be/imis/imis.php?module=institute&insid=ID>).

This publication is accessible in an interactive way on the website of the Compendium for Coast and Sea (www.compendiumcoastandsea.be) and the VLIZ-website (www.vliz.be). An overview of the available marine research infrastructure within the MRGs is given in the Compendium publication 'Marine Research Infrastructure'.

Expertise of the marine research groups

The Belgian MRGs study a wide range of marine/maritime topics (see Compendium for Coast and Sea, Indicator Report on Marine Research and Innovation), covering various research fields and disciplines. The geographical visualisation of the MRGs according to research domain emphasises the fragmented nature of the current marine research landscape in Belgium (figure 1).

The majority of the MRGs are active in the research domain of natural sciences (55%), followed by engineering and technology (33%), agricultural and veterinary sciences (9%), social sciences (4%), humanities (4%) and finally medical and health sciences (3%). On the level of research disciplines, 31% of the MRGs focus on biological sciences and 17% on earth sciences, followed by chemical sciences (7%), civil engineering (6%), biotechnology (6%) and fisheries and aquaculture sciences (6%) (figure 2).

NUMBER AND LOCATION OF THE MRGs ACCORDING TO THEIR RESEARCH DOMAINS

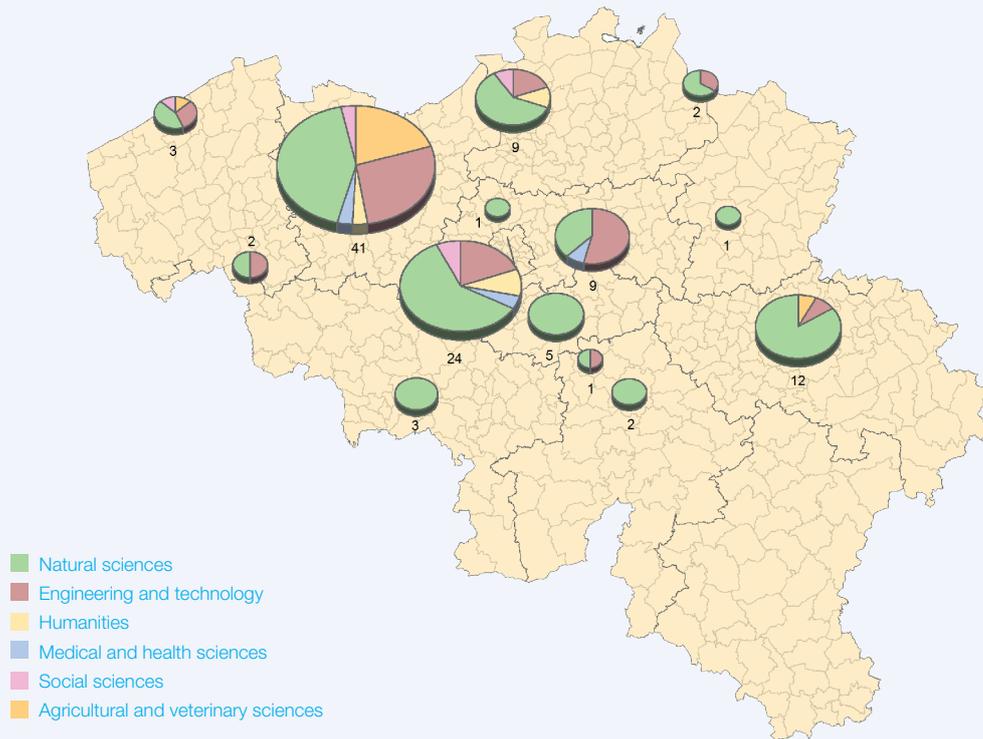


Figure 1. Number and location of the MRGs according to their research domains (July 2018). Institutes can be located at several places and institutes can belong to multiple research fields.

NUMBER OF MRGs BY RESEARCH DISCIPLINE

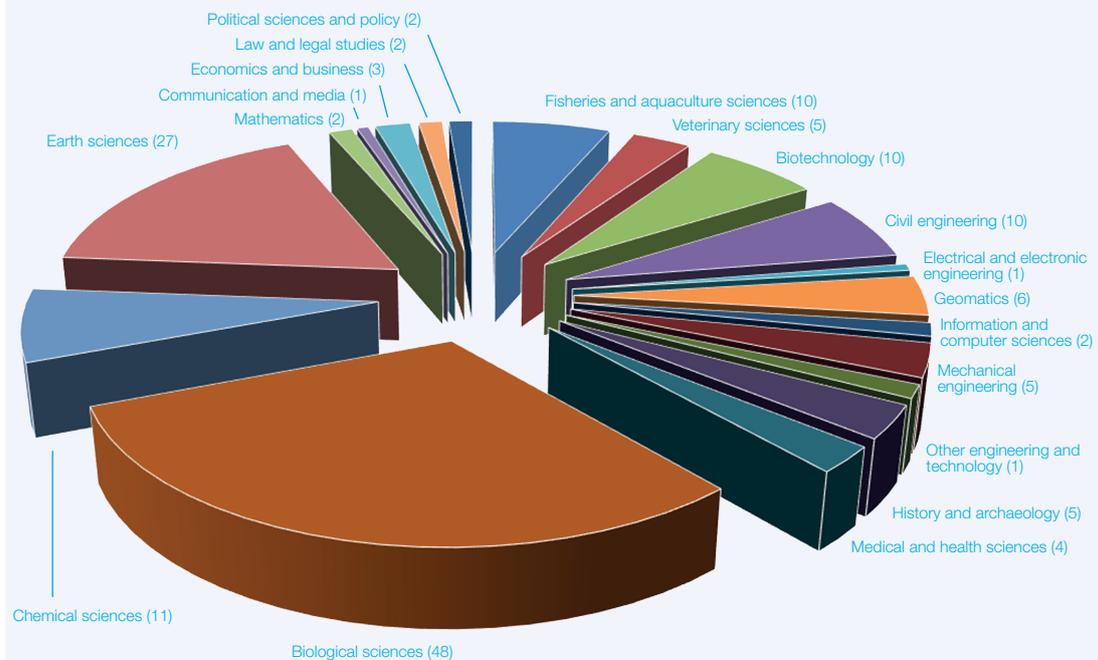


Figure 2. Number of MRGs by research discipline (July 2018). Institutes can belong to multiple research disciplines.

Antwerp University Association

● Ecosystem Management research group	16
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KU Leuven University Association

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● Laboratory of Biodiversity and Evolutionary Genomics	29
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● Department of Civil Engineering	31
● Division ESAT - Electrical Energy and Computer Architectures *	32
● Division of Geology	33
● Laboratory Food and Lipids	34
● Section Process Engineering for Sustainable Systems	35
● Division of Applied Mechanics and Energy Conversion	36
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Ghent University Association

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● Atomic and Mass Spectrometry research group	49
● Department of Movement and Sport Sciences	50
● BIOMATH	51
● Cartography and GIS - 3D Data Acquisition research group	52
● Laboratory of Chemical Analysis	53

* Content not validated by the respective research group in 2018

● Biological sciences	● Engineering and technology	● Humanities
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Hasselt University

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Vrije Universiteit Brussel

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Flemish scientific institutes

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Haute École Paul-Henri Spaak

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Université Catholique de Louvain

● Marine Biology laboratory	118
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Université Libre de Bruxelles

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University of Liège

MARE Cluster *	132
● Research unit Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis *	134
● Animal Ecology and Ecotoxicology laboratory *	135
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University of Mons

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University of Namur

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Federal scientific institutes

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Flemish university associations



Antwerp University Association

// Faculty of Pharmaceutical, Biomedical and Veterinary Sciences

- Toxicological Centre

// Faculty of Arts and Philosophy

- Centre for Urban History

// Faculty of Applied Economics

- Department of Transport and Regional Economics

// Faculty of Sciences

- Ecosystem Management research group
- Behavioural Ecology and Ecophysiology research group
- Research group Functional Morphology
- Research group Systemic Physiological and Ecotoxicological Research

// Other

- Antwerp Maritime Academy

/ Ecosystem Management research group

www.uantwerpen.be/en/research-groups/ecobe

// Institutional hierarchy

Faculty of Sciences

Department of Biology

// Point of contact

Prof. dr. Patrick Meire

// Research domain and discipline

Natural sciences; Biological sciences

Natural sciences; Earth sciences



Abstract

The Ecosystem Management research group (ECOBE) of the University of Antwerp studies the ecology of aquatic ecosystems and wetlands, as well as the processes occurring at the land-water interface along the river continuum and the river-coast-sea interaction. Study areas include small streams (with narrow banks) and large rivers, floodplains and estuaries. The studies are used to assess the impact of different management options on ecosystem functioning and biodiversity.

// Institutional hierarchy

Faculty of Sciences

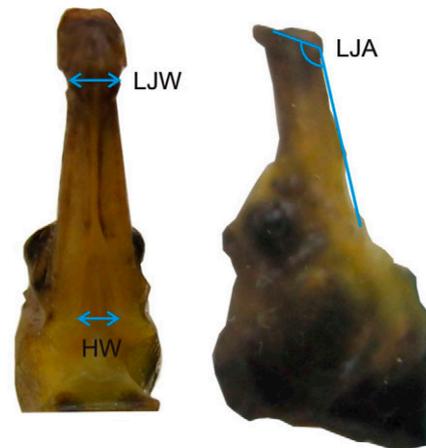
Department of Biology

// Point of contact

Prof. dr. Peter Aerts

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research group Functional Morphology of the University of Antwerp studies the evolution of the morphology and function of vertebrate musculoskeletal systems by combining comparative and experimental methods together with ecological and behavioural aspects. The group describes the shape of structural elements as well as their relationship (functional and mechanical) with each other and the environment.

In the marine field, the research group studies suction feeding in fishes.

/ Behavioural Ecology and Ecophysiology research group

www.uantwerpen.be/en/research-groups/behavioural-ecology-ecophysiology

// Institutional hierarchy

Faculty of Sciences

Department of Biology

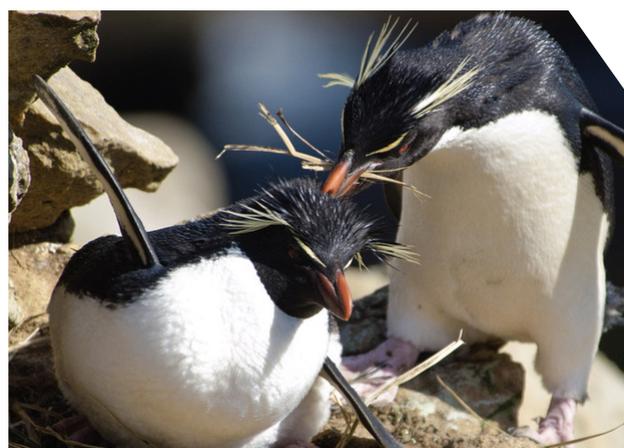
// Point of contact

Prof. dr. Marcel Eens

// Research domain and -discipline

Natural sciences; Biological sciences

Natural sciences; Chemical sciences



Abstract

The main research interest of the Behavioural Ecology and Ecophysiology Research group is the study of the causes and consequences of the variation in behavioural traits among individuals. A major challenge in biology is to understand the interactions between an organism and its environment. Behaviour resides in the central core of this association as it affects and is affected by development, physiology, ecological dynamics, environmental choice and evolution. Therefore, behaviour can be considered as a key component of integrative biology in a human-altered world. We study behaviour from four perspectives (mechanisms, development, adaptive function, phylogeny) simultaneously, thus using an integrative and interdisciplinary framework. We apply theoretical and methodological insights from animal behaviour and behavioural ecology to conservation biology and global change biology. The overarching aim of our research is to explain and ideally predict how individuals and species respond behaviourally to human-induced rapid environmental change. Most research is on terrestrial birds, although an increasing number of studies is focusing on marine species. With regard to marine research, reproduction and foraging ecology is studied in lesser black-backed gulls, different penguin species and northern fulmars using both field experiments and GPS tracking technologies. We also study the role of different seabird species as biomonitors of pollution and environmental change. We are exploring both indicators and consequences of exposure, including immune function, endocrinology, reproduction and the expression of visual and acoustic traits. Special attention is being paid to the use of bird feathers as a non-destructive indicator of both exposure to and effects (stress hormones) of pollutants. Using archived museum feather collections, temporal trends in a wide range of pollutants are being studied.

// Institutional hierarchy

Antwerp University Association

// Point of contact

Dr. Rowan Van Schaeren

// Research domain and discipline

Engineering and technology; Civil engineering
 Engineering and technology; Electrical and electronic engineering
 Engineering and technology; Mechanical engineering
 Natural sciences; Chemical sciences
 Social sciences; Law and legal studies
 Social sciences; Economics and business



Abstract

The Antwerp Maritime Academy is the only academy in Belgium which provides education in Nautical Sciences and Marine Engineering at bachelor and master level. The courses are given in Dutch and French. They meet stringent international and quality-standard requirements set by the International Maritime Organisation (IMO). This allows the Antwerp Maritime Academy to offer certificates that are fully compliant with IMO STCW-standards (Standards of Training, Certification and Watchkeeping). For example, in Nautical Sciences, the STCW Operational Level is obtained at the completion of the bachelor cycle, while the STCW Management Level is a modular part of the master cycle. In Marine Engineering the STCW Management Level is already reached within the bachelor cycle. The certificates gives access to the onboard functions mentioned below. In addition, it also gives access to onshore careers in a nautical-economic or nautical-technical function.

- Bachelor nautical sciences: Graduates start as Junior Officer of the watch;
- Master nautical sciences: Graduates have access to management jobs onboard a vessel (e.g., chief officer, captain, etc.);
- Bachelor Marine Engineering: Graduates general start as Junior Engineering Officer.

The Antwerp Maritime Academy is active in practice-based research, research that is driven by practitioners to improve or innovate the professional practice. The multidisciplinary team of lecturers are involved in a large variety of research domains such as language and communication, corrosion and biofouling, education, development of a solar boat, etc. Students are actively involved in ongoing research projects by bachelor and master projects.

// Institutional hierarchy

Faculty of Arts and Philosophy

History Department

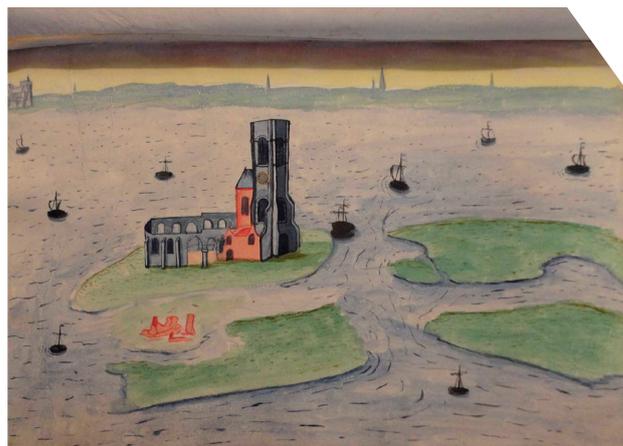
// Point of contact

Prof. dr. Ilja Van Damme

Prof. dr. Tim Soens

// Research domain and discipline

Humanities; History and archaeology

**Abstract**

The Centre for Urban History (CSG) of the University of Antwerp was founded in September 2004. CSG studies important aspects of the urban society, economy, ecology, culture and politics from the medieval period up until present time. Cities are emphatically categorised into their spatial and chronological context, in relation to each other, but also in relation to the non-urban and non-human environment. Research priorities include the urban material culture, civil society, urban identity, knowledge networks, economic growth and social inequality, migration and urban ecology.

Since a few years, the group increasingly focuses on studying the relationship between cities and their natural environment from a historical perspective. Given the geographical research focus on the North Sea area and the role of rivers and estuaries in urban development in this part of Europe, the historical relationship between cities and water constitutes a prominent part of the research. Since 2013, the marine research is part of the research line ENVIRHUS: 'Environmental and Rural History of Urbanized Societies', coordinated by Prof. dr. Tim Soens.

Within the marine and coastal domain, the research focuses on five topics:

- The study of the causes, impact and perception of historical flood disasters;
- The historical study of polders and water-meadows in the North Sea area (as a bottom-up organisation for coast and river water management);
- Broader research on coastal development during the last millennium (mainly the interaction between natural and human dynamics);
- The study of peat development and excavation;
- The study of heritage aspects of coastal and river landscapes (focusing on the integration of natural values and cultural historical values).

The CSG intensively collaborates with research groups from the University of Antwerp (Ecosystem Management research group) and Ghent University (research group Economy, Ecology and Demography and the Renard Centre of Marine Geology).

/ Research group Systemic Physiological and Ecotoxicological Research

www.uantwerpen.be/en/research-groups/sphere

// Institutional hierarchy

Faculty of Sciences

Department of Biology

// Point of contact

Prof. dr. Ronny Blust

// Research domain and discipline

Natural sciences; Biological sciences

Natural sciences; Chemical sciences



Abstract

The research group Systemic Physiological and Ecotoxicological Research (SPHERE) of the University of Antwerp holds this name since 2012, and was formerly known as Ecophysiology, Biochemistry and Toxicology (EB&T). The group was founded in 1973 and was initially named laboratory of Biochemistry and General Zoology. SPHERE conducts research on important issues of environmental and adaptational biology. The research group focuses on how organisms respond to environmental changes with an emphasis on the different levels of biological organisation: from the molecular level (including genomics, proteomics and metabolomics) to the broader response of populations in real field situations. Expertises include molecular, cellular and organismal toxicity tests; characterisation of mode of action of microcontaminants; analysis of inorganic and organic contaminants; chemical and biological monitoring and diagnostics; development of application of biomarkers and sensors; modelling of bioavailability, accumulation and toxicity.

Within the marine domain, SPHERE studies the following topics:

- The combined effects of temperature, hypoxia, carbon dioxide and nitrogen on the ion regulation of fish;
- Trophic transfer and bioaccumulation of contaminants in food webs in the Scheldt Estuary and the North Sea;
- The intake and toxicity of metals in marine and estuarine areas for key species such as mussels and scallops, fish and sharks;
- Fate and effects of microplastics in marine environments;
- Modelling and bioaccumulations of pollutants in marine organisms.

SPHERE participates within several marine projects dealing with topics such as the effects of pollutants on populations and benthic communities in the North Sea, and the influence and recovery of anthropogenic interventions on fish populations. The network of the research group includes both Belgian and international universities as well as Flemish scientific institutes such as the Research Institute for Agriculture, Fisheries and Food (ILVO).

// Institutional hierarchy

Faculty of Pharmaceutical, Biomedical and Veterinary Sciences

Pharmaceutical Sciences Department

// Point of contact

Prof. dr. Hugo Neels

// Research domain and discipline

Natural sciences; Chemical sciences



Abstract

The Toxicological Centre of the University of Antwerp consists of two divisions, the Clinical Toxicology branch and the Environmental Research branch. The first branch performs clinical toxicological research, forensic research and routine analyses for the Belgian Ministry of Justice. The Environmental Research branch primarily focuses on persistent organic pollutants (POPs) and on the development of new analytical procedures to analyse these chemicals. Within the marine field, the Toxicological Centre conducts research on the presence of POPs in fish, eels and marine mammals.

// Institutional hierarchy

Faculty of Applied Economics

// Point of contact

Prof. dr. Ann Verhetsel

// Research domain and discipline

Social sciences; Economics and business



Abstract

The department of Transport and Regional Economics (TPR) of the University of Antwerp was founded in 1979 and performs research on the interface between general and business economics. The department focuses on freight transport, ports and the maritime sector, air transport, urban distribution, innovation in transport and logistics, the appraisal of infrastructure projects, strategic analyses and policy recommendations, the interaction between transport and regional dimension, urban economics, and the interaction between mobility and the economy. During its existence the department has expanded its field of interest to the study of issues related to air transport and pipelines. In the future, the above mentioned topics will be further examined, taking into account future developments (regarding market and policy) and innovative topics. This department traditionally responds maximally to emerging challenges (related to society, industry as well as policy) to translate these into research questions which are tackled using existing or newly developed techniques, often in an international partnership. Big challenges that arise (and have a large impact on transport) include climate change, varying energy costs and sources, labour, geographical market shifts and internationalisation.

The group studies the following maritime and port-related themes:

- Competition and cooperation in the maritime and port sector;
- Ports as junctions in the logistics chain;
- Productivity of terminals;
- Costs of maritime traffic;
- Ports policy;
- Strategic planning in ports;
- Traffic forecasting;
- Innovation in maritime transport and ports.

TPR is involved in various scientific networks such as TransportNET, the World Conference on Transport Research Society (WCTRS) and houses the Flemish Policy Research Centre of Commodity and Passenger Transport (MOBILO). Furthermore, researchers of this department hold leading positions in academic associations such as the WCTRS and the European COST-action for Public-Private Partnerships in Transport (TU1001). They are also members of several journal editorial boards including for example the journal of 'Maritime Policy and Management'. Regarding education and research on maritime issues and port development, the group closely cooperates with the Delft University of Technology, Technical University of Lisbon, University of Genova, University of the Aegean, University of South California, Massachusetts Institute of Technology, National University of Singapore, Singapore Nanyang University of Technology and Vietnam Maritime University.

KU Leuven University Association

// Marine@KULEuven Cluster

// Biomedical Sciences Group

- Laboratory of Toxicology and Pharmacology

// Science and Technology Group

- Laboratory of Biodiversity and Evolutionary Genomics
- Department of Civil Engineering
- Division ESAT - Electrical Energy and Computer Architectures
- Division of Geology
- Section Process Engineering for Sustainable Systems
- Division of Applied Mechanics and Energy Conversion

// Science, Engineering and Technology Group, Kulak Kortrijk Campus

- Laboratory Aquatic Biology
- Laboratory Food and Lipids

// Rega Institute

- Bioinformatics and (Eco-)systems Biology lab - Raes lab

// Point of contact

Prof. dr. Filip Volckaert

Prof. dr. Jaak Monbaliu

// Number of partners

9



MARINE@KULEUVEN
Marine Research

Abstract

KU Leuven has internationally-recognised expertise in fundamental and applied research in the field of marine science and technology. To strengthen its reputation, KU Leuven established Marine@KULeuven as part of the LSUE (Leuven Sustainable Earth) Research Center.

The mission of LSUE is to bring together scientists from different disciplines with a common interest in sustainable development in order to bring research, education and service to society in this domain to a higher level by capitalising on complementary expertise and insight. LSUE groups a broad range of topics among others in the research domains of geo- and ecosystems, soil, water, land, sea, climate, biodiversity, ecosystem services, materials, sustainable production processes, development policy and environmental policy.

The interfaculty consortium Marine@KULeuven is composed of 9 research groups from four faculties (Science, Engineering and Technology Group; Rega Institute; Biomedical Sciences Group; Faculty of Engineering Science). The groups conduct research on various marine/maritime topics and disciplines: e.g. modelling of waves, currents and sediment transport, coastal engineering, fish ecology, toxins, genetics, phytoplankton diversity, microalgae cultures, microalgae as sources of nutritionally-interesting lipids, microfossils, offshore energy production, membrane technology, etc.

Marine@KULeuven aims to promote and facilitate the collaboration between these research groups as well as with Flanders Marine Institute (VLIZ). This cooperation is an important step in assuring that marine research at KU Leuven can contribute to the great ocean/sea related challenges, providing a research platform that is intended to stimulate a true effort towards integration.



Partners

Faculty of Engineering Science

- Section Process Engineering for Sustainable Systems

Biomedical Sciences Group

- Laboratory of Toxicology and Pharmacology

Science, Engineering and Technology Group

- Hydraulics Laboratory
- Laboratory of Biodiversity and Evolutionary Genomics
- Laboratory Aquatic Biology
- Laboratory Food and Lipids
- Division ESAT - Electrical Energy and Computer Architectures
- Division of Geology

Rega Institute

- Bioinformatics and (Eco-)systems Biology lab - Raes Lab

// Institutional hierarchy

Science, Engineering and Technology Group
Kulak Kortrijk Campus

Department of Biology

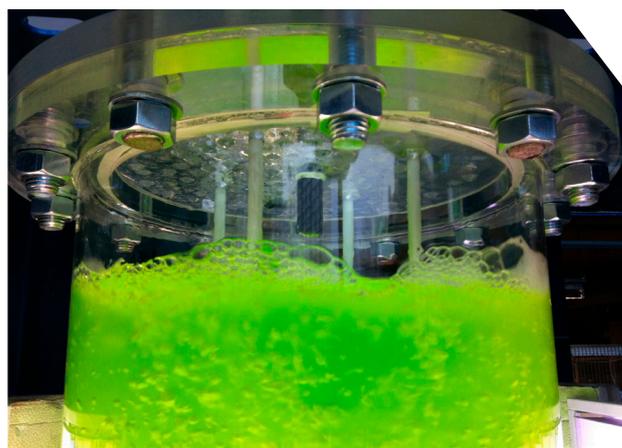
// Point of contact

Prof. dr. Koenraad Muylaert

// Research domain and discipline

Natural sciences; Biological sciences

Engineering and technology; Biotechnology



Abstract

The laboratory Aquatic Biology of the KU Leuven University (Kulak Kortrijk Campus) was founded in 2008. The laboratory conducts fundamental and applied research with regard to aquatic microorganisms in both natural and artificial waters. The research focuses on three main topics: (1) the causes and solutions for eutrophication and algal blooms, both in freshwater and marine ecosystems; (2) the development of applications of microalgae, such as in waste water treatment, biofuel production or food and animal feed. The main aim of the marine microalgae research is to discover particular species that are a source of omega-3 fatty acids and new antioxidants; (3) fundamental research regarding the evolutionary interaction between parasites and their hosts, using the water flea *Daphnia* as an animal model.

The marine topics studied by this group can be summarised as follows:

- Study of the variations in phytoplankton diversity and density in the Scheldt Estuary;
- Research on cultivation of marine microalgae.

The group focuses on the use of marine microalgae in sustainable technologies such as replacing fish oil by algae oil and microalgae as a source of new natural products (antioxidants, pigments). They group focuses on several challenges related to microalgae production, such as the cost-effective harvesting of microalgae, the development of techniques for the extraction and processing of omega-3 fatty acids from microalgae and the control of contamination of large-scale cultures by pest organisms.

In the scope of the above-mentioned research, the laboratory collaborates intensively with the Agricultural University of Athens (Athens, Greece), IMDEA Energy (Madrid, Spain), National Renewable Energy Laboratories (Golden, USA), Sandia National Laboratories (Albuquerque, USA), University of New South Wales (Sydney, Australia), Korea Institute of Energy Research (Daejeon, South Korea), Universidade Federal de Rio Grande (Brazil) and the Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico).

// Institutional hierarchy

Science and Technology Group

Department Biology

Ecology, Evolution and Biodiversity Conservation Section

// Point of contact

Prof. dr. Filip Volckaert

// Research domain and discipline

Natural sciences: Biological sciences

**Abstract**

The laboratory of Biodiversity and Evolutionary Genomics (LBEG) of the KU Leuven University, formerly known as the laboratory of Animal Diversity and Systematics, was founded in 1986. During its existence, the research focus has shifted from taxonomy and systematics of vertebrates towards the study of biodiversity and evolution of vertebrates.

Currently the laboratory leads and participates in research projects with a focus on the interface between ecology and evolution. Specific topics include the genetic structure of fish populations, connectivity, the co-evolution between fish hosts and parasites, the tracing and identification of fish, the effects of phenotypic plasticity of adaptation and selection, the sustainable management of the North Sea and the impact of anthropogenic activities on fish populations, with a specific focus on pollutants as a selective agent. Geographically, research is performed in the European seas and the Southern Ocean. LBEG participates in a broad portfolio of European and national projects and cooperates closely with the University of Padova, University of Santiago de Compostella, DTU-Aqua, Max Planck Institute for Evolutionary Biology, IMARES and Ifremer.

The marine topics studied at LBEG are:

- Phylogeography and historical genetics;
- Connectivity of marine fish;
- Naturally and human-induced adaptation of marine fish;
- Seascape genomics;
- Host-parasite co-evolution, with focus on parasitic flatworms;
- Bio-archaeology of fish.

// Institutional hierarchy

Rega Institute

Department of Microbiology and Immunology

// Point of contact

Prof. dr. Jeroen Raes

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Raes lab combines large-scale, next-generation sequencing with novel computational approaches to investigate the functioning and variability of microbial communities. In addition, the lab focuses on the development of computational methods for the analysis of (next-generation) sequence data and the investigation of community properties from metagenomics, metatranscriptomics and meta-metabolomics data, which are applied in a wide range of environments (ocean, soil, etc.).

The marine research of the lab focuses on comparative metagenomics and metatranscriptomics of ocean plankton communities, from viruses to fish larvae. This research is also part of the Bioinformatics and (Eco-)systems Biology lab of VIB.

// Institutional hierarchy

Department of Civil Engineering

// Point of contact

Prof. dr. Jaak Monbaliu

// Research domain and discipline

Engineering and technology; Civil engineering

Natural sciences; Earth sciences



Abstract

The Civil Engineering department of the KU Leuven University hosts a number research section active in marine research:

- Hydraulics section;
- Coastal and Geotechnical Engineering group of the Technology Cluster Construction, Campus Brugge;
- Structural Mechanics section;
- Building materials and Building Technologies section;
- Raymond Lemaire International Centre for Conservation.

Research at the Hydraulics section involves a diversity of marine topics. Hydrodynamics and sediment mechanics are the key words. The laboratory conducts research on the interaction between waves, currents and suspended particles transport (i.e. non-cohesive and cohesive sediments, sand-mud mixtures and microplastics). Research topics include modelling of forces on floating objects such as floating wind turbines, the modelling of tide and storm induced currents, the modelling of sediment transport processes, i.e. particle-turbulence interactions, settling and flocculation, erosion, dynamic behaviour (self-weight consolidation and fluidisation by waves) of cohesive sediment soils and mud rheology, and the prediction of morphological changes in estuaries and along coasts. Within this context, remote sensing observations play an important role. Furthermore, the researchers focus on the possible effects of climate change on the various functions of coasts and estuarine areas. The emphasis lies on changes in the boundary conditions (waves and storm surges) and the possible consequences (for instance inundations). The laboratory is actively involved in national and international research projects. It also participates in the nautical bottom research of the Maritime Access division and Flanders Hydraulics Research.

The Coastal and Geotechnical Engineering group at Campus Brugge focuses on the interaction between water, soil and coastal or water bound structures. Examples are assessments on morphological changes at the coast; monitoring and modelling of aeolian sand transport; numerical simulation tools in coastal and hydraulics engineering including numerical modelling of wave energy converters in the near and far field for offshore energy; and cyclic loading of foundations. Together with the Hydraulics section, this group is partner in the Coastal and Ocean Basin (COB) at the Greenbridge site in Ostend.

Research in the Structural Mechanics section of KU Leuven is concentrating on the dynamic analysis of structures excited by wind, earthquakes, traffic, building activities and machinery. The methodologies and numerical techniques developed at the Structural Mechanics section have a broad range of applicability, for example, vibration monitoring techniques have been applied to near- and offshore structures (wind turbines, lock doors, etc.) where the estimation of wind and wave loads forms a crucial aspect in the design and construction of these structures.

Research at the Building Materials and Building Technologies section is dealing with the durability and sustainability of construction materials, including salt loaded materials in coastal environments and with the potential use of secondary raw materials derived from coastal or river materials. Example of the latter is the (patented) development of supplementary cementitious materials from sludge from the Scheldt River.

The Raymond Lemaire International Centre for Conservation (RLICC), jointly supported by the Civil Engineering Department and the Department of Architecture, is active in the field of coastal cultural heritage. Research is dealing with the alignment of coastal policies with cultural heritage based on the understanding that cultural heritage is a resource for (local) sustainable development in line with the 'Cultural Heritage Counts for Europe report'.

/ Division ESAT - Electrical Energy and Computer Architectures

www.esat.kuleuven.be/electa

// Institutional hierarchy

Science, Engineering and Technology Group

Department of Electrical Engineering (ESAT)

// Point of contact

Prof. dr. Ronnie Belmans

// Research domain and discipline

Engineering and technological sciences; Electric and electronic engineering



Abstract

The research of the ESAT-ELECTA division of the KU Leuven University covers a broad spectrum of electrical energy systems and the robust control of electrotechnical systems. More specifically, this group concentrates on the study of power systems, power quality, power electronics, information infrastructure and socio-economic issues. In this regard, the development of a future smart grid is a key objective.

The marine research component of this group concerns the techno-economic aspects of the energy production by offshore wind mills. In the future, ESAT-ELECTA will also focus on the following topics: expansion of offshore electricity networks, exploiting offshore electricity systems, coupling offshore networks to onshore networks and lastly, the storage of energy offshore.

Together with the Flemish Institute for Technological Research (VITO) and the Interuniversity Microelectronics Centre (IMEC), ELECTA is a co-founder of EnergyVille, a knowledge center which carries out research regarding renewable energy. The research group participates in several projects, including the Nemo Link project (electricity connection between Belgium and the United Kingdom).

// Institutional Hierarchy

Science, Engineering and Technology Group

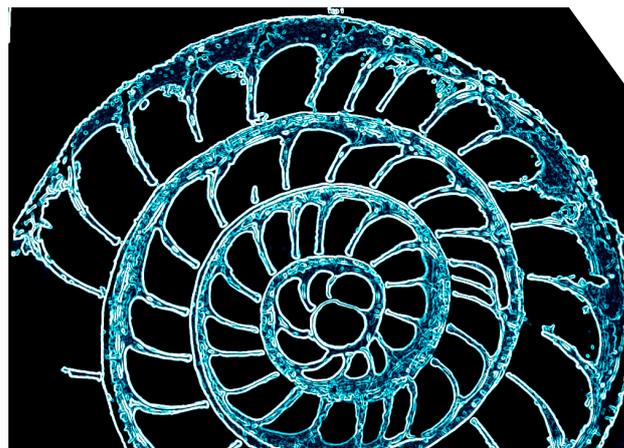
Department of Earth and Environmental Sciences

// Point of contact

Prof. dr. Robert Speijer

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The division of Geology of the KU Leuven University studies a wide range of earth science topics such as applied geology, archaeometry and geoarchaeology, continental tectonics, hydrogeology, igneous petrology, biogeology and palaeoclimatology, geodynamics and geofluids, sedimentology and applied mineralogy. Within the context of marine research, the group has expertise in marine micropalaeontology and marine carbonates.

// Institutional hierarchy

Science and Technology Group
Kulak Kortrijk Campus

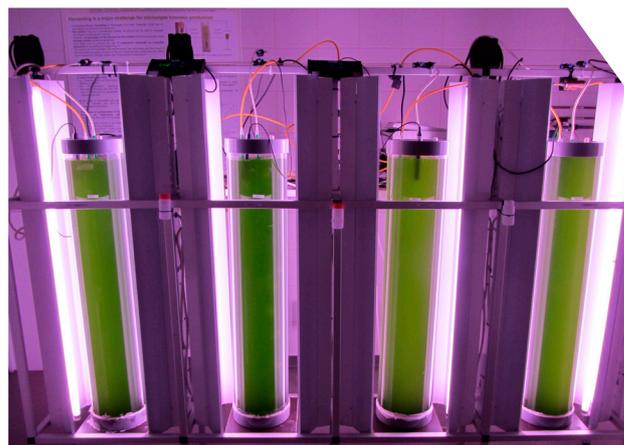
Department of Microbial and Molecular Systems

// Point of contact

Prof. dr. Imogen Foubert

// Research domain and discipline

Engineering and technology; Biotechnology
Natural sciences; Biological sciences



Abstract

The laboratory Food and Lipids concentrates its research on the lipid (fat) fraction of foodstuffs. On the one hand, lipids are often under pressure from a health-conscious point of view but on the other hand they are essential for the sensory (e.g. taste), nutritional (e.g. essential fatty acids, fat soluble vitamins) and technological (e.g. spreadability) properties of fat-rich food products. The mission of the laboratory is thus to conduct research facilitating the production of healthy/ier fat-rich food products without compromising the taste or the technological functionality.

The marine research of the laboratory is related to autotrophic microalgae as new sources of nutritionally-interesting lipids. The current focus is on the long-chain omega-3 fatty acids EPA and DHA, although work is also done on (phyto)sterols, carotenoids and other lipid-soluble antioxidants. The research investigates the possibilities of the microalgae (from a composition point of view) and how they can be applied in foodstuffs and nutraceuticals (downstream processing). Work is being done on drying, cell disruption, extraction and incorporation of biomass and oil in foodstuffs (e.g. in fruit and vegetable-based products and in eggs of laying hens fed with microalgae).

// Institutional hierarchy

Science and Technology Group

Department of Chemical Engineering

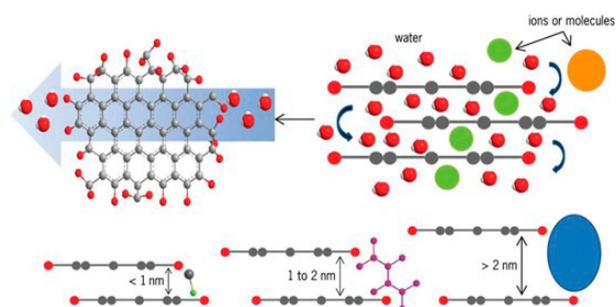
// Point of contact

Prof. dr. ir. Bart Van der Bruggen

// Research domain and discipline

Engineering and technology; Other engineering and technology

Natural sciences; Chemical sciences



Abstract

The ProcESS section is dedicated to contribute to sustainable chemical processing by developing intensified and integrated flow sheets, using continuous reactors and separators with alternative energy forms.

The marine aspect is situated in the research in membrane technology which focuses on the development and application of separation processes in aqueous and non-aqueous solutions. This *inter alia* concerns seawater desalination and the restoration of saline soil due to seawater intrusion.

// Institutional hierarchy

Science and Technology Group

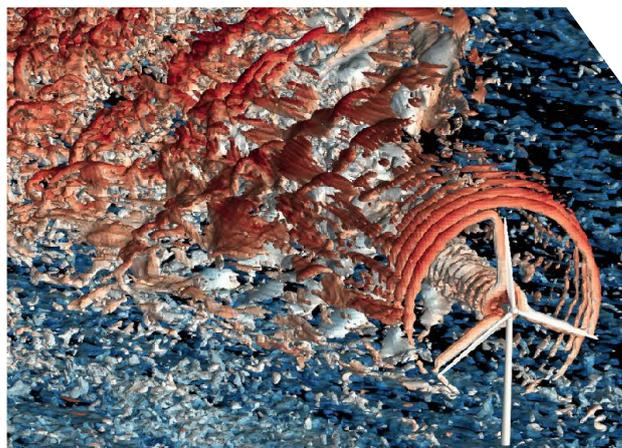
Department of Mechanical Engineering

// Point of contact

Prof. dr. ir. Johan Meyers

// Research domain and discipline

Engineering and technology; Mechanical engineering



Abstract

Within the division of Applied Mechanics and Energy Conversion (TME), several research groups are active:

- Thermal and Fluids Engineering;
- Energy and Environment;
- Simulation of Thermal Systems;
- Turbulent Flow Simulation and Optimization.

This last group focuses on the simulation, optimisation, and optimal control of turbulent flows and *inter alia* applies this research on flows in (offshore) wind farms.

// Institutional hierarchy

Biomedical Sciences Group

Department of Pharmaceutical and Pharmacological Sciences

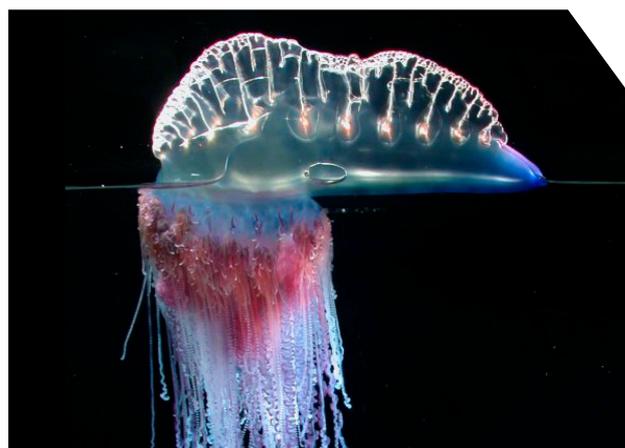
// Point of contact

Prof. dr. Jan Tytgat

// Research domain and discipline

Engineering and technology; Biotechnology

Medical and health sciences; Medical and health sciences



Abstract

The laboratory for Toxicology and Pharmacology of the KU Leuven University conducts research on substances foreign to the body (among which toxins) and studies the safety aspects and the composition of foodstuffs. At the request of the Belgian Court of Justice, the laboratory also performs forensic toxicological analyses and conducts research on biological samples (including post mortem) and confiscated products.

With regard to marine research, the laboratory focuses on the discovery and characterisation of toxins (peptides and small organic molecules) present in poison glands or organs of marine species such as jellyfish, sea anemones and *Conus* snails. The research group aims to further concentrate on this topic in the future. Within this context, the main challenge is to combine *state-of-the-art* analytical techniques (for example chromatography, mass spectrometry and sequencing) in order to link proteomics with transcriptomics and functional studies (using electrophysiological assay with voltage clamp on cloned ion channels and receptors).

The laboratory for Toxicology and Pharmacology also participated in the MAREX-project (2010-2014 - EU FP7) on exploring marine resources for bioactive compounds.

Ghent University Association

// Aqua UGent Cluster

// EnerGhentIC Cluster

// Marine@UGent Cluster

// Faculty of Bioscience Engineering

- Research group Agro-food Marketing and Consumer Behavior
- Laboratory of Aquaculture and Artemia Reference Center
- BIOMATH
- Laboratory of Food Microbiology and Food Preservation
- Center for Microbial Ecology and Technology
- Laboratory of Environmental Toxicology and Aquatic Ecology
- Environmental Organic Chemistry and Technology
- Particle and Interfacial Technology group
- Laboratory of Plant Ecology
- Research group Soil Spatial Inventory Techniques
- Research group Thermochemical Conversion of Biomass

// Faculty of Veterinary Medicine

- Laboratory of Chemical Analysis
- Department of Morphology
- Department Pathology, Bacteriology and Poultry Diseases
- Laboratory of Virology

// Faculty of Medicine and Health Sciences

- Department of Movement and Sport Sciences
- Research group Nutrition and Food Safety

// Faculty of Engineering and Architecture

- Hydraulics laboratory
- Magnel laboratory for Concrete Research
- Maritime Technology division
- Department of Materials, Textiles and Chemical Engineering
- Center for Mobility and Spatial Planning
- Soete Laboratory
- Coastal Engineering, Bridges and Roads unit

// Faculty of Arts and Philosophy

- Department of Archaeology
- Research group Economy, Ecology and Demography

// Faculty of Law and Criminology

- Maritime Institute

// Faculty of Sciences

- Atomic and Mass Spectrometry research group
- Cartography and GIS - 3D Data Acquisition research group
- Research group Evolutionary Morphology of Vertebrates
- Research group Evolutionary Developmental Biology
- Phycology research group
- Marine Biology research group
- Laboratory of Microbiology
- Nematology research unit
- Research unit Palaeontology and Palaeo-environment
- Department of Plant Systems Biology
- Laboratory of Protistology and Aquatic Ecology
- Renard Centre of Marine Geology
- Terrestrial Ecology research group
- Laboratory for Applied Geology and Hydrogeology

// Point of Contact

Dr. Margriet Drouillon

// Number of partners

10



Abstract

Aqua UGent is one of the IOF Business Development Centers of Ghent University and groups top scientists that are active in different aspects of sustainable aquaculture and blue growth. The consortium groups six research groups (150 scientists) from three faculties (Bioscience Engineering; Veterinary Medicine; Pharmaceutical Sciences; Sciences).

Aqua UGent is one of the world's leading centers of excellence for sustainable aquaculture. It provides multidisciplinary expertise and innovations in the areas of hatchery management, genomics and breeding, microbial management, health management, environmental monitoring and aquaculture business management.

Aqua UGent functions as a direct interface between its members and companies, government institutions, consumer and professional organisations. It identifies and initiates multidisciplinary research projects that can benefit the industry and/or society. Aqua UGent actively monitors new research findings for the benefit of the entire value chain of the aquaculture industry and provides interdisciplinary scientific and technological expertise, innovations, training and advice to its partners.



Partners

Faculty of Bioscience Engineering

- Laboratory of Aquaculture and Artemia Reference Center
- Laboratory of Environmental Toxicology and Aquatic Ecology
- Laboratory for Immunology and Animal Biotechnology*
- Center for Microbial Ecology and Technology
- Research group Environmental Organic Chemistry and Technology

Faculty of Veterinary Medicine

- Department of Morphology
- Laboratory of Virology

Faculty of Pharmaceutical Sciences

- Laboratory of Pharmaceutical Microbiology*

Faculty of Sciences

- Marine Biology research group
- Research group Evolutionary Morphology of Vertebrates

*No marine research group

// Point of contact

Dr. Siegfried Segers

// Number of partners

11 (topic offshore energy)



Abstract

EnerGhentIC is the interdisciplinary community of Ghent University researchers working on the energy challenge. The three main activities include:

- Research and valorisation, i.e. from fundamental research to applied research with industry;
- Education and training, i.e. from master student programs and projects to life-long training for industry professionals;
- Supporting and stimulating the energy transition, supporting the societal energy challenge including awareness creation.

The challenges related to the energy require a multidisciplinary approach. Therefore, EnerGhentIC groups researchers from different faculties across Ghent University (Engineering and Architecture, Bioscience Engineering, Economics and Business Administration, Law and Criminology, Political and Social Sciences). The three major topics tackled by the EnerGhentIC community are 'Energy Efficiency', 'Renewables' and 'Energy Systems'. Within the topic 'Renewables', researchers are active in offshore wind and ocean energy (wave and tidal energy) in a broad sense.

With regard to the broader context of Blue Growth, EnerGhentIC actively contributes to Marine@UGent and the GOBlue Initiative.

Through EnerGhentIC you can get in contact with researchers from Ghent University working on the following topics in offshore energy:

- Technical research
 - Small to large, on- and offshore, wind turbines (holistic approach);
 - Finite Element Modelling (FEM) of blades and blade monitoring (wind and tidal);
 - Fluid-structure interaction (FSI) blade modelling (wind and tidal);
 - Design of energy efficient electromechanical drive trains and their condition monitoring (wind, wave and tidal);
 - Providing ancillary services to the grid with wind turbine parks;
 - PTO (Power-take-off) design, simulation and grid interaction (emulator – test benches for wave, tidal and wind);
 - Tidal energy drive trains;
 - Energy resource analysis (wave and tidal)
 - Hydrodynamic scale model testing (Coastal and Ocean Basin);
 - Wave energy converter (WEC) concepts;
 - Floating body behavior (wind, wave, tidal, floating PV);
 - Wave impact on structures, including fluid structure interaction (FSI);
 - Farm wake effects (simulation and scale testing for wave and tidal);
 - Offshore geotechnics;
 - Scour protection of offshore foundations (monopiles);
 - Condition Monitoring System (CMS) of drive trains and drive train components (such as bearings) and power curve anomaly detection, multi-sensor CMS;
 - Corrosion of metals, fatigue of composites and metals;
 - Dynamic dashboarding;
 - Hydrodynamics of vessels and marine propulsion;
 - Alternative drive trains for marine transport (e.g. methanol, hydrogen, etc.) incl. bottom cycling.



Abstract (continuation) and partners (topic offshore energy)

- Non-technical research
 - Energy and climate economics, economics of climate policy, electricity markets and the energy transition;
 - Energy security and international politics, global governance and international institutions;
 - Energy law;
 - Environmental analysis (Life Cycle Analysis - LCA), environmental technologies and clean technology.

To this end EnerGhentIC comprises a number of explicit partners (see below), as well does it collaborate with other initiatives at Ghent University on the topic of offshore energy. EnerGhentIC also partners with others being e.g. a founding father of the Innovative Business Network Offshore Energy (IBN-OE).

Faculty of Bioscience Engineering

- Research group Environmental Organic Chemistry and Technology

Faculty of Economics and Business Administration

- Centre for Environmental Economics and Environmental Management*

Faculty of Engineering and Architecture

- Research group Transport Technology*
- Internet and Data Lab*
- Electrical Energy Lab*
- Dynamical Systems and Controls research group*
- Mechanics of Materials and Structures research group*
- Maritime Technology Division
- Coastal Engineering, Bridges and Roads unit

Faculty of Political and Social Sciences

- Ghent Institute for International Studies*

Faculty of Law and Criminology

- Centre for Environmental and Energy Law*

*No marine research group

// Point of contact

Prof. dr. Colin Janssen (scientific coordinator, head)

Dr. Noémie Wouters (liaison officer)

// Number of partners

70



Abstract and partners

Ghent University has a long-standing and internationally recognised expertise in fundamental and applied research in the fields of marine and maritime sciences and technology. In 2012, Ghent University founded the Marine@UGent consortium which aims to promote and facilitate collaboration between the approximately 70 marine-oriented research groups of the UGent Association as well as with Flanders Marine Institute (VLIZ) and other national and international partners. Marine@UGent members, spanning ten faculties, conduct research in disciplines ranging from biological sciences, aquaculture, pollution and food sciences to maritime law, marine energy and coastal and marine spatial planning and engineering. During the past decade, UGent Association marine/maritime research efforts resulted an average of 209 peer-reviewed publications per year (2008-2015).

During the past two years, Marine@UGent has developed a clear R&D Blue Growth strategy, i.e. the GOBlue Initiative, aiming to enhance its interactions and collaborations with the marine/maritime industry. In this context, UGent is now developing focused research in its incubator Greenbridge and Science Park@Campus Ostend.

Faculty of Bioscience Engineering

- Research group Agro-food Marketing and Consumer Behavior
- Laboratory of Agrozoology*
- Laboratory of Aquaculture and Artemie Reference Center
- Laboratory of Biochemistry and Glycobiology*
- BIOMATH
- Laboratory for Animal Nutrition and Animal Product Quality*
- Centre for Industrial Biotechnology and Biocatalysis*
- Laboratory of Industrial Water and Ecotechnology*
- Isotope Bioscience laboratory*
- Research unit Knowledge-based systems*
- Laboratory of Food Microbiology and Food Preservation
- Center for Microbial Ecology and Technology
- Laboratory for Environmental Toxicology and Aquatic Ecology
- Research group Environmental Chemistry and Technology

- Particle and Interfacial Technology group
- Laboratory of Plant Ecology
- Research group on Spatial Inventory Techniques

Faculty of Veterinary Medicine

- Laboratory of Chemical Analysis
- Department of Pharmacology, Toxicology and Biochemistry*
- Department of Veterinary Medical Imaging and Small Animal Orthopaedics*
- Department of Morphology
- Department of Pathology, Bacteriology and Poultry Diseases
- Department of Obstetrics, Reproduction and Herd Health*
- Laboratory of Virology
- Department of Nutrition, Genetics and Ethology*

Faculty of Economics and Business Administration

- Department of Innovation, Entrepreneurship and Service Management*
- SHERPPA (Study Hive for Economic Research and Public Policy Analysis)*



Partners (continuation)

Faculty of Pharmaceutical Sciences

- Laboratory of General Biochemistry and Physical Pharmacy*
- Laboratory of Pharmaceutical Biotechnology*
- Laboratory of Pharmaceutical Microbiology*
- Laboratory of Pharmaceutical Technology*
- Laboratory of Drug Quality and Registration*

Faculty of Medicine and Health Sciences

- Department of Movement and Sport Sciences
- Department of Clinical Chemistry, Microbiology and Immunology*
- Department of Basic Medical Sciences*
- Research group Nutrition and Food Safety

Faculty of Engineering and Architecture

- Hydraulics laboratory
- Magnel laboratory for Concrete Research
- Department of Materials, Textiles and Chemical Engineering
- Maritime Technology division
- Center for Mobility and Spatial Planning
- Plasmatechnology research group*
- Soete laboratory
- WAVES research group*
- Coastal Engineering, Bridges and Roads unit

Faculty of Arts and Philosophy

- Department of Archaeology
- Research group Economy, Ecology and Demography

Faculty of Law and Criminology

- Maritime Institute

Faculty of Sciences

- Atomic and Mass Spectrometry research group
- Department of Biomedical Molecular Biology*
- Zoology Museum*
- Research group Evolutionary Morphology of Vertebrates
- Research group Evolutionary Developmental Biology
- Phycology research group
- Cartography and GIS - 3D Data Acquisition research group
- Limnology research unit*
- Marine Biology research group
- Laboratory of Microbiology
- Nematology research unit
- Research unit Palaeontology and Palaeoenvironments
- VIB-UGent - Center for Plant Systems Biology
- Laboratory of Protistology and Aquatic Ecology
- Renard Centre of Marine Geology
- Terrestrial Ecology research group
- Laboratory for Applied Geology and Hydrogeology
- Department of Applied Mathematics, Computer Science and Statistics*
- Laboratory of Aging Physiology and Molecular Evolution*
- X-ray Microspectroscopy and Imaging Group*
- Centre for X-ray Tomography*

HoGent

- Department of Biosciences and Food Sciences*

*No marine research group

/ Research group **Agro-food Marketing and Consumer Behavior**

www.ugent.be/bw/agricultural-economics/en/research

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Agricultural Economics

// Point of contact

Prof. dr. ir. Wim Verbeke

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences



Abstract

The research group Agro-food Marketing and Consumer Behavior of the Agricultural Economics department (Ghent University) was founded in 2001 and focuses on the marketing challenges associated with agriculture production and its resulting agricultural and food products in Belgium, Europe and abroad. Within this context, consumer behaviour is always the starting point. Furthermore, the laboratory deals with research questions regarding the role and impact of personal, product and environmental factors (such as communication and labelling) on the opinions, perceptions, attitudes and choices of consumers.

The focus on consumer behaviour, with respect to fish and fishery products, is a result of the cooperation within the EU Sixth Framework (FP6) Project SEAFOODplus (2004-2008). Subsequently, the research group focused on the consumer perception of fish and fisheries products, the impact of communication and labelling, and the balance between health, safety, sustainability and price from the consumers' point of view. The research topics can be summarised as follows:

- Consumer acceptance of technological innovation in the food chain;
- Trends and changes in food choices;
- Impact of ethical and sustainability considerations of consumers and citizens;
- Impact of communication and labelling on the food choice;
- Perception of safety, health and sustainability of food and food production.

The research group participated in several European research consortia (FP6 and FP7) dealing with consumer behaviour with respect to food and collaborates intensively with Norwegian (NOFIMA and University of Tromsø) and Danish (Aarhus University and DTU) institutes.

/ Laboratory of Aquaculture and Artemia Reference Center

www.aquaculture.ugent.be

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Animal Production

// Point of contact

Prof. dr. Peter Bossier

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences



Abstract

The laboratory of Aquaculture and Artemia Reference Center, so called since 1989, was founded in 1978 under its former name Artemia Reference Center (ARC). Since its establishment, the laboratory has been involved in research on larviculture of fish and shellfish species of aquaculture interest. Initially, the research mainly focused on the universally-used brine shrimp *Artemia* as a vital food source for fish and shellfish larvae. Research topics encompass: brine shrimp culturing biology, natural occurrences, production techniques, strain characterisation as well as nutritional value and enrichment. Gradually, research activities extended to other live food organisms, such as microalgae and rotifers, i.e. particularly their production and nutritional manipulation, with emphasis on lipids and vitamins C and E. Meanwhile, the worldwide industrialisation of larviculture increased the demand for thorough research on the zootechnical, microbiological and immunological aspects of larviculture. Therefore, the ARC engaged in a multidisciplinary collaboration effort with specialists from different research institutes, local and foreign, in the framework of nationally and internationally funded Research and Development (R&D) projects. The laboratory is the coordinator of the UGent Aquaculture R&D consortium and the IOF consortium Aquaculture Ghent University (Aqua UGent).

// Institutional hierarchy

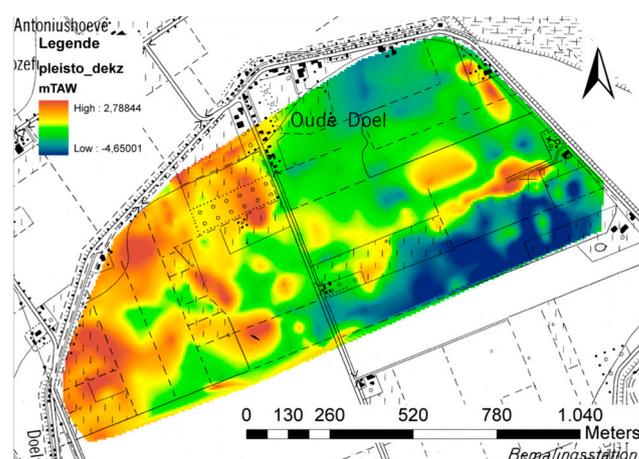
Faculty of Arts and Philosophy

// Point of contact

Prof. dr. Philippe Crombé

// Research domain and discipline

Humanities; History and archaeology



Abstract

The department of Archaeology of Ghent University is composed out of five research units which perform archaeological research with a focus on different time periods.

For the prehistory and medieval historical periods, several research topics with a specific focus on the coastal area are studied. It concerns the following themes:

- An archaeological survey of the land-sea transition zone at Doelpolder Noord: impact of sea level rises on the palaeolandscape and human occupation from Prehistory to the Middle Ages;
- Long distance raw material distribution in the Mesolithic of the southern North Sea basin;
- The late medieval and early post-medieval settlement of Middelburg (Flanders);
- Medieval Bruges and its associated ports. A landscape-archaeological approach to the Zwin-debate;
- A multidisciplinary investigation of the consumption of ceramics in the Zwin-Scheldt estuaries during the 15th - 18th centuries AD.

/ Atomic and Mass Spectrometry research group

www.analchem.ugent.be/A&MS/index.php

// Institutional hierarchy

Faculty of Sciences

Department of Chemistry

// Point of contact

Prof. dr. Frank Vanhaecke

// Research domain and discipline

Natural sciences; Chemical sciences



Abstract

The A&MS group is specialised in the development of methods for the determination, elemental speciation and isotopic analysis of (trace) metals and metalloids via ICP-mass spectrometry and the application of these methods in interdisciplinary contexts.

The marine aspect of the research concerns the study (quantification, characterisation, isotopic analysis) of components in the marine environment, such as high-precision isotopic analysis of Hg for assessing pollution around a WWII submarine wreck or for unraveling the Hg metabolism in marine mammals, Chlorine and Bromine isotope ratio measurements in seawater, etc.

// Institutional hierarchy

Faculty of Medicine and Health Sciences

// Point of contact

Prof. dr. Jan Bourgois

// Research domain and discipline

Medical and health sciences; Medical and health sciences



Abstract

The department of Movement and Sport Sciences of Ghent University focuses on the following research lines: kinesiology, exercise physiology and training, sport management, physical activity, fitness and health and didactics of physical education.

The marine research (research group Exercise and Environmental Physiology) focuses on the physiology and epidemiology of injury in watersports such as rowing, sailing and kitesurfing, as well as on ocean environmental effects (cold water, waves, wind, etc.) on human physiology (thermoregulatory responses) and safety at sea and on the beach (drowning, resuscitation, lifeguarding).

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Data Analysis and Mathematical Modelling

// Point of contact

Prof. dr. ir. Ingmar Nopens

// Research domain and discipline

Engineering and technology; Biotechnology

Natural sciences; Biological sciences

Natural sciences; Mathematics



Abstract

BIOMATH develops and applies mathematical models and methodologies for the analysis and optimisation of bio-processes.

Research topics related to the marine field:

- Fundamental relations between spatiotemporal fish behaviour and hydraulic conditions in anthropogenically impacted streams (e.g. European eel (*Anguilla anguilla*) and Atlantic salmon (*Salmo salar*));
- Membrane modelling (in context of desalination of seawater);
- Kinetic modelling of micro-algae.

/ Cartography and GIS - 3D Data Acquisition research group

<http://geoweb.ugent.be/research-units/cartogis>
<http://geoweb.ugent.be/research-units/3dda>

// Institutional hierarchy

Faculty of Sciences

Department of Geography

// Point of contact

Prof. dr. Philippe De Maeyer

// Research domain and discipline

Engineering and technology; Geomatics

Engineering and technology; Other engineering and technology



Abstract

The Geomatics division of Ghent University is a cooperation of the research groups 'Cartography and GIS' and '3D Data Acquisition'. The Cartography and GIS research group performs both fundamental and applied research on several aspects of cartography and geographical information sciences, applied to marine and coastal research. The emphasis lies on flood risk and effect calculations and the development of cross-domain data models. The 3D Data Acquisition research group performs research in coastal engineering, ocean modelling, gravimetric data processing and morphological modelling of coastal zones using state-of-the art technology.

The group participates in national and European research projects and collaborates intensively with Flanders Hydraulics Research, Flanders Marine Institute (VLIZ), Antwerp Maritime Academy, École Nationale Supérieure de Techniques Avancées Bretagne (ENSTA, Brest) and HafenCity Hamburg (HCU).

// Institutional hierarchy

Faculty of Veterinary Medicine

Department of Veterinary Public Health and Food Safety

// Point of contact

Prof. dr. ir. Lynn Vanhaecke

// Research domain and discipline

Agricultural and veterinary sciences; Veterinary sciences

Natural sciences; Chemical sciences



Abstract

The laboratory of Chemical Analysis (LCA) of Ghent University was founded in 1992. LCA belongs to the department of Veterinary Public Health and Food Safety and has over 40 years of experience in the detection of residues and contaminants in matrices of animal origin (BELAC accredited under ISO 17025). Based on this elaborate experience, LCA aims to use the most recent, accurate and sensitive analytical methodology to detect, quantify or identify known and unknown residues, contaminants including micropollutants or food components as well as derivatives or metabolites hereof, within a variety of matrices of animal (or vegetable) origin to ensure food safety and quality. This vision is also reflected in the current and future ongoing research projects.

Part of the scientific research performed by LCA is related to the marine or estuarine environment:

- Analysis of micropollutants in the Belgian coastal zone;
- Food safety of seafood;
- The determination of endocrine disruption in the Scheldt Estuary;
- Metabolism and transfer of marine algal toxins to molluscs and the environment.

In the future, the group will continue to develop methods for multi-residue and multi-contaminant analysis of water and biota monsters, using high-resolution mass spectrometry (MS). This analysis will include emerging pollutants such as pharmaceuticals, phthalates, PFCs, phenols, hormones, antibiotics, etc. LCA will also elaborate on the analytical aspects associated with research on marine toxins. The metabolomics-approach, which is already used in several other research areas within the lab, will also serve as a basis for innovative research.

Taking into account the low concentrations of the components to be analysed (ppt or ppb) and the complexity of the matrices, high-tech equipment is required. For this purpose, the laboratory uses 1 LC-MSn and 1 U-HPLC-QqQ-MS/MS which enable the identification and quantification of components and their residues and/or metabolites in complex matrices. Besides that, LCA also has 3 high-resolution apparatus: 1 U-HPLC-Orbitrap-MS, 1 U-HPLC-(Q)-Orbitrap-MS and 1 REIMS-Q-ToF, which allow for multi-component screening, biomarker and metabolome studies. Furthermore, LCA participates in several national projects and collaborates intensively with the laboratory of Environmental Toxicology and Aquatic Ecology (UGent) and the Operational Directorate Natural Environment of the Royal Belgian Institute of Natural Sciences (RBINS).

// Institutional hierarchy

Faculty of Arts and Philosophy

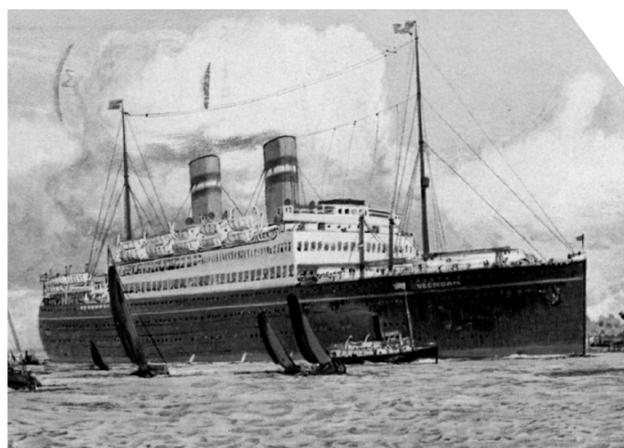
History Department

// Point of contact

Prof. dr. Erik Thoen

// Research domain and discipline

Humanities; History and archaeology

**Abstract**

The research group Economy, Ecology and Demography (EED) of Ghent University was founded in 1995. The group studies a large number of different aspects relating to economic, ecological and demographic history. Starting with a socio-economical approach, this research unit covers sub-areas closely linked to the study of demographic structures, material culture, agrarian technologies and changes in ecology and landscape.

The group focuses on the following marine topics:

- Historic geography of coastal landscapes;
- History of the social environment in coastal landscapes of Belgium and the Netherlands;
- Demographic history in coastal areas (such as malaria in the Flemish coastal area);
- History of maritime relationships in the development of a global economy;
- The study of maritime migration during the period 1882-1938.

From now on, the group will focus even more than before on the historic landscape and environment of the coastal area and the hinterland, in which social factors play an important role.

In the academic year 2011-2012, the Francqui-Leerstool was assigned to Prof. dr. Erik Thoen. EED is part of the international interuniversity research group CORN (Comparative Rural History of the North Sea Area) and collaborates intensively with the centre for Urban History (University of Antwerp), the interfaculty centre for Agrarian History (KU Leuven University), the research institute for History and Culture (University of Utrecht) and the institute of Early Modern History (Ghent University).

// Institutional hierarchy

Faculty of Sciences

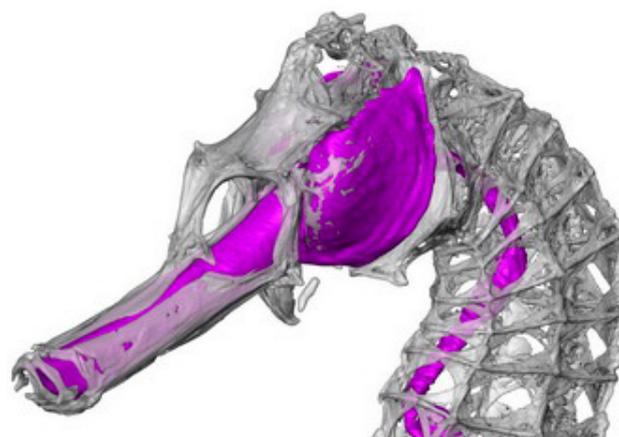
Biology Department

// Point of contact

Prof. dr. Dominique Adriaens

// Research domain and discipline

Natural sciences; Biological sciences

**Abstract**

The research group Evolutionary Morphology of Vertebrates of Ghent University originates from the laboratory of Zoology, and was founded in 2001. This research group studies the evolutionary morphology of vertebrates, including marine fish. The research topics focus on ontogeny and (abnormal) morphology of marine (and other) fish, both from an evolutionary as applied (aquaculture) context. Projects on marine fish focus on syngnathid fish, European eel, seabass and gilthead sea bream. The group also performs research on the biomimetics and potential use of natural structures in industrial design (such as prehensile tail of seahorses). The group undertook three expeditions to Gabon (1999, 2000 and 2011) to collect fish species from lakes and rivers. They also participated in an expedition to Guyana in 2007 to study the Essequibo and Amazon basin and they organised an expedition to Peru in order to study the fish fauna in Andes Rivers.

The marine research topics studied by this group are:

- Phylogeny and the evolution of the muscles and skeleton of cranial systems in Anguilliformes;
- Effect of physical and nutritional parameters on the development of *Dicentrarchus labrax* larvae in axenic and gnotobiotic environments;
- The application of histology and geometric morphometry in the early detection of opercular malformations in cultivated sea breams (*Sparus aurata*);
- The phenotypical variation in the cranial morphology of the European eel in relation to feeding ecology and pollution;
- PRO-EEL - The propagation of the European eel - towards a self-maintaining aquaculture;
- The evolution and design of the feeding apparatus of seahorses and pipefish (Syngnathidae);
- The study of the seahorse skeleton and its potential use in industrial designs.

In the future, the group will continue to study, among others, the morphological aspects of skeletal malformations in cultivated (aquaculture) fish.

The research group collaborates closely with the laboratory of Aquaculture and Artemia Reference Center, which is the coordinator of the UGent Aquaculture R&D Consortium and the IOF consortium Aquaculture Ghent University (Aqua UGent), in which the research group Evolutionary Morphology of Vertebrates is actively involved. The group is also member of the Marine@UGent consortium. Furthermore, the group collaborates intensively with the Centre for X-ray Tomography (UGent, UGCT) and the Institute for Nature and Forest Research (INBO).

// Institutional hierarchy

Faculty of Sciences

Biology Department

// Point of contact

Prof. dr. Ann Huyseune

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research group Evolutionary Developmental Biology of the Biology Department at Ghent University focuses on the evolutionary developmental biology (evo-devo) of the vertebrate skeleton and dentition. With a tradition in morphology and histology, current research includes molecular, histochemical and cytochemical approaches to unravel the basic processes of vertebrate skeletal development. Naturally, the aim of the conducted research is to relate the features of selected skeletal or dental elements with specific biochemical and molecular events. Finally, the findings are placed in an evolutionary perspective.

The lab is specialised in the analysis of both cartilaginous and bony fish, including widely-used model organisms like the catshark (*Scyliorhinus canicula*), the bichir (*Polypterus senegalus*), the zebrafish (*Danio rerio*) and various species of cichlids (Cichlidae). Moreover, farmed species such as Atlantic salmon (*Salmo salar*) are studied as well. Other studies within the group extend to non-mammalian model organisms such as the clawed frog (*Xenopus*).

The lab has active collaborations and ongoing projects together with leading scientists and institutions in the United States, Canada, Singapore, France, Portugal and Norway.

// **Institutional hierarchy**

Faculty of Sciences

Biology Department

// **Point of contact**

Prof. dr. Olivier De Clerck

// **Research domain and discipline**

Natural sciences; Biological sciences

**Abstract**

The Phycology research group was founded at the end of the 90s under its former name 'laboratory of Morphology, Ecology and Plant Systematics'. The research undertaken by the laboratory has gradually evolved from floristics and descriptive taxonomy towards diversity, biogeography, diversification and developmental biology of marine macroalgae (seaweed). More specifically, the following themes are studied:

- Development and life cycle control of seaweeds: the mechanisms and genetics governing fertility and growth are studied in a number of model organisms (e.g. *Ulva*, *Dictyota*) making use of a combination of genetic and genomics techniques and culture-based experiments;
- Evolutionary dynamics and biogeography: the macroevolutionary studies aim at answering the question regarding the bloom or decline of algal groups. This includes studying the relevant biological, environmental and geological data in a phylogenetic context;
- Bacteria-algae interactions: the study of the identity and the role of prokaryote symbionts of siphonous green algae, in collaboration with the laboratory of Microbiology (Ghent University);
- Spatial and temporal analysis of communities and the variation of species: the acquisition and integration of spatial data in relation to the marine environment and the application to ecological, biogeographical and evolutionary questions (ecological niche modelling, remote sensing of spatial and temporal changes in seaweed communities);
- Taxonomy and diversity: the group has extensive experience in this research domain and remains committed to this discipline, focusing on DNA research and statistical morphometrics;
- Invasive biology: the group uses correlative and mechanistic modelling techniques to predict the spread and eventual range of invasive marine macroalgae. The latter technique makes use of physiological data related to growth under different environmental conditions.

Regarding their future services, the group would like to play a leading role in the management of biodiversity information and taxonomy of seaweeds. Furthermore, the Phycology research group participates in both Belgian and international research projects and collaborates with several research groups worldwide.

// **Institutional hierarchy**

Faculty of Engineering and Architecture

Department of Civil Engineering

// **Point of contact**

Prof. dr. ir. Tom De Mulder

// **Research domain and discipline**

Engineering and technology; Civil engineering

**Abstract**

The Hydraulics laboratory of Ghent University was founded in 1935. The research activities of the laboratory concern the broad field of hydraulics within the civil engineering domain. The group has a special interest for hydraulic structures, hydro- and morphodynamics of rivers and estuaries, and eco-hydraulics. Laboratory and field measurements are intensively used as a basis for the validation of mathematical models.

Regarding coast and estuary related hydraulics, research is performed on the following topics:

- Idealised modelling of tidal hydrodynamics and morphodynamic equilibria of tidal systems;
- Hydro- and morphodynamics of estuaries, rivers and open channel junctions;
- Dynamics of overflow dredging plumes;
- Hydrodynamics and mass transfer between a flow past a lateral embayment;
- Hydraulic design of locks and weirs.

In the future, the laboratory will continue to study the abovementioned topics, in collaboration with Belgian and foreign universities.

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Food Safety and Food Quality

// Point of contact

Prof. dr. ir. Frank Devlieghere

// Research domain and discipline

Natural sciences; Biological sciences

Agricultural and veterinary sciences; Fisheries and aquaculture sciences



Abstract

The laboratory of Food Microbiology and Food Preservation (LFMFP) of Ghent University was founded around 1980. The expertise of the laboratory has gradually expanded since its establishment due to an increasing awareness of the research discipline. The food crises in Belgium and Europe increased the awareness and appreciation of food safety.

The laboratory focuses on studying microbial behaviour in food products during harvesting/slaughtering, fabrication, storage, distribution and preparation. Two essential areas of research are: predictive microbiology and microbial analysis. The group also performs research on mild preservation and decontamination techniques in order to prolong the preservation and to increase the microbial safety of food products. Microbial food safety is a key research theme of the laboratory, with an emphasis on viruses, in for example fish and fishery products. Quality assurance systems are implemented and analysed to ensure microbial food safety and quantitative data are collected for exposure assessment to enable more accurate microbial risk evaluation.

As a consequence of the economic interests, special attention is paid to the mechanisms of microbial decay of food products, such as fish and fishery products.

The marine research of this group focuses on:

- Development of preservation strategies for fish and fishery products;
- Packaging of fish and fishery products;
- Development of intelligent packaging for the indication of decay of packed fish and fishery products;
- Microbial ecology of fishery products (shrimps, cod, etc.);
- Methods to assess the microbial risks in fish and fishery products;
- Viruses in ready-made food, such as shellfish;
- Pangasius processing.

In the future, the laboratory will focus on the further development of certain aspects regarding microbial food safety (detection of food pathogens and viruses), predictive microbiology (quantitative insights into the microbial behaviour of food products) and minimal preservation (new decontamination methods and microbial aspects of food packaging). The group maintains an intense collaboration with the food industry and politics due to the integration of an accredited laboratory (with up-to-date infrastructure) into the laboratory of Food Microbiology and Food Preservation. The laboratory is active within several consortia, such as Food2know, Pack4food and the UGent Aquaculture R&D Consortium.

/ Magnel laboratory for Concrete Research

www.ugent.be/ea/structural-engineering/en/research/magnel

// Institutional hierarchy

Faculty of Engineering and Architecture

Department of Structural Engineering

// Point of contact

Prof. dr. ir. Luc Taerwe

// Research domain and discipline

Engineering and technology; Civil engineering



Abstract

The Magnel laboratory for Concrete Research was founded in 1926 and has a long-standing tradition in the study of a wide variety of aspects related to concrete and cementitious materials. The research focuses on the following topics:

- Structural behaviour of concrete;
- Concrete technology;
- Concrete and environment.

The marine research focuses on concrete durability in aggressive environments. The main topic in this field is the behaviour of concrete when exposed to chlorides and sulphates, mainly in a submerged marine environment. In order to study the marine degradation mechanisms more realistically, the combined attack of chlorides and sulphates is investigated. Furthermore, the influence of mechanical loading on the resistance against chloride penetration is also a research topic.

In addition, the influence of exposure to marine environments on the rebar corrosion process is investigated. A basic experimental characterisation of the concrete in terms of chloride and corrosion resistance should allow for an adequate service life prediction based on commonly-used models such as the one described in DuraCrete or fib Bulletin 34. In this context, specific attention is now being paid to self-healing concrete. Self-healing concrete is perceived as a possible solution to prevent early-age cracking and prolong the service life of concrete structures in marine environments (bridges, tunnels, port infrastructure, etc.).

// Institutional hierarchy

Faculty of Sciences

Biology Department

// Point of contact

Prof. dr. Ann Vanreusel

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The MARBIOL research group performs ecological, taxonomic and phylogeographic research on marine ecosystems and species. Since its foundation, there has been a geographical expansion of the study areas, from the Belgian coast, North Sea and adjacent estuaries to a wider variety of marine habitats, from the tropics to polar systems, including seagrass ecosystems, deep-sea ecosystems such as canyons, cold-water corals, chemo-synthetic-based ecosystems and abyssal plains. At the same time, there has been a significant shift from the initial morphological taxonomic and descriptive ecological studies based on field observations towards process-oriented and functional studies with an experimental, biochemical and molecular approach. The policy-oriented questions regarding sustainable fisheries, deep-sea mining of minerals, marine spatial planning and nature conservation constitute important elements in the valorisation of the fundamental research conducted by the group.

The research mainly focuses on the following topics:

- The study of ecosystems in the deep sea, such as submarine canyons along continental margins, cold-water corals, seeps, hydrothermal vents, polymetallic nodule fields, abyssal plains and the impact of deep-sea mining activities;
- The study of polar offshore and coastal habitats;
- The study of temperate coastal ecosystems (e.g. North Sea and adjacent estuaries), including sandbanks, beaches, seagrass beds and tidal marshes (biodiversity, ecosystem functioning, etc.);
- Marine benthic foodwebs and biogeochemical fluxes;
- Effects of environmental changes and stressors (incl. pollution) on behaviour and physiology of benthic invertebrates and fish, trophic interactions, functional responses traced by trophic biomarkers;
- Foodweb ecology with aquaculture applications;
- Constructing biodiversity databases for ecological modelling and marine spatial planning;
- Taxonomic research and barcoding of marine organisms: a.o. Nematoda and Copepoda (harpacticoid copepods);
- Population genetics and habitat connectivity;
- Evolutionary ecology of marine nematodes and other key marine species;
- Fish migration, behaviour and habitat use;
- Sustainable human use of the coast and sea: marine protected areas, human impact on nature and environment (e.g. beach suppletion, aggregate extraction, contaminants, offshore wind farms, fisheries, etc.);
- Marine spatial planning and nature conservation;
- Invasive species;
- Ecological modelling / habitat mapping.

In the future, the group will further focus on the impact of disturbances (including global climate change) on coastal, deep-sea and polar ecosystems, the importance of biodiversity for marine ecosystem functioning, and ecosystem-based fisheries and its impact on benthic communities.

The MARBIOL yearly trains dozens of master and PhD students in marine sciences (cf. Erasmus mundus IMBRSea, interuniversity MSc programme Oceans and Lakes MARES educational networks). The six main topics are (1) Future oceans: temperature changes – hypoxia – acidification; (2) Understanding biodiversity effects on the functioning of marine ecosystems; (3) Biological invasions; (4) Natural and mineral resources: mining impact, overexploitation, fisheries and aquaculture; (5) Noise pollution in oceans; (6) Habitat loss, urban development, coastal infrastructures and marine spatial planning. The MARBIOL participates in numerous national and international research projects. MARBIOL coordinates the Belgian node of the EMBRC-ERIC, a pan-European Research Infrastructure for marine biology and ecology research.

// Institutional hierarchy

Faculty of Law and Criminology

Department of European, Public and International Public Law

// Point of contact

Prof. dr. Frank Maes

// Research domain and discipline

Social sciences; Law and legal studies

Social sciences; Economics and business

Social sciences; Political sciences and policy



Abstract

The Maritime Institute of Ghent University was founded in 1986. The roots of the institute lie within the Faculty of Law. Its main research topics are: international law of the sea, international and European environmental law and biodiversity law, sustainable management of the North Sea, marine protected areas, marine spatial planning and integrated coastal zone management. Within the scope of environmental law, particular attention is paid to the pollution from ships, marine nature protection, the law with regard to fresh-water bodies as well as climate change. Since 2015 focus is also on ports and shipping economics. The conducted research often has a multidisciplinary nature due to the collaboration with other research groups of Ghent University (marine biologists, bio-engineers, marine geographers, environmental economists) or other European research groups. The Maritime Institute is also a partner in the Centre for Environmental and Energy Law of Ghent University.

The members of the Maritime Institute have, within their field of expertise, extensive lecturing experience on Master level and on Master after Master level in various faculties of Ghent University (Law, Political Sciences, Sciences, Bioscience Engineering). The Maritime Institute coordinates the Msc in Maritime Sciences and the Permanent Training in Port Management. In addition, the institute organises an annual thematic Maritime Symposium.

A key moment for the institute was winning the Award 'Rudi Verheyen' in 2004. The research team, led by Prof. Maes and Prof. Lavrysen, won the price thanks to their preliminary research that led to the drafting of the decree on integrated water policy and the accompanying Explanatory Memorandum. The most successful project was GAUFRE on marine spatial planning. The concept and the need to plan activities at sea introduced by GAUFRE has been taken up by UNESCO and the EU, and becomes a wide spread practice in the world.

In the future, the Maritime Institute will further focus on topics such as marine biodiversity, marine spatial planning, climate change law and its effects on the sea, offshore renewable energy, international law of the sea, marine protected areas and protection of underwater culture heritage. The institute is internationally renowned for its participation in European and national projects, as well as for their cooperation with many European research institutes.

// Institutional hierarchy

Faculty of Engineering and Architecture

Department of Civil Engineering

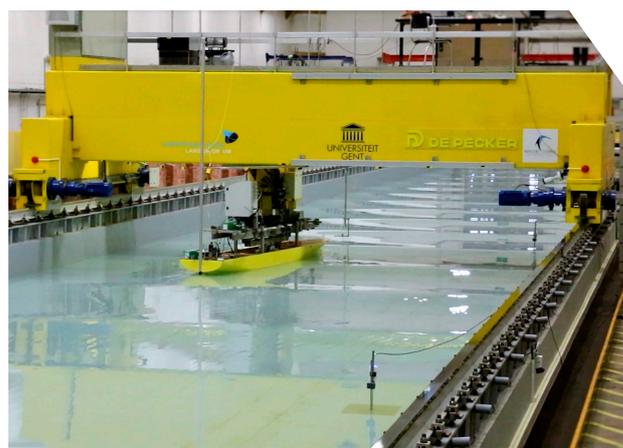
// Point of contact

Prof. dr. Marc Vantorre

// Research domain and discipline

Engineering and technology; Civil engineering

Engineering and technology; Other engineering and technology



Abstract

In 1904, the research unit Naval Architecture (Ghent University) was founded, which can be considered as the precursor of the current Maritime Technology division. This division was initially known as the 'laboratory for Naval Architecture' and later on as the 'service for Naval Architecture'.

The mission of the Maritime Technology division is threefold. Its primary aim is to ameliorate the academic education regarding the design, construction, propulsion, functioning and maintenance of marine structures such as ships, but also offshore constructions. The second objective concerns the fundamental and applied scientific research in the maritime field, especially regarding the hydrodynamics of vessels and other floating structures (such as wave energy converters). The third purpose is to carry out scientific studies for and in collaboration with enterprises and public services in the maritime field.

The research undertaken by this division mainly focuses on maritime hydrodynamics, i.e. the behaviour of ships and other floating structures in the water. While the emphasis of the research lies on ship behaviour in shallow and confined water (access channels, rivers, canals, harbours), energy extraction from sea waves by using floating structures, the effects of fouling and roughness on ship performance and, more recently, dynamics of aquaculture plants are also covered.

Research on the latter themes includes aspects such as model research, manoeuvring of ships in shallow water (with a focus on manoeuvring simulations), influence of fluid mud layers on ship behaviour (nautical bottom), ship-bank interaction, ship-ship interactions, moored ships, arrival and departure arrangements for deep-draft vessels, probabilistic admission policy, vertical ship movements caused by the squat effect and waves, sailing in and out of locks, inland and estuarine shipping (risk analysis), fairway design and equivalent bottom. In the context of the Knowledge Centre 'Manoeuvring in Shallow and Confined Water', which was founded in 2008, there is a structural collaboration with Flanders Hydraulics Research. With the same laboratory there is a collaboration for the towing tank for manoeuvres in shallow and confined waters. Furthermore, scientific advice is provided for the lock model and the simulators for ship manoeuvres.

// Institutional hierarchy

Faculty of Engineering and Architecture

// Point of contact

Prof. dr. ir. Wim Van Paepegem

// Research domain and discipline

Engineering and technology; Mechanical engineering



Abstract

In the department of Materials, Textiles and Chemical Engineering two main research programmes can be distinguished: Metals Science and Technology and Mechanics of Materials and Structures.

The marine research activities are situated in the Mechanics of Materials and Structures group and focus on composites for wave energy converters. Specifically, the impact of waves on the composite materials is studied. Furthermore, research is conducted on the behaviour of composites in sailing masts. Finally, new concepts of wave energy converters are studied.

// **Institutional hierarchy**

Faculty of Bioscience Engineering

Department of Biochemical and Microbial Technology

// **Point of contact**

Prof. dr. ir. Nico Boon

// **Research domain and discipline**

Engineering and technology; Biotechnology

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Natural sciences; Biological sciences

**Abstract**

The center for Microbial Ecology and Technology (CMET) was founded in 1978 and specialises in the study and application of mixed microbial cultures and communities. CMET focuses on the optimal management of these microbial resources (Microbial Resource Management, MRM) enabling the development of novel products and processes to improve the environment and human health in the most sustainable way. More specifically, CMET applies this approach in the fields of applied microbial ecology, functional feed, medical microbial ecology, risk assessment, biomaterials and nanotechnology, water treatment, aquaculture, bio-energy, and soils and sediments.

CMET conducts research on the following marine topics:

- Microbial diversity and activity in deep-marine sediment ecosystems;
- Simulation of the deep-sea biosphere using a continuous high-pressure bioreactor;
- Bioremediation of marine ecosystems.

The center collaborates intensively with several foreign institutes (e.g. Shanghai JiaoTong University, University of Milan, Technical University of Crete and University of Bologna) and participates in the UGent Aquaculture R&D consortium and the IOF consortium Aquaculture Ghent University (Aqua UGent). Furthermore, the group is involved in several European and national marine research projects.

// Institutional hierarchy

Faculty of Sciences

Department of Biochemistry and Microbiology

// Point of contact

Prof. dr. Anne Willems

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The laboratory of Microbiology of Ghent University (LM-UGent) was founded in 1959. The research topics of the laboratory are: microbial diversity, taxonomy, ecology and diagnosis in different sectors including the medical sector, food sector and environmental microbiology (including marine microbiology). The laboratory also holds the Belgian Coordinated Collections of Microorganisms/Laboratory of Microbiology, Ghent University (BCCM/LMG) Bacteria Collection which contains more than 27,000 strains, belonging to over 500 genera and 3,000 species. The BCCM/LMG Bacteria Collection was established in 1982, funded by BELSPO. This ensured the future of the bacteria collection which has steadily grown since the establishment of the laboratory.

The marine research of this group concentrates on the following topics:

- Biodiversity effects on the functioning of marine benthic ecosystems focusing on the role (and diversity) of bacteria, in particular in the Paulinapolder in the Scheldt Estuary and the Belgian part of the North Sea. Special attention goes to the nitrogen and carbon cycles, intertidal benthic biofilms and interactions between diatoms, bacteria and copepods;
- Study of marine methanotrophs;
- Study of the biodiversity, specificity and function of endosymbiotic bacteria in coenocytic green algae;
- Identification and classification of new marine bacteria.

The group is active within national and international projects and collaborates intensively with laboratories within Ghent University, such as the Marine Biology research group, the Phycology research group, laboratory of Protistology and Aquatic Ecology and the laboratory of Microbial Ecology and Technology. The laboratory is a member of the Marine@UGent consortium and participates in the European Marine Biological Resource Centre (EMBRC).

Laboratory of Environmental Toxicology and Aquatic Ecology

www.ecotox.ugent.be

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Animal Sciences and Aquatic Ecology

// Point of contact

Prof. dr. Colin Janssen

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The laboratory of Environmental Toxicology and Aquatic Ecology (GhEnToxLab) of Ghent University was founded at the end of the 60s and was formerly known as the laboratory for Biological Research of Aquatic Pollution. The research of GhEnToxLab focuses on both fundamental and applied aspects of aquatic toxicology and ecological risk assessment, marine genomics and stress ecology and Oceans & Human Health research.

Past and present research topics include:

- The bioavailability and effects of metals in freshwater and marine ecosystems (sediments and water);
- Acclimatisation (epigenetics), adaptation and micro-evolutionary consequences of stressors on aquatic organisms (both anthropogenic contaminants as well as global change stressors);
- Development and use of advanced (semi-)automated monitoring (e.g. videorecording of plancton) and molecular techniques (e.g. eDNA and sequencing) for monitoring marine systems (biodiversity) and assessment of stress and/or impact;
- Study of the presence and ecological effects of existing and new chemical substances in the marine environment (endocrine disruptors, persistent substances, pharmaceutical substances, etc.) using new techniques (e.g. passive samplers);
- Occurrence, uptake and effects of microplastics with particular emphasis on the risks posed to humans and the environment;
- Study of ecological processes (e.g. competition and predation) and the development and validation of ecosystem models for assessing biodiversity, ecosystem functioning and structure of marine systems under stress;
- Experimental, monitoring and modelling approaches to understand and assess the occurrence and effects of biogenic substances (e.g. HAB toxins) on ecosystems and human health.

The current research strategy of GhEnToxLab is to further expand its marine research in the domains of blue omics, blue growth and Oceans & Human Health. Given the global concern regarding the health and use of our seas and oceans, GhEnToxLab will continue to focus on how emerging stressors as well as combinations of multiple stressors (including global change) affect marine systems, from the molecular level to the population and community level. The ultimate aim is to incorporate this knowledge in ecological risk management frameworks and environmental policy.

GhEnToxLab collaborates with both Belgian and foreign research institutes, participates in the UGent Aquaculture R&D consortium and the IOF consortium Aquaculture Ghent University (Aqua UGent). This lab is also the founder and current coordinator of the interfaculty research consortium Marine@UGent, and is/was the coordinator (or participant in) of several multidisciplinary marine research projects such as AS-MADE (Assessment of Marine Debris on the Belgian Continental Shelf: occurrence and effects), ENDIS-RISKS (Endocrine disruption in the Scheldt Estuary: distribution, exposure and effects); INRAM (Integrated Risk Assessment and Monitoring of micropollutants in the Belgian coastal zone) and NEWSTHEPS (New strategies for monitoring and risk assessment of hazardous chemicals in the marine environment with passive samplers) and various EU projects related to marine contaminants and other stressors.

// **Institutional hierarchy**

Faculty of Engineering and Architecture

Department of Civil Engineering

// **Point of contact**

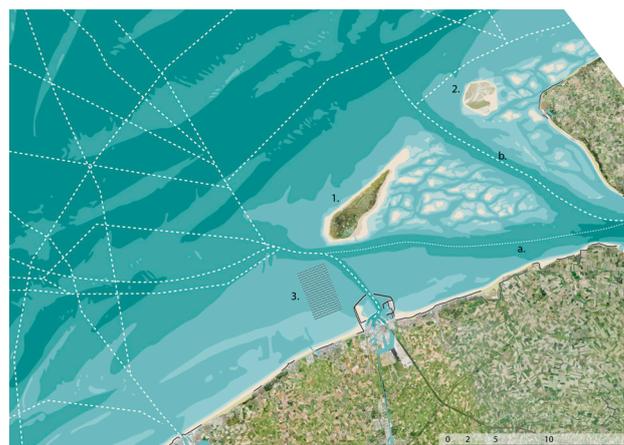
Prof. dr. ir. Luuk Boelens

// **Research domain and discipline**

Engineering and technology; Civil engineering

Engineering and technology; Geomatics

Social sciences; Economics and business

**Abstract**

The Center for Mobility and Spatial Planning (AMRP) was founded in 1990 and originates from the Seminar for Survey and Spatial Planning (1972-1990). The scientific domains on which AMRP concentrates are: spatial economy and spatial management, spatial planning and spatial design, environmental management, sustainable mobility and integrated water management. Within this framework, AMRP participates in several national and European research projects and collaborates intensively with several Belgian and Dutch institutes and consultancy offices.

The marine research of this group is associated with the following projects:

- CcASPAR: climate change and changes in spatial structures;
- Climate Proof Areas (CPA): how to deal with climate change;
- Climar: Evaluation of the impact of global climate change and adaptation measures for marine activities;
- WaterCap: climate change and its effects on the hydrological cycle.

In the future, AMRP will further develop the spatial design research as a commercial tool to mobilise stakeholders to participate in a positive marine/maritime story.

// Institutional hierarchy

Faculty of Veterinary Medicine

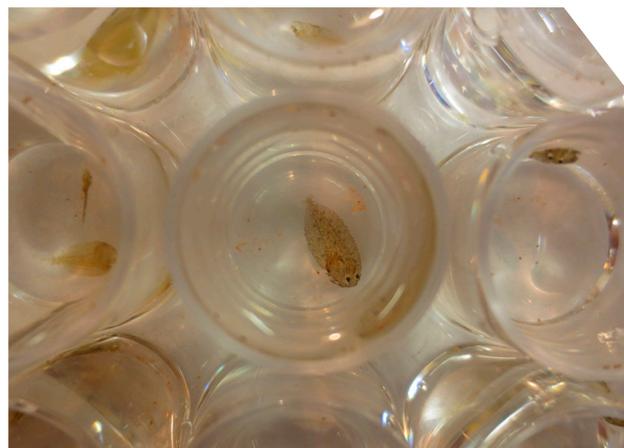
// Point of contact

Prof. dr. Wim Van den Broeck

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Agricultural and veterinary sciences; Veterinary sciences



Abstract

The department of Morphology of Ghent University studies the physique of animals, especially of pets, horses and farm animals kept for food production (including aquaculture) and of marine animals such as marine fish and invertebrates. The department's scientific expertise is made available to the public by organising numerous courses and by the provision of advice services to veterinarians, clinicians and educational and research institutes in Belgium and abroad.

The department is subdivided into three units: Anatomy, Histology and Embryology. The research projects of the department of Morphology focus on the following disciplines: tonsillar immunomorphology, anatomy of the circulatory system, mechanisms of angiogenesis during embryonic development and aquatic veterinary medicine.

Within the aquatic veterinary medicine branch, the following marine topics are studied:

- The gastrointestinal development of fish larvae;
- The interactions between microorganisms with probiotic effects/prebiotics on the one hand and the host (larvae of marine fish species (sea bass (*Dicentrarchus labrax*)/sole (*Solea solea*)) and nauplii of the fairy shrimp) on the other hand. The use of pro- and prebiotics still gains popularity in aquaculture practices despite the fact that their activity in larvae is still unknown. Consequently, there is an increasing scientific and practical interest in unraveling the host-microbial interactions in early larval stages.

The department of Morphology collaborates with the Artemia Reference Center (Faculty of Bioscience Engineering, UGent) and the department of Pathology, Bacteriology and Poultry Diseases (Faculty Veterinary Medicine, UGent). The department of Morphology is also part of the UGent Aquaculture R&D consortium, the IOF consortium Aquaculture Ghent University (Aqua UGent) and the Marine@UGent consortium.

The Morphology Museum is also part of this department. The museum manages a didactic and research collection in the comparative morphology of vertebrates. The emphasis lies on the museum objects of classic pets, horses and farm animals. The museum has extensive expertise in conservation techniques of organic specimens. Worldwide, there is a need for unambiguous protocols regarding conservations techniques for mammalian skeletons in natural historical collections. Therefore, the museum also focuses on this research domain and has established an intensive collaboration with the Operational Directorate Natural Environment (RBINS) regarding this topic. The museum is furthermore involved in the recovery and conservation of stranded marine mammals along the Belgian coast.

// Institutional hierarchy

Faculty of Sciences

Biology Department

// Point of contact

Prof. dr. Wim Bert

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

Since the 1930s, the Nematology research unit has developed experience in nematological research, especially in taxonomy, morphology and phylogeny. Currently, the group focuses on the taxonomy, phylogeny, morphology and biology of nematodes from natural and agricultural ecosystems including free-living, plant-parasitic, virus-vector families and entomopathogenic nematodes.

Research conducted on marine and brackish free-living nematode taxa is very limited at this moment, with a focus on the taxonomy, phylogeny and morphology of Desmoscolecida, Epsilonematidae and Draconematidae. Nevertheless, the group considers organising a yearly workshop on the identification of aquatic nematodes. Further, the group contributes (editor) to the World Database of Free-Living Marine Nematodes (NeMys).

/ Research group Environmental Organic Chemistry and Technology

www.ugent.be/bw/doct/en/research-groups/envoc

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Green Chemistry and Technology

// Point of contact

Prof. dr. ir. Kristof Demeestere

Prof. dr. ir. Jo Dewulf

Prof. dr. ir. Herman Van Langenhove

// Onderzoeksdomein en -discipline

Engineering and technology; Other engineering and technology
Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Natural sciences; Biological sciences

Natural sciences; Chemical sciences



Abstract

The research group Environmental Organic Chemistry and Technology (EnVOC) focuses on three subdisciplines:

- Environmental analysis and chemistry - modern HRMS-based (high resolution mass spectrometry) analysis of trace organic compounds in ecosystems; occurrence, fate and behaviour of (emerging) organic micropollutants in the environment;
- Environmental technology - innovative biological and physical-chemical technologies to remove (emerging) organic micropollutants in air and water;
- Clean technology - a holistic approach that pursues environmental performance at the production itself considering the resource intake, the production technology, the product-service relation and the end-of-life fate of the product.

The marine research *inter alia* focuses on the following topics: the sustainability analysis of algae production systems, the integration of linear inverse models and ecological network analysis into life cycle assessment for fish production, and the development of new strategies for monitoring and risk assessment of hazardous chemicals in the marine environment with passive samplers and (un)targeted HRMS screening.

// Institutional hierarchy

Faculty of Sciences

Department of Geology

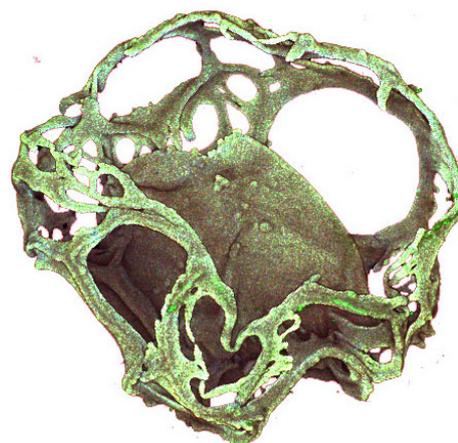
// Point of contact

Prof. dr. Stephen Louwye

Prof. dr. Thijs Vandenbroucke

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The research unit Palaeontology and Palaeoenvironments of Ghent University was founded in 1960. The group studies the biogeography, biostratigraphy, palaeoecology and evolution of a broad range of fossil organisms such as Paleogene, Neogene and Quaternary dinoflagellate cysts, Lower Paleozoic Chitinozoa, Lower Paleozoic arthropods, Neogene freshwater molluscs and Neogene marine mammals. Besides these fossil organisms, Neogene and Quaternary pollen are studied.

There are two key marine research topics that are addressed by this group. A first series efforts focuses on the study of Early-Middle Palaeozoic microfossils of marine, planktonic organisms. Their biostratigraphy and geochemistry is used to track ancient palaeo-environments. Current research questions revolve around the environmental triggers of large-scale macro-evolutionary events, such as major radiations and mass-extinction. The focus is organic walled chitinozoan microfossils, but the group also uses graptolites, ostracods, conodonts, etc. The second research topic deals with the study of organic-walled phytoplankton and pollen in Cenozoic Neogene and Quaternary marine deposits of the North Sea Basin, the Atlantic and Pacific Ocean.

The current research themes include:

- Palaeoecology of Neogene and Quaternary dinoflagellate cysts;
- The use of dinoflagellate cysts as a proxy for palaeoenvironmental changes;
- The development and validation of climate proxies based on Neogene and Quaternary dinoflagellate cysts;
- Biostratigraphy of Cenozoic dinoflagellate cysts;
- The use of pollen as a proxy for vegetation and palaeoenvironmental reconstructions.

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Green Chemistry and Technology

// Point of contact

Prof. dr. ir. Arne Verliefde

// Research domain and discipline

Natural sciences; Chemical sciences

Engineering and technology; Other engineering and technology



Abstract

The Particle and Interfacial Technology group focuses on various physico-chemical aspects of dispersions and solutions, such as:

- Formulation of colloidal dispersions, such as (double) emulsions, (nano)suspensions and liposomal dispersions;
- Removal of solutes from aqueous streams using advanced membrane processes, such as RO, FO, ED, etc.;
- Determination of particle size and surface charge characteristics;
- Determination of membrane surface charge and wettability characteristics;
- Physico-chemical treatment processes of water streams.

The marine research focuses on the development and optimisation of a novel hybrid membrane process for energy-efficient seawater desalination.

// Institutional hierarchy

Faculty of Veterinary Medicine

// Point of contact

Prof. dr. Annemie Decostere

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Agricultural and veterinary sciences; Veterinary sciences



Abstract

The department of Pathology, Bacteriology and Poultry Diseases studies host-microbial interactions, antimicrobial resistance and several (non-)infectious diseases in various animal species.

The marine aspect of the research focuses on:

- Beneficial effects of pre- and probiotics and their modes of action in marine larviculture;
- The etiology of skin ulcerations of flatfish in the North Sea;
- Evaluation of the impact of pulse fishing on a selection of marine fish and invertebrate species in the North Sea;
- Pathogenesis of bacterial infections in fish with a focus on the gill and gut as portal of entry;
- Microbial endocrinology.

// Institutional hierarchy

Faculty of Sciences

Department of Plant Biotechnology and Bioinformatics

// Point of contact

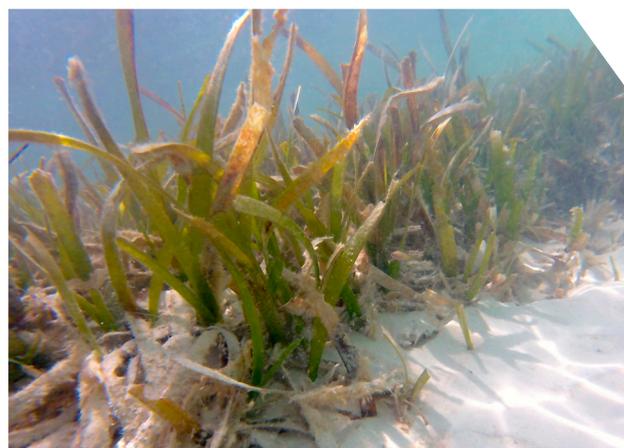
Prof. dr. Dirk Inzé

// Research domain and discipline

Engineering and technology; Biotechnology

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Natural sciences; Biological sciences



Abstract

In the next decades, the world market for plant-derived products is expected to grow exponentially. Not only do we rely on plants to feed the growing world population, but plants will also play a pivotal role in providing a significant portion of our energy needs, and in fulfilling our demand for renewable industrial resources. It is expected that (bio-)technological advances will further boost crop productivity and quality in a wider range of applications. In addition, new technologies will make it possible to develop agricultural practices in better harmony with the natural environment. The mission of PSB is to significantly contribute to solving the above-described grand challenges by laying the scientific foundation for innovations and by enabling that such innovations find their way to society at large. The research is framed in the following five thematic areas providing important challenges and opportunities for plant research:

- Sustainable bio-energy and bio-based products;
- Climate resilient crops;
- Plant diversity;
- Innovative crop care;
- Plants and human health.

The majority of the marine research is conducted in the Bioinformatics and Evolutionary Genomics group focusing on functional, structural and comparative genomics. This research targets species important for aquaculture, such as *Artemia* (in close collaboration with the laboratory of Aquaculture and Artemia Reference Center - UGent), several pico-algae (collaboration with Observatoire Océanologique de Banyuls sur Mer, France) and Amoebozoa (collaboration with Roscoff Marine Station, France). Other marine topics include sea grasses and the genetic study of algae (e.g. diatoms) for which collaborations are established with the laboratory of Protistology and Aquatic Ecology and the Phycology research group (UGent).

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Applied Ecology and Environmental Biology

// Point of contact

Prof. dr. Kathy Steppe

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research of the laboratory of Plant Ecology focuses on plant-environment interactions with a special emphasis on exploring factors that determine, enhance or limit water and carbon fluxes.

The marine aspect of the research is related to mangroves and includes the influence of siltation on anatomical and hydraulic features as well as the water use and stem diameter variations of mangrove species.

// Institutional hierarchy

Faculty of Sciences

Biology Department

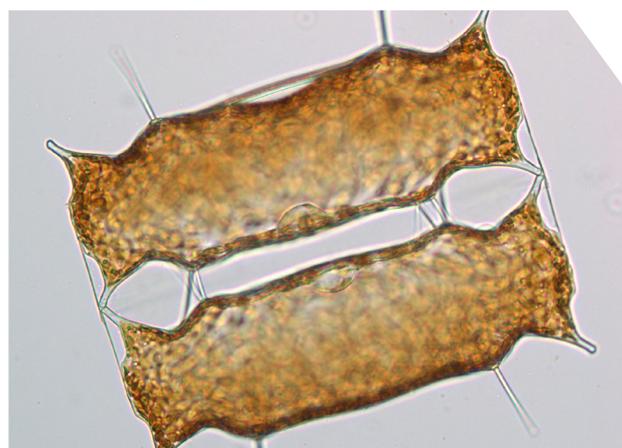
// Point of contact

Prof. dr. Wim Vyverman

// Research domain and discipline

Natural sciences; Biological sciences

Engineering and technology; Biotechnology



Abstract

Research in the laboratory of Protistology and Aquatic Ecology (Ghent University) focuses on three main topics: (1) biology and evolution of unicellular eukaryotes, (2) ecological and evolutionary drivers of short- and long-term dynamics of freshwater, estuarine and marine microbial ecosystems, (3) ecophysiology, molecular biology and biotechnology of microalgae.

Current marine research topics include:

- The role of dispersal, local adaptation and ecological interactions in shaping the genetic/genomic structure of microalgal populations and their spatial and temporal dynamics;
- The role of biotic interactions for community assembly and dynamics in benthic and pelagic microbial ecosystems (including chemical communication between microalgae and between microalgae and prokaryotes, trophic interactions between microalgae and zooplankton and –benthos; mixotrophy);
- Identification of endogene and exogene regulatory mechanisms of cell and life cycle in diatoms;
- Mechanisms and speed of speciation in diatoms;
- Ecophysiology of estuarine and marine planktonic and benthic microalgae;
- (Meta-)omics of microbial (meta-)communities and species interactions;
- Short- and long-term dynamics of phytoplankton and microphytobenthos communities;
- Remote sensing of phytoplankton and phytobenthos dynamics in inland and coastal waters;
- The phenology and functional ecology of (toxic) marine algal blooms;
- The role of intraspecific and species diversity for the stability and functioning of microbial food webs;
- The response of polar microbial metacommunities to environmental and climate variability;
- The late Quaternary evolution of Antarctic coastal environments;
- Regulation of the metabolism of biotechnologically important microalgae;
- Microalgal taxonomy and phylogeny.

The majority of the research projects take place in a multidisciplinary context in cooperation with Belgian and international research institutes. The laboratory manages an extensive collection of diatom cultures which is part of the BCCM consortium (Belgian Coordinated Collections of Microorganisms, <http://bccm.belspo.be>). The laboratory participates in the ESFRI European Marine Biological Resource Centre (EMBRC), ESFRI LifeWatch, Marine@UGent and the Aquaculture R&D consortium. The PAE-lab is also actively involved in international networks dealing with the (molecular) biology and biodiversity of microalgae.

// Institutional hierarchy

Faculty of Sciences

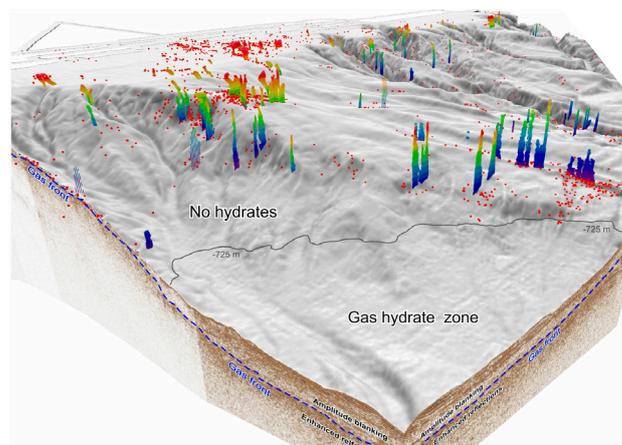
Department of Geology

// Point of contact

Prof. dr. David Van Rooij

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Renard Centre of Marine Geology (RCMG) at Ghent University performs research in the field of marine and lacustrine geology. RCMG scientists carry out research in numerous oceans, seas and fjords worldwide (Atlantic margin, Antarctic margin, Mediterranean Sea, Southeast Pacific, etc.), and they conduct projects on lake and coastal lagoon environments in Chile, France, Argentina, Japan, Thailand, Alaska, Nepal, Kenya, Thailand and Indonesia. RCMG scientists participate in several international research projects and they collaborate with renowned foreign marine research groups such as IFREMER (France), NOC Southampton (UK), MARUM (Germany), OGS (Italy), LSCE (France), WHOI (USA), COPAS (Chile) and Royal NIOZ (The Netherlands).

The current marine research topics at RCMG are:

- Palaeoceanography, including past and present deep-water circulation;
- Palaeoseismology: sediment records of megathrust, crustal and intraslab earthquakes and tsunamis;
- Palaeoclimatology: reconstruction of Late Quaternary changes in precipitation, wind strength, dust transport and glacier variability;
- Sediment transport from source to sink: sediment production on land, transport by rivers, deposition in lakes and fjords, and influence on coastal marine productivity;
- Methane hydrates (occurrences and stability conditions), cold seeps and mud volcanoes (processes of seepage, methane fluxes and budgets);
- Cold-water coral and carbonate mounds: the study of the habitats on continental margins of the North Atlantic Ocean and the Mediterranean Sea with an emphasis on the study of carbonate mounds and deep-water coral habitats;
- Mapping of marine habitats: Integrated method of marine mapping - multibeam, side-scan sonar imaging and acoustic characterisation of the seabed. The development of habitat models based on geophysical and hydrographical data;
- Applied marine research: sediment and morphodynamics, sustainable management of natural resources, the evaluation of landfills and marine geoarchaeological research.

The research group was founded in 1986 and acquired international recognition by discovering the cold-water coral mounds 'Belgica mounds' in the Porcupine Seabight (Ireland) in 1997, which were drilled into during the IODP Expedition 307 in 2005. One of the main strengths of the research undertaken at RCMG is the combination of geophysical techniques with sediment sampling.

/ Research group **Soil Spatial Inventory Techniques**

www.ugent.be/bw/soilmanagement/nl/onderzoek/bodeminventarisatietechnieken-orbit

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Environment

// Point of contact

Prof. dr. ir. Marc Van Meirvenne

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The research group on Soil Spatial Inventory Techniques (ORBit) is responsible for the education, research and services related to the spatial inventory of soil properties in support of strongly differing applications. The expertise comprises:

- Mobile proximal soil sensor configurations for the investigation in a non-destructive way of soil properties;
- Geophysical prospection techniques for geoarchaeological and environmental applications;
- Geostatistical interpolation and simulation techniques;
- Sampling strategies for the characterisation of soil-related properties;
- GIS-techniques for the processing of sensor measurements.

The marine research is focused on the development of a geophysical methodology for soil inventory in the western Belgian coastal plain and a landscape-archaeological study of the Zwin area.

// Institutional hierarchy

Faculty of Engineering and Architecture

Department of Electrical Energy, Metals, Mechanical
Construction and Systems

// Point of contact

Prof. dr. ir. Patrick De Baets

// Research domain and discipline

Engineering and technology; Mechanical engineering



Abstract

The Soete laboratory performs basic and application-oriented research in following domains:

- Tribology (abrasion, wear, erosion);
- Fatigue and lifetime assessment;
- Structure - property relations;
- Finite element modelling;
- Design of structures, components and products;
- Combined damage mechanisms (abrasion-corrosion; fatigue-corrosion) in challenging, including marine, environments.

The marine research focuses on the assessment of abrasive wear of shackle chains of trawl nets, defective welds in offshore pipelines, fatigue analysis of steel used in offshore structures as well as the study of the mechanical behaviour of polymer composite and water lubrication used in marine applications. The group is involved in several relevant research projects, such as the SIM MaDurOS program, Qualify project in Interreg2Seas, etc.

Soete laboratory belongs to the UGent valorisation consortium Metals, which supports metals R&D from nano to mega and from fundamental material properties to large applications. In addition, Soete laboratory has dedicated personel to offer services to industry and partners.

// Institutional hierarchy

Faculty of Sciences

Biology Department

// Point of contact

Prof. dr. Luc Lens

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Terrestrial Ecology research group (TEREC) originates from the 'laboratorium voor Ecologie der Dieren' (laboratory for Animal Ecology). TEREC studies the patterns and processes on which the functioning of terrestrial ecosystems is based. This includes research on population and vegetation dynamics, biotic interactions between plants, herbivores, pollinators and predators, variation in behaviour and life cycle properties, and phenotypical (development) plasticity and bio-indicators of invertebrate and vertebrate species. Four main research topics can be distinguished within the research of this group: population and community ecology, evolutionary ecology, plant-animal interactions and applied ecology. Throughout the years, the research of the group has gradually evolved to terrestrial ecology with an emphasis on the ecology of dunes, tidal marshes and sea birds. Key moments for the group include: the introduction of new research topics (such as the study of arthropods in dunes (1973)) and eco-evolutionary research in tidal marshes (1981), and the implementation of a high-tech sensor network to monitor habitat use and migration patterns of large gulls (2013) as part of the Flemish contribution to the LifeWatch infrastructure.

Specific coastal research topics concern:

- Ecology and functioning of dune systems (e.g. research on the blue grasshopper, spiders, marram grass, plant - herbivore interactions), etc.;
- Year-round life history strategies of coastal breeding gulls;
- Distribution strategy of spiders as an indicator of the structure and dynamics of coastal tidal marshes;
- Plant - herbivore interactions and mechanisms of succession as determining factors for the vegetation structure;
- Seed dispersion by large mammals in dune areas;
- Population biology of higher plants in a fragmented dune landscape;
- Biological evaluation of Belgian beaches and the impact of sand suppletions;
- Spatial and nutritional ecology of coastal breeding gulls;
- Ecotoxicology of coastal breeding gulls with special focus on mercury pollution.

In the future, the group intends to expand and advance the research on sea birds and the eco-evolutionary research of plant - herbivore interactions, both in an applied and fundamental way. This research includes the study of European marram grass-associated biodiversity and the impact on ecosystem functioning as well as the impact of climate change and areal extension on evolution and life history characteristics. The most important national partners with regard to the research on marine birds are the Marine Biology research group (Ghent University), ISOFYS (Ghent University), the Department of Biology (University of Antwerp), the Research Institute for Nature and Forest (INBO), the Flemish Research Institute for Agriculture, Fisheries and Food (ILVO) and Flanders Marine Institute (VLIZ). Concerning the study of plant - herbivore interactions, the most important national partners are KU Leuven University (areal extension). For the European marram grass-associated research the group cooperates with the Royal Belgian Institute of Natural Sciences (RBINS; Entomology) and INBO. In this context, the use of physiological markers (feather, CORT, immunobiology, stable isotopes) and GPS telemetry (study of movements) is increasing, mainly within the context of the 'zendernetwerk meeuwen en bruine kiekendieven' funded by the LifeWatch project.

Research group Thermochemical Conversion of Biomass

www.ugent.be/bw/gct/en/research/thermochemical-conversion-of-biomass

// Institutional hierarchy

Faculty of Bioscience Engineering

Department of Green Chemistry and Technology

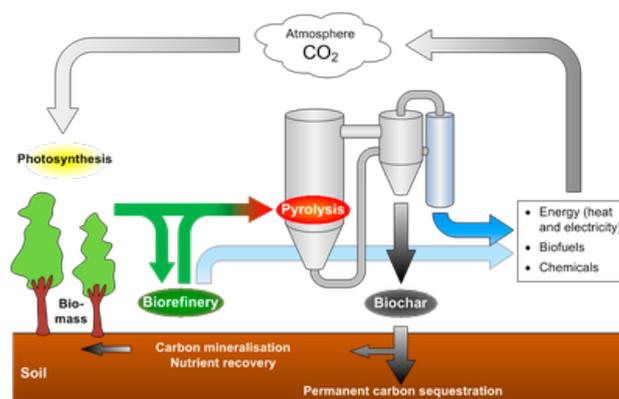
// Point of contact

Prof. dr. ir. Frederik Ronsse

// Research domain and discipline

Engineering and technology; Biotechnology

Engineering and technology; Other engineering and technology



Abstract

The research conducted within the research group Thermochemical Conversion of Biomass aims at the development and optimisation of thermochemical conversion technologies to renewable fuels, functional materials, chemicals and energy from biomass. The marine research focus is on the conversion of micro-algae and macro-algae including hydrothermal liquefaction of biofuel production and carbonisation for the production of char and activated carbon.

// Institutional hierarchy

Faculty of Sciences

Department of Geology and Soil Science

// Point of contact

Prof. dr. Kristine Walraevens

// Research domain and discipline

Natural sciences; Earth sciences

Engineering and technology; Other engineering and technology



Abstract

The laboratory for Applied Geology and Hydrogeology of Ghent University was founded in 1970 and was formerly known as 'Leerstoel Toegepaste Geologie' (Chair Applied Geology). The research unit studies the movement and quality of groundwater, as well as the interaction of groundwater with the bedrock. This includes the study of the flow of groundwater, the amount of groundwater available for extraction from particular aquifers, chemical reactions and pollution due to human activities. Between 1960 and 1989, the research group was responsible for the development of salinisation maps, charting the depth of the interface between fresh and salt groundwater in the Belgian coastal area. Ever since, research related to groundwater in coastal areas has been extended, both in Belgium and abroad.

The following research topics are studied in the coastal area:

- Groundwater quality and the hydrogeochemical processes in coastal aquifers;
- Groundwater modelling of coastal aquifers;
- Exploitation of coastal aquifers;
- Groundwater regimes in dunes in relation to the ecosystem;
- Geophysical research in coastal areas (mainly geo-electrical and electromagnetic);
- Mapping of the depth of the interface between fresh and salt groundwater;
- Study of submarine groundwater discharge in the sea;
- Sustainable groundwater extraction in coastal areas.

// Institutional hierarchy

Faculty of Veterinary Medicine

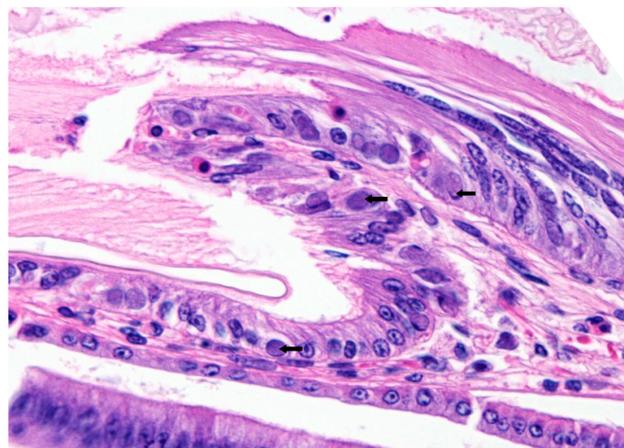
Department of Virology, Parasitology and Immunology

// Point of contact

Prof. dr. Hans Nauwynck

// Research domain and discipline

Agricultural and veterinary sciences; Veterinary sciences



Abstract

The laboratory of Virology studies a number of viruses (pseudorabies virus, porcine reproductive and respiratory syndrome virus, influenza virus, Equine herpesvirus 1, etc.) in different animals.

The marine research of this laboratory focuses on viral diseases in aquaculture such as the so-called white spot syndrome virus in shrimp farms.

/ Research group Nutrition and Food Safety

www.publichealth.ugent.be/index.cfm/research/units/nutrition-and-food-safety

// Institutional hierarchy

Faculty of Medicine and Health Science

Department of Public Health

// Point of contact

Prof. dr. Stefaan De Henauw

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Medical and health sciences; Medical and health sciences



Abstract

The research unit Nutrition and Food Safety of Ghent University was founded in 1998. The research performed by this group can be subdivided into three main research topics. The first concerns the nutritional research on various food related issues (nutrients, feeding pattern, body composition, influence of social and ecological aspects such as stress) and their impact on public health. The second area includes research on food safety, with the emphasis on chemical food safety in relation to environmental problems and food technological phenomena (for instance the use of additives and pigments). The third research topic concerns methodological research that is used to support food research and research on food safety, including nutrition assessment, measuring body composition and probabilistic techniques used to evaluate exposure.

Within the marine domain, the group performs research on the following topics:

- Fish and sea food as a dietary source of omega-3 fatty acids;
- Toxicological risks associated with the consumption of fish.

A noteworthy moment for this group was winning the Prof. dr. G. Verdonk prize for dietetics presented by the Belgian Royal Academy for Medicine (period 2003-2006) for the work 'Evaluation of benefits and risks related to seafood consumption'. The research group participated in the European FP7 project ECSAFESEAFOD and collaborates intensively with the department of Food Safety and Food Quality and the research group Agro-food Marketing and Consumer Behavior, both of Ghent University.

/ Coastal Engineering, Bridges and Roads unit

www.ugent.be/ea/civil-engineering/en/research/coastal-bridges-roads

// Institutional hierarchy

Faculty of Engineering and Architecture

Department of Civil Engineering

// Point of contact

Prof. dr. ir. Peter Troch

// Research domain and discipline

Engineering and technology; Civil engineering



Abstract

The Coastal Engineering, Bridges and Roads unit of the department of Civil Engineering of Ghent University comprises two different research groups: 'Coastal Engineering' and 'Bridges and Roads'.

The Coastal Engineering group focuses on the design and construction of coastal structures (mainly breakwaters and sea dikes), coastal defense (protecting the hinterland from flooding by waves and sea level rise) and the structural response of these structures to wave loading (such as armour layer stability, wave overtopping and overflow, porous flow and the development of pore pressures in the core of the breakwater). Research studies also focus on the interactions between the water motions (waves and tides) including the associated sediment transport and the coastal structures (which may cause local erosion of the seafloor). Another research theme deals with renewable wave and tidal energy. The research group is actively involved in the system development for exploiting wave energy and in the research with regard to interaction effects within parks of wave energy convertors. The group also has extensive experience in the development and use of instruments for field measurements of currents and waves in oceans, estuaries and rivers. Finally, the research group is very active in the experimental and numerical modelling of wave propagation and the interaction with coastal structures.

The research methodology is based on the use and integration of physical models, numerical models and field measurements. Therefore, the group has two physical wave flumes and multiple numerical models for the propagation of wind-generated waves (MILDwave, FLOW3D, OpenFOAM) and tidal currents (COHERENS).

In the future, this group will keep its focus mainly on topics such as coastal defense (particularly coastal structures) and renewable energy. The group was involved in both national and European (e.g. FP6, FP7) research projects on coastal structures and offshore energy production and is a member of several consortia (Marine@UGent consortium, WECAN consortium, Coastlab network).

Hasselt University

// Faculty of Sciences

- Research group Zoology: Biodiversity and Toxicology

/ Research group Zoology: Biodiversity and Toxicology

www.uhasselt.be/UH/Research-groups/Details-research-group.html?oid=52

// Institutional hierarchy

Faculty of Sciences

Discipline group Biology - Geology

// Point of contact

Prof. dr. Tom Artois

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research group Zoology: Biodiversity and Toxicology of Hasselt University was founded in 1976 and was formerly known as the research group Biodiversity, Phylogeny and Population Studies and the research group Zoology. The group conducts research on invertebrate animals, and in particular on free-living flatworms (Platyhelminthes).

The main focus lies on the following research topics:

- Biodiversity, including cryptic biodiversity;
- Phylogeny and phylogeography, based on molecular markers and morphological characteristics;
- Effect of pollution on several biological aspects of turbellarians: regeneration and stem cell dynamics, life history parameters, morphology, etc.;
- Molecular and cellular effects of pollution.

The marine research topics concern the biodiversity, phylogeny and biogeography of marine invertebrates, in particular of free-living flatworms. The toxicological part of the research focuses on the stem cell-oriented coping capacity of regenerative animals towards carcinogenic and neurotoxic compounds and on the role of the redox balance in the process of regeneration, using marine and freshwater turbellarians as model systems.

The group is a member of the Centre for Environmental Sciences (CMK) UHasselt.

Vrije Universiteit Brussel

// Department of Business

- Management and Strategy Cluster

// Faculty of Engineering

- Acoustics and Vibration research group
- Department of Hydrology and Hydraulic Engineering
- Department Mechanics of Materials and Constructions

// Faculty of Arts and Philosophy

- Department of Art Sciences and Archaeology

// Faculty of Law and Criminology

- Centre for International Law

// Faculty of Science and Bio-engineering Sciences

- Plant Biology and Nature Management laboratory
- Research group Analytical, Environmental and Geochemistry
- Research group Physical Geography
- Research group Marine Biology

// Institutional hierarchy

Faculty of Engineering

Mechanical Engineering

// Point of contact

Prof. dr. ir. Christof Devriendt

// Research domain and discipline

Engineering and technology; Mechanical engineering

Engineering and technology; Information and computer sciences



Abstract

AVRG is a mechanical engineering research group at VUB. The central goal of AVRG is to conduct fundamental and applied research in the broad field of smart process monitoring, with a special emphasis on Experimental and Operational Modal Analysis, Frequency-Domain Identification of Multivariable Systems and Non-Destructive Damage Assessment.

The research efforts revolves around the following three research domains: Monitoring of Offshore Wind Energy Systems, Condition Monitoring of Rotating Machines and Metal Additive Manufacturing (also known as 3D printing). In the topic of monitoring offshore wind energy AVRG has a longstanding involvement in the Offshore Wind Infrastructure (OWI)-lab. The group has led several research projects, on all Belgian offshore wind farms, with the aim to reduce the cost of offshore wind energy. Both by developing tools for condition monitoring of the machinery and by trying to better understand the challenges of building wind turbines in the offshore environment. The group has developed a track-record in performing both long-term and instantaneous dynamic measurements on offshore wind turbines and vessels.

// Institutional hierarchy

Faculty of Science and Bio-engineering Sciences

Department of Biology

Ecology and Biodiversity

// Point of contact

Prof. dr. Nico Koedam

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Ecology and Biodiversity research group at the Vrije Universiteit Brussel comprises several laboratories, amongst which the Plant Biology and Nature Management laboratory (APNA). This lab focuses on seven research themes: (1) limnology (ecological quality), (2) mangroves, (3) conservation genetics, (4) temperate forests and urban ecology, (5) sustainable development governance, (6) invasive exotic aquatic plants and (7) bird migration and wetlands. Collaboration with intra-VUB colleagues Bram Vanschoenwinkel, Farid Dahdouh-Guebas, Harry olde Venterink, Marc Kochzius, Matthieu Kervyn, Jean Hugé, and colleagues abroad is complementing APNA-expertise. This is needed in order to facilitate integrative and multidisciplinary approaches.

The study of coastal vegetation and mangroves constitutes the first marine component of the research. Besides studying the mangrove vegetation as an ecosystem and a vegetation type, the physiological functioning of the mangrove tree is part of APNA's research focus. Mangrove wood studies are carried out in close collaboration with the Kenya Marine and Fisheries Research Institute (KMFRI) and the wood laboratory of the Royal Museum for Central Africa (RMCA). The micro-CT-scan equipment (at APNA, open for collaboration), combined with CT-scan, MRI and NMR (each through external collaborative links) allow for high-resolution tissue research, for some approaches real-time plant physiological behaviour. Biogeography, climate relations and the dispersal mechanistic process are investigated in the field, with ex situ experiments and by means of modelling. Validation as well as input data for mangrove ranges are sought in the mangrove genetic population structure (mostly Western Indian Ocean and East Atlantic).

Seagrasses are studied for their population genetic structure, dispersal and distributional patterns across coastal lagoons and wetland areas. Molecular markers are designed using the most recent technologies. Isolation-by-distance is tested by means of different models at various spatial scales, from continent-wide phylogeography approaches up to fine-scaled spatial analyses of clones and their resilience within a lagoon.

An emerging coastal and marine field in the group addresses the connectivity of (as for now) European and North African wetlands, mostly coastal, in the Palaeartic migratory route of waders/seabirds. This research is based on fieldwork and on connectivity modelling. It has an explicit relation to EU nature legislation.

An overarching theme within APNA is the interest and research concerning the sustainable use and management of coastal resources, particularly in East Africa and with a focus on mangrove ecosystems and their goods and services. This research is policy relevant, which translates into studies regarding international (coastal) policies and governance.

/ Research group Analytical, Environmental and Geochemistry

<http://we.vub.ac.be/nl/analytical-environmental-and-geo-chemistry>
<https://youtu.be/xyDYMz3f6aU>

// Institutional hierarchy

Faculty of Science and Bio-engineering Sciences

Department of Chemistry

// Point of contact

Prof. dr. Philippe Claeys

// Research domain and discipline

Natural sciences; Chemical sciences

Natural sciences; Earth sciences



Abstract

The research group Analytical, Environmental and Geochemistry (AMGC) of the Vrije Universiteit Brussel specialises in research in earth and environmental sciences. The scientific approach focuses on the holistic use of biogeochemical tracers, such as elemental concentrations (Cd, Pb, PGE etc.) and isotopic ratios (D/H, $^{18}\text{O}/^{16}\text{O}$, $^{87}\text{Sr}/^{86}\text{Sr}$, etc.), - in some cases referred to as “proxies” – that are measured on a substrate (e.g. mineral phase, fossil, mussel-shell, teeth, seawater, ice cores etc.) to infer specific environmental parameters (such as condition of formation, temperature, acidity, salinity, CO_2 level, composition, bio-productivity etc.). Variations in these “proxies” characterise the factors triggering or resulting from (palaeo)environmental changes and document at different scales, the short and/or long-term effects of these modifications on the Global Earth System.

The group develops state of the art analytical methods for the study of aquatic systems such as oceans, coastal ecosystems, estuaries, rivers and lakes. Another focus is on past and present global changes, palaeoceanography and reconstruction of ancient environments. These developments are closely connected to the study of biogeochemical processes in (palaeo) oceanography; understanding marine ecosystems and the quantification of the productivity and export production in open oceans; biogeochemical cycles of carbon, nitrogen and pollutants (inorganic and organic) in coastal ecosystems; metal fluxes and microbial diversity in contaminated marine sediments; and the accumulation of pollutants in marine organisms, etc. AMGC also specialises in the sampling of labile, bioavailable dissolved fractions of both nutritive and toxic trace elements; the determination of trace metals using HR-ICP-MS (high resolution inductive coupled plasma mass spectrometry); the determination of stable isotopes of hydrogen, oxygen, carbon and nitrogen using IRMS (stable isotope mass spectrometry); high resolution 2D visualisation of spore metals in sediments using laser technology coupled to ICP-MS; the determination of Th/U ratios in particles using a scintillation counter; and the measurement of persistent organic hydrocarbons (i.e. dioxins and PCBs) using genetically modified cell lines (CALUX). Moreover, μX -ray fluorescence is also used for the determination of major and trace elements, as well Fourier Transform Infra-Red spectroscopy to determine functional groups.

Ongoing research addresses a.o. the development of methods to assess export production fluxes, the 3D visualisation of spore elements found in sediments and the development of 3D process models for the description of their behaviour. The research group participates in several national and international research projects and collaborates with Belgian and foreign research institutes worldwide.

// Institutional hierarchy

Faculty of Sciences and Bio-engineering Sciences

Department of Geography

// Point of contact

Prof. dr. Philippe Huybrechts

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The research group Physical Geography (FARD) of the Vrije Universiteit Brussel was founded in 1970. The original research concentrated on glaciology and Quaternary geology and shifted towards the research themes 'ice and climate' and 'volcanology' from 2011 onwards. The first theme focuses on the dynamics of natural ice masses and their interaction with the climate system. The research group's emphasis lies on 3D modelling of the continental cryosphere (Antarctica, Greenland and the Quaternary ice sheets), regional Antarctic ice sheet dynamics (modelling, field work, remote sensing) and research on glaciers in the Alps, the Himalaya and the Caucasus Mountains (modelling, mass balance, radar sounding and GPS measurements).

Within the field of volcanology, the research topics concern the geomorphology and spatial distribution of volcanoes, the characterisation of instability processes and on the monitoring of eruptive processes on African volcanoes.

Within the marine domain, the group studies ice sheet and glacier dynamics and their impact on global sea level changes. The research group Physical Geography is also strongly involved in the IPCC reports regarding the themes 'cryosphere', 'sea level' and 'polar ice sheets'.

// Institutional hierarchy

Faculty of Engineering

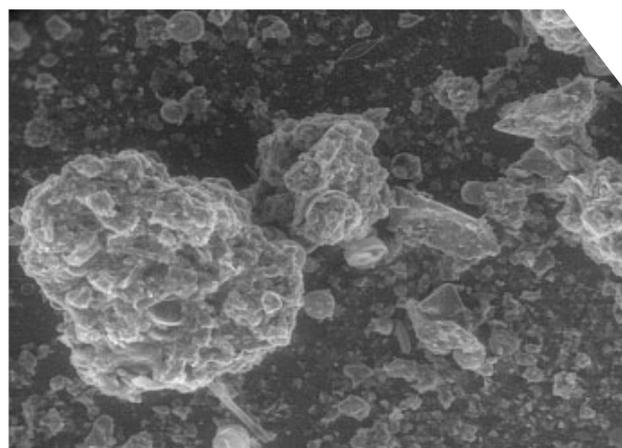
// Point of contact

Prof. dr. Margaret Chen

// Research domain and discipline

Engineering and technology; Civil engineering

Engineering and technology; Geomatics



Abstract

The department of Hydrology and Hydraulic Engineering of the Vrije Universiteit Brussel was founded in 1976. Since its establishment, this department specialises in numerical simulation techniques and computer applications which resulted in expertise in the use and development of hydrological modelling techniques. GIS and remote sensing are employed during the development, use and visualisation of these models and their results.

In the marine and estuarine fields, the department studies hydrodynamics, sediment transport, particle and sediment flocculation and aggregation, geo-acoustic characteristics, lithological and geomorphological evolution of the Scheldt Basin, the estuarine river floors and the coastal zone.

The department of Hydrology and Hydraulic Engineering participates in research projects funded by Flemish, Belgian or European scientific programmes, or directly by the industry. These projects conduct research on aspects concerning the Sigmaphan, Moneos (integrated monitoring of the Scheldt Estuary), the long term vision of the Scheldt Estuary and the coastal zone, etc.

// Institutional hierarchy

Faculty of Law and Criminology

Department of International and European Law

// Point of contact

Prof. dr. Erik Franckx

// Research domain and discipline

Social sciences; Law and legal studies



Abstract

The centre for International Law of the Vrije Universiteit Brussel is the successor of the International Law department, and originates from the merge of 3 former institutes (90s): the Centre for the Study of the Law of the United Nations and the Specialized Agencies (REVN), the International Institutions Unit (INRI) and the Centre for the Study of East-European Socialist Legal Systems (Centrum OOST). Since 2003, this centre constitutes, together with the centre for European Law, the department of International and European Law (IERE).

The group mainly performs research on the following four areas: (1) law of the sea, (2) law of international organisations, (3) international regional law in Africa and (4) the East-European legal system.

The marine-related research focuses on the international law of the sea in general. The main interests include marine pollution and the marine environment, the international and European fisheries law and maritime demarcation issues. On a regional level, the main focus lies on Arctica, the Baltic Sea and the South China Sea. Finally, the practices of the Belgian State are followed closely.

// Institutional hierarchy

Faculty of Arts and Philosophy

// Point of contact

Prof. dr. Dries Tys

// Research domain and discipline

Human sciences; History and archaeology



Abstract

Maritime and coastal archaeology and landscape research are a core theme of the research of the department of Art Sciences and Archaeology (VUB). The following topics are studied:

- Archaeological and historical research of coastal embankments;
- Archaeological and historical research of coastal settlements (terp settlements, fishing villages);
- Archaeological and historical research of coastal material culture and identity;
- Archaeological and historical research of coastal trade and exchange (and trade settlements);
- Archaeological and historical research of the early medieval coastal plain.

/ Management and Strategy Cluster

<http://research.vub.ac.be/business/mast-management-and-strategy>

// Institutional hierarchy

Department of Business

// Point of contact

Prof. dr. Elvira Haezendonck

// Research domain and discipline

Social sciences; Economics and business



Abstract

The Management and Strategy (MAST) Cluster of the Vrije Universiteit Brussel (VUB) conducts research and advisory work in three domains:

- Stakeholder management, with a special focus on complex investment evaluations. Unique research and advisory expertise has been developed in the optimal design of public - private partnerships (PPSs), triple bottom-line (TBL) measurement tools for projects with high external effects, and corporate social responsibility (CSR) policies;
- Sustainable mobility and infrastructure management, focused on assessing large-scale infrastructure projects such as port terminals, intermodal transport hubs, brownfield rejuvenation investments for mixed usage and greenfield development sites. The cluster builds upon more than 25 years of leading research and leadership in this area;
- International strategic management, with a focus on the governance and expansion strategies of large multinational enterprises and their subsidiaries. The cluster has achieved a world-class status in this field with numerous publications in leading scholarly journals.

The marine-related research of MAST focuses on themes such as port authority and port cluster strategic management, port performance management, interaction of ports with other transport modes and integrated evaluation of port projects.

// Institutional hierarchy

Faculty of Science and Bio-Engineering Sciences

Department of Biology

// Point of contact

Prof. dr. Marc Kochzius

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research group Marine Biology at the VUB specialises in research on (molecular) marine ecology of fauna from the poles and temperate seas to the tropics and from invertebrates to fishes. The main research topic is the connectivity of populations by pelagic early life history stages (eggs and larvae), which can potentially drift with ocean currents hundreds of kilometres. Since adults of most animals in these ecosystems are sedentary and do not migrate, dispersal by early life history stages is the only possibility to replenish exploited populations or to recolonise disturbed habitats. Knowledge about these processes is important in the context of the design of marine protected area (MPA) networks and ecosystem resilience after natural or anthropogenic disturbance. Exchange among populations is investigated by using molecular genetic techniques (PCR, DNA sequencing and microsatellites) and population genetic analysis. These genetic techniques can also aid species delineation (molecular systematics), species identification (DNA barcoding) and the reconstruction of evolutionary relationships (molecular phylogenetics). Another area of research is the multivariate analysis of community structures in comparison with environmental parameters. Natural and anthropogenic disturbances can have profound negative effects on the faunal community structure and function of marine ecosystems. Such studies can give insights into sometimes subtle responses of these communities to stressors.

// Institutional hierarchy

Faculty of Engineering

// Point of contact

Prof. dr. ir. Danny Van Hemelrijck

// Research domain and discipline

Engineering and technology; Mechanical engineering



Abstract

The department of Mechanics of Materials and Constructions (MeMC) studies the mechanical behaviour of innovative material systems and lightweight constructions under complex loading conditions by means of (combined) experimental testing and advanced numerical modeling. This is conducted in close collaboration with national and international academic and industrial partners.

The marine research focuses on fatigue assessment of offshore wind turbines using response estimation techniques.

Flemish scientific institutes



Flemish scientific institutes

// Policy Domain Economy, Science and Innovation

- Botanic Garden Meise
- Flanders Marine Institute
- Flemish Institute for Technological Research

// Policy Domain Agriculture and Fisheries

- Flemish Research Institute for Agriculture, Fisheries and Food

// Policy Domain Mobility and Public Works

- Flanders Hydraulic Research

// Policy Domain Environment

- Flanders Heritage Agency
- Research Institute for Nature and Forest

// Institutional hierarchy

Government of Flanders

Policy Domain Environment

// Point of contact

Dr. Marnix Pieters

// Research domain and discipline

Humanities; History and archaeology



Abstract

The Flanders Heritage Agency is operational since July 2011, and results from a fusion between the 'Heritage' division of the agency for Space and Heritage ('Ruimte en Erfgoed') and the Flemish Institute for Immovable Heritage ('VIOE'). Flanders Heritage Agency deals with built, archaeological and landscape heritage but also with heraldic heritage and the historical fleet (varend erfgoed). The agency realises inventories, studies and protects valuable buildings, landscapes, archaeological sites and sailing heritage. The agency also supports the immovable heritage management and performs research that supports policy and management. From 2003 onwards, there were a variable number of researchers active within the Flanders Heritage Agency and its predecessors (Institute for the Archaeological Heritage (IAP), VIOE) who perform policy-oriented research on topics related to maritime and/or underwater heritage. In the present structure of the agency, there is no research group dedicated to marine topics or underwater heritage, but marine researchers are spread over different units of the agency. The marine or maritime research expertise within the agency is related to the following topics:

- Late medieval fishing settlements in the southern North Sea coastal areas;
- The medieval cogs of Doel;
- Maritime conservation: this topic gradually became more important since the start of the project 'De Kogge' (2009-2014);
- The medieval origin and development of commercial fisheries in the North Sea, the Baltic Sea and the North Atlantic Ocean. This includes combining data from European archaeological research on fish remains from the period 600-1600 AD;
- Archaeological heritage in the Belgian part of the North Sea and the adjacent intertidal zone (developing inventories of old findings, research on new findings). This topic aims at achieving three scientific goals: (1) development of a reliable research methodology (using geophysical and remote sensing techniques); (2) developing proposals for a transparent and sustainable management policy and for the further development and implementation of a legal framework for underwater heritage and (3) practical guidance for actors at sea and an increase of the support for underwater heritage;
- Support for the conservation policy of the historical fleet (inventories, documentation and history of ships and shipyards).

The challenge faced by the marine researchers is to create awareness among policy makers and maritime actors of the importance of marine heritage and to obtain the necessary resources to study and conserve this highly-vulnerable maritime heritage when appropriate.

Key events of the maritime group are the cooperation agreement (5 October 2004) between the federal government and the Flemish Region concerning maritime heritage, the realisation of the TV documentary 'Vergaan in de Noordzee' (Canvas; 2004), the realisation in 2006 of an online accessible database on maritime archaeology (www.maritieme-archeologie.be), the multidisciplinary study-project 'De Kogge' in the period 2009-2014, the approval and realisation of the IWT/SBO-project 'Archaeological heritage in the North Sea' (2013-2016), the ratification by Belgium of the UNESCO-Convention for the protection of underwater cultural heritage in 2013 and advice for the new Belgian law for protecting underwater cultural heritage (2014) that resulted in the protection of 8 underwater cultural heritage sites (situation spring 2018).

There is also a close collaboration with both national and international institutes and participation in various international research projects.

// Institutional hierarchy

Government of Flanders

Policy Domain Agriculture and Fisheries

// Point of contact

Dr. Hans Polet

// Research domain and discipline

Agricultural and veterinary sciences; Fisheries and aquaculture sciences

Natural sciences; Chemical sciences

Natural sciences; Biological sciences



Abstract

ILVO conducts multidisciplinary and independent research aimed at sustainable agriculture and fisheries within an economic, environmental and social perspective. ILVO builds up fundamental and applied knowledge necessary to monitor the environment, improve products and production methods, monitor the quality and safety of end products and improve policy instruments. The marine research within ILVO is mainly carried out at the Ostend site and includes the research domains 'Aquatic Environment and Quality' and 'Fisheries and Aquatic Production'.

The group 'Aquatic Environment and Quality' studies the influence of all human activities on the (benthic) aquatic ecosystem, the quality of the marine environment, the health and quality of marine products and the structural and functional marine biodiversity. This includes, *inter alia*:

- Long-term monitoring, biological response to a changing marine environment (benthos, fish, jellyfish, bacteria), chemical pollution, marine waste and microplastics, climate change, invasive species, etc.;
- Biological, (bio)chemical and physical impact of all human activities (integrated evaluation, in-combination and cumulative impact), in situ and lab experiments;
- Genetic research (barcoding, metabarcoding, functional genetics, metagenomics, etc.);
- Ecosystem-based management and marine nature conservation (MSFD, MSP), structural and functional indicators, ecological modelling;
- Healthy and qualitative fishery products (freshness, food safety, food integrity, rapid detection, biosensors, etc.);
- Blue biotechnology (e.g. micro/macroalgae in pharmaceuticals and nutrition, biodegradable plastics, natural antifouling, etc.).

The group 'Fisheries and Aquatic Production' studies marine animal and plant production in all its forms and includes, amongst others, the following disciplines:

- Fisheries data collection (fish stocks, socioeconomic data, fish processing, aquaculture, recreational marine fishing); customised software and measuring equipment
- Model-based integration of various data types (including VMS) including, a.o., fish stock estimates, management strategies and ecosystem approach;
- Fleet dynamics and the effects of policy measures (quotas, fishing effort, technical adjustments, etc.), socio-economic modelling, participation processes, etc.;
- Fisheries technical innovation (adaptation of fishing gear, pulse fishing, passive techniques, etc.) and related impact studies (soil impact, selectivity, etc.);
- The valorisation of by-products (i.e. fishery by-products and the fish processing sector) with a view to a circular bioeconomy;
- Development and implementation of methods to achieve sustainable fishing activities and related products;
- Research on integrated multitrophic aquaculture systems, recirculation systems, new breeding species and feed, multiple use of space, etc.

The research within ILVO-Marine is supported by a technological knowledge pool and extensive logistics within the wider ILVO. The department has BELAC accredited laboratories, its own seawater supply and numerous experimental and aquaculture facilities. ILVO-Marine also stands for extensive consultancy and services, actively participates in a multitude of national and international research projects and collaborates with numerous national and foreign institutes.

// **Institutional hierarchy**

Government of Flanders

Policy Domain Environment

// **Point of contact**

Prof. dr. Maurice Hoffmann

// **Research domain and discipline**

Natural sciences; Biological sciences

**Abstract**

The INBO is committed to nature and its sustainable management and use. The institute works primarily on behalf of the Government of Flanders, but also carries out research and provides knowledge to all those who prepare policy, implement it or are interested in it. The institute also provides information for international reports and responds to requests from local authorities. In addition, INBO supports organisations for nature management, forestry, agriculture, hunting and fishing.

The Species Diversity research team focuses on the study of the evolution, food ecology, habitat use and migration patterns of seabirds, bird counts on the Belgian part of the North Sea (BNS), the coupling of the pelagic component and top predators in the food web, the study of nature compensation in the polder area and the impact of human activities on seabird populations. In this context, INBO has built up important partnerships with numerous research institutions on monitoring projects at the BNS (WAKO I and II, WESTBANKS, TROPHOS, BWZee, SPEEK), compensation measures for the expansion of the port of Rotterdam and the ecology of the lesser black-backed gulls and kittiwakes (LifeWatch). The monitoring activities contribute to the Marine Strategy Framework Directive and the Birds and Habitats Directives.

The Estuaries research team provides information for the Long Term Vision Scheldt Estuary (LTVS), the updated Sigma Plan, the Water Framework Directive (WFD) and the Birds and Habitats Directives. The integrated system monitoring of hyper- and macrobenthos, water birds, fish, vegetation and ecotopes provides information for ecological modelling, the licensing policy, setting and assessment of ecological objectives, an ecological recovery strategy for the Scheldt Estuary and the design, planning and evaluation of the accompanying measures. The research is carried out in collaboration with numerous partners. INBO also participates in the international coordination project INTERTIDE.

The Landscape Ecology and Nature Management research team focuses on landscape dynamics along the Flemish coast, including geomorphology, hydrology, management, vegetation and focus species. Scientific support is provided for nature management, restoration and policy making in dunes and salt marshes.

The research team Monitoring and Restoration of Aquatic Fauna conducts policy related scientific research into the monitoring of fish to assess the ecological status of estuaries. Migration patterns and spawning activities are studied in diadromous species (especially Twaite shad). In the framework of the LTVS and the updated Sigma Plan, we also follow the evolution of fish concentrations in flood plains with controlled reduced tides and in newly constructed flood plains and wetlands, i.e. compensation measures for the ecological recovery of the estuary.

The LifeWatch team provides technical support to researchers from projects in which it participates (such as LifeWatch, TriAS and the Belgian Biodiversity Platform). This support is mainly focused on the publication of open data and the development of research software. The approach is transparent, international and community oriented, with the aim of making biodiversity research more efficient and reproducible.

The Aquatic Management research team conducts ichthyological research in estuaries. This includes a.o. research into the use and restoration of habitats, migration and migration bottlenecks, effects of pumping stations and hydropower and developing species recovery and management plans (e.g. the Eel Management Plan).

// **Institutional hierarchy**

Government of Flanders

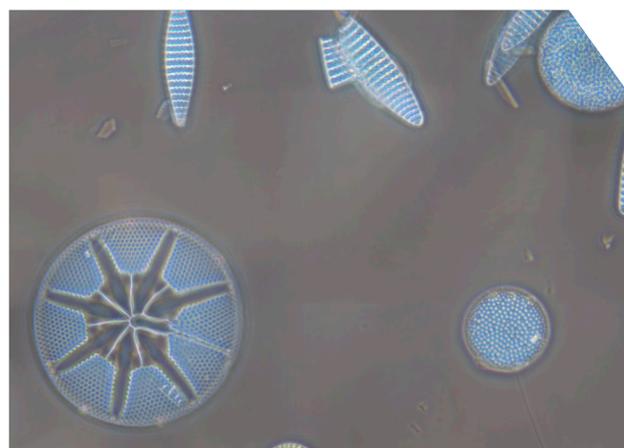
Policy Domain Economy, Science and Innovation

// **Point of contact**

Dr. Steven Dessein

// **Research domain and discipline**

Natural sciences; Biological sciences

**Abstract**

On 1 January 2014, the National Botanic Garden (BGM) of Belgium became the Botanic Garden Meise which is part of the Government of Flanders.

The BGM is a centre of excellence for botanical and horticultural science, plant conservation and education. With a herbarium collection of circa 4 million specimens and a living collection of nearly 25,000 accessions, the BGM is ranked among the largest botanic gardens in the world.

The science at the Garden centres on collection-based studies of plant diversity, biogeography, comparative morphology, evolution and ecology. The research spans a wide array of taxonomic groups, including vascular plants, algae, fungi, lichens and protists. Geographically, the research of the Garden concentrates on temperate Europe (especially Belgium), the palaeotropics (especially Central Africa) and polar regions (mainly Antarctica). The biodiversity research of the Garden forms a platform for plant conservation and sustainable development, in close collaboration with other botanic gardens and conservation organisations. BGM is also dedicated to share its knowledge on plants and their environment to the research community, stakeholders, students and the general public.

The marine research of the institute focuses on algae and fungi. Algal research centres on diversity and evolution of marine macroalgae (green, brown and red algae) and microalgae (mainly diatoms). By combining molecular phylogenetic, morphological, ecological and biogeographical data, BGM explores the historical processes by which algal species arise, diverge ecologically, and come to occupy different habitats and geographic regions. Recently genome-wide sequence data, which are generated by high-throughput sequencing technologies, are employed for systematic and evolutionary research. The diversity of freshwater and brackish water species from islands and African inland saline environments are also part of the research scope. Furthermore, diatoms of the polar regions (mostly Antarctica and sub-Antarctic islands) are an important research domain. The Garden also studies fungi associated to halobiont and/or halotolerant Arthropoda (mainly Coleoptera) from coastal and estuarine environments (incl. salt marshes from the Scheldt and the Zwin). The nature of the brackish environment and the composition of its fungus-infected entomofauna is used as a model for explaining the mechanisms behind specificity, speciation, inter- and intraspecific transmission of these fungi (Laboulbeniales).

// Institutional hierarchy

Government of Flanders

Policy Domain Economy, Science and Innovation

// Point of contact

Prof. dr. Jan Mees

// Research domain and discipline

Natural sciences; Earth sciences

Natural sciences; Biological sciences

Engineering and technology; Information and computer sciences

Social sciences; Communication and media

Social sciences; Political sciences and policy



Abstract

The Flanders Marine Institute (VLIZ) is an autonomous institute with the legal status of a non-profit organisation and was founded in 1999. VLIZ promotes accumulation of marine knowledge and excellence in marine research in Flanders. The marine research areas are the ocean and seas, the coast and the tidal systems. The target groups for knowledge accumulation are the marine research community as well as educational institutions, the general public, policymakers and the industry (within the scope of the blue economy).

The five strategic objectives of VLIZ can be summarised as follows:

- Initiate, support, promote and implement innovative and multidisciplinary marine research for the benefit of, in collaboration with or complementary to Flemish and international marine research groups;
- Promote the national and international image of Flemish marine research;
- Serve as a national and international point of contact in the field of marine research;
- Promote ocean literacy in Flanders and marine research visibility among the general public;
- Provide tailored scientific data, information, knowledge and insights to the Flemish marine research community, the blue economy and policymakers with regard to marine matters.

In order to accomplish its strategic objectives, VLIZ fulfills a number of core activities:

- Supporting marine scientific research by providing research equipment and infrastructure (e.g. research vessel 'Simon Stevin'); operating and managing the VLIZ data center; exhibiting an extensive collection of marine literature in the VLIZ library;
- Combining the scanning for challenges and opportunities for marine research in Flanders with active research, including in collaboration with industry;
- Supporting a sustainable and scientifically founded policy for the coastal zone, the marine areas and the adjacent estuaries by providing policy-relevant products and services to the marine research community, policy makers and industry;
- Managing an information desk sharing qualitative sea-related information with various target groups (young and old, professional and general public, local and international, educational and research community) and in various existing and innovative formats;
- Taking up mandates to represent the Flemish marine research community in the international marine scientific circles, and formal networks related to the Blue Economy;
- Accommodating and supporting international organisations for the Flemish government (UNESCO/IOC Project Office for IODE, EMB secretariat, EMODnet secretariat, JPI Oceans secretariat Brussels);
- (Co-)organising the Flemish contribution to marine research infrastructures of the ESFRI list, such as LifeWatch, ICOS and EMBRC.

// Institutional Hierarchy

Government of Flanders

Policy Domain Economy, Science and Innovation

// Point of contact

ir. Dirk Fransaer

// Research domain and discipline

Natural sciences; Earth sciences

Engineering and technology; Geomatics



Abstract

The Flemish Institute for Technological Research (VITO) is an independent research and consulting center that focuses on innovative technologies and scientific knowledge with applications for governments and industry. VITO develops innovative technological solutions and provides scientifically underpinned advice and support to stimulate sustainable development and strengthen the economic and social environment in Flanders.

The Land Use group performs marine research, concentrating on themes such as 'earth observation' (remote sensing) and 'environmental modelling'. VITO focuses on research on the development and demonstration of image processing algorithms and related models, using (manned and unmanned) airplanes, water platforms as well as satellite observations (optical sensors). During the last 20 years, the Earth Observation department gained broad recognition on a national, European and global level. The research emphasis lies on monitoring and mapping of vegetation, sediment balance, water quality and oil pollution, effects of dredging activities, spatial extension of sediment plumes, etc., with the aim of ensuring better monitoring of environmental processes.

In the framework of environmental modelling research, VITO develops a service concerning hydrological models, water quality modelling, in situ measurements of water quality and quantity, water management and flood risks, social cost-benefit analyses and the determination of ecosystem goods and services. Cooperation agreements were established regarding the planning and implementation of the Sigmaphan, the social cost-benefit analyses in the Scheldt Estuary and Flemish ports, coast lines and coastal protection. VITO has specialised research infrastructure for environmental research in coastal waters and estuaries.

// Institutional hierarchy

Government of Flanders

Flemish Ministry of Mobility and Public Works

Department of Mobility and Public Works

// Point of contact

Prof. dr. Frank Mostaert

// Research domain and discipline

Natural sciences; Earth sciences

Engineering and technology; Civil engineering



Abstract

Flanders Hydraulics Research was founded in 1933, and was initially part of the 'Antwerpse Zeediensten' until 1945. In this year, the institute became a separate research department under the Ministry of Public Works, Administration Waterways and Marine Affairs. In 1989, this entity was integrated in the Ministry of the Flemish Community, which included the merging of Flanders Hydraulics Research with the department of Hydrological Research. Since 2006, the laboratory is a division of the Technical Support Services of the Department of Mobility and Public Works of the Government of Flanders.

Flanders Hydraulics Research is active within four research fields:

- Coast and maritime access;
- Nautical research;
- Water management;
- Hydraulic constructions.

The research of the laboratory is targeted at three main topics:

- Safe and smooth manoeuvring of ships in Flemish ports and on Flemish inland waters;
- Optimisation of hydraulic constructions (ports, locks, dams, dikes, weirs, etc.);
- Developing efficient measures to control exceptional water levels in rivers.

More specifically, Flanders Hydraulics Research performs hydraulic and nautical studies for hydraulic constructions, harbours, rivers, the coast and the environment. The hydrodynamic regime of important non-tidal rivers and canals is also studied, and the laboratory also performs studies which are highly relevant for the management of waterways. The laboratory manages the hydrological monitoring network, is charged with flood risk warning in Flanders, carries out assignments for the agency for Maritime and Coastal Services and performs similar assignments for other Belgian and foreign governmental services as well as for private companies.

Flanders Hydraulics Research disposes of a wide range of research infrastructure, from physical models (wave flume, wave basin, multifunctional test basin, towing tank, current flume, Scheldt and Zeebrugge model), ship simulators, a sediment laboratory to its own applied software. The laboratory also participates in several projects with both Belgian and foreign universities and institutes, with an emphasis on cross-border collaboration regarding the Scheldt Estuary.

Universities and
graduate schools of
the Wallonia-Brussels
Federation



Haute École Paul-Henri Spaak

// Paramedical Department

- Environmental, Occupational Physiology laboratory

/ Environmental, Occupational Physiology laboratory

www.researchgate.net/profile/Costantino_Balestra

// Institutional hierarchy

Haute Ecole Bruxelles-Brabant (HE2B)

Paramedical Department

// Point of contact

Prof. dr. Costantino Balestra

// Research domain and discipline

Medical and health sciences; Medical and health sciences
Natural sciences; Biological sciences



Abstract

The Environmental and Occupational Physiology laboratory is part of the Paramedical department of the Haute école Paul-Henri Spaak. This group conducts research on the physiology in certain environments such as space, confined environments, high-altitude environments, remote areas, hyperbaric environments, etc.

The marine research of this group focuses on the study of the physiology during diving activities. Furthermore, the group is also interested in remote area medicine and wellness as well as preconditioning or training activities. This research field can be applied to seafarers or sailors, submariners, etc.

Université Catholique de Louvain

// Science and Technology Sector

- Marine Biology laboratory
- Applied Mechanics unit
- Institute of Life Sciences
- Georges Lemaître Center for Earth and Climate Research

// Institutional hierarchy

Biology School

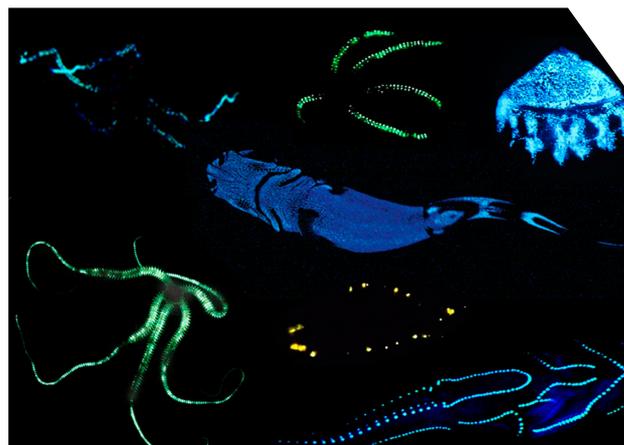
Earth and Life Institute - Biodiversity pole

// Point of contact

Prof. dr. Jérôme Mallefet

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Marine Biology laboratory (BMAR) of the Université Catholique de Louvain mainly studies bioluminescence, but formerly also researched the marine biodiversity on ship wrecks on the Belgian continental shelf. This research unit frequently collaborates with other universities around the world, such as Victoria Museum and the Sydney and Perth Universities (Australia), the University of Bergen and SARS Institute (Norway), Goteborg and Lund Universities (Sweden), Otago University (New Zealand), University of California - Santa Barbara Campus (USA), Ryukyus and Hiroshima Universities, Churashima Research Center (Japan), Arago laboratory and the Observatoire de Roscoff (France). The group is also part of the Interuniversity Center for Marine Biology (CIBIM).

The laboratory conducts research (physiology, eco-ethology, morphology, molecular biology) on the following marine topics:

- Biodiversity of bioluminescence;
- Bioluminescence in echinoderms and sharks;
- The control mechanisms, functions and evolution of bioluminescence;
- Origin of marine luminous compounds;
- Bioluminescence on the pelagic ringworm *Tomopteris*.

// Institutional hierarchy

Louvain School of Engineering

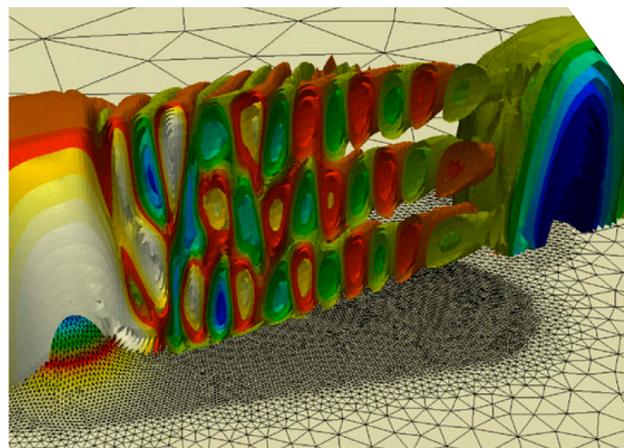
Institute of Mechanics, Materials and Civil Engineering

// Point of contact

Prof. dr. ir. Eric Deleersnijder

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Applied Mechanics unit (MEMA) of the Université Catholique de Louvain studies the theoretical prediction of the behaviour of solids and fluids using mathematical models and computer simulation techniques. Also, research is conducted regarding fluid mechanics, solid mechanics, simulation of industrial processes and numerical methods, as well as algorithms for scientific computations.

Within the marine field, the group performs modelling of ocean circulations, sea level variations and ice dynamics by means of various models (e.g. SLIM and CART). The SLIM-model is *inter alia* applied on the Scheldt river - estuary - sea continuum.

// Institutional hierarchy

Science and Technology Sector

// Point of contact

Prof. dr. Jean-François Rees

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Institute of Life Sciences (ISV) of the Université Catholique de Louvain performs biological research using molecular and cellular methods. This research is applied on animals, plants, microorganisms as well as on biomolecules. Within the research group Biology of Nutrition and Environmental Toxicology, marine related research is conducted on the following topics:

- The influence of pollutants such as PCBs on antioxidant enzymes in the muscles and liver of deep-sea fish;
- Antioxidant mechanisms of animals in the proximity of hydrothermal vents and other deep-sea fish;
- The toxicokinetics and physiological effects of organic contaminants on marine mammals such as seals;
- Effects of multiple stress (nutrition and pollution) in aquatic organisms, from molecular to ecosystem approach.

// Institutional hierarchy

Science and Technology Sector

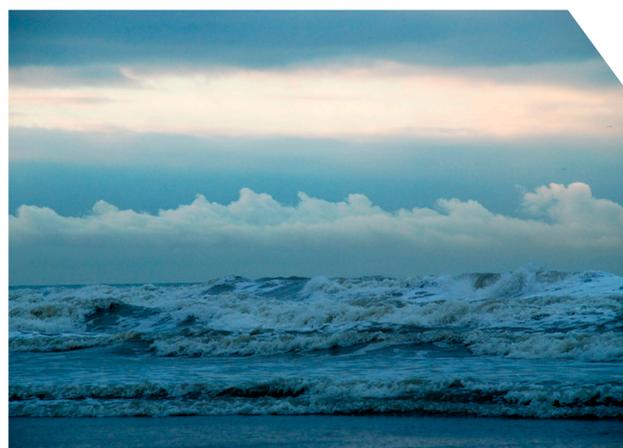
Earth and Life Institute

// Point of contact

Prof. dr. Hugues Goosse

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Lemaître Centre for Earth and Climate Research (TECLIM) of the Université Catholique de Louvain aims to understand the functioning of the Earth system, with a focus on climate and the relationship between human activities and the natural environment. The four main research themes of the centre involve past climate, the current state of the earth and solar system, human-environment interactions and modelling.

The marine-related research of TECLIM concerns climate, sea-ice and ocean models (e.g. LIM, SLIM and CART). These models are applied on various systems at global scale, in polar regions, for the Scheldt Estuary and the Great Barrier Reef.

Université Libre de Bruxelles

// Faculty of Sciences

- Biogeochemistry and Earth System Modelling group
- Research group Marine Biology
- Laboratory of Systems Ecology and Resource Management
- Glaciology unit
- Laboratory G-Time

// Faculty of Applied Sciences / Brussels Polytechnic School

- Environmental Hydroacoustics Lab

// Interfaculty School of Bio-engineering

- Laboratory of Ecology of Aquatic Systems

// Institutional hierarchy

Faculty of Sciences

Departement of Geosciences, Environment and Society

// Point of contact

Prof. dr. Lei Chou

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Biogeochemistry and Modelling of the Earth System (BGéoSys) research group of the Université Libre de Bruxelles has expertise in a range of research fields, from the biogeochemistry of continental and marine systems, the kinetics of 'water - rock - microorganism' processes to the modelling of the Earth system. The group focuses mainly on the carbon and nutrient cycles and on their role in shaping the present and past climates on Earth.

More specifically, the research concentrates on the following topics:

- Modelling of the Earth system;
- Hydrological and biogeochemical cycles (C, N, P, Si, S, Fe): weathering, land - ocean - atmosphere exchange, marine (bio)geochemistry, benthic hypoxia, early diagenesis and sedimentology;
- Geochemistry of contaminants (heavy metals, N, P) in aquatic and soil systems;
- Geomicrobial processes at the 'water - rock - microorganism'-interface (i.e. fungi and bacteria);
- Carbon and nitrogen cycles, green-house gases (CO₂, CH₄, N₂O), ocean acidification, marine calcification and climate, marine biological nitrogen fixation;
- Biogeochemical and geomicrobial dynamics in the sedimentary systems;
- Palaeoenvironments and palaeoclimate: archiving and tracing of processes in geological records;
- Water and fossil fuels resources.

// Institutional hierarchy

Faculty of Sciences

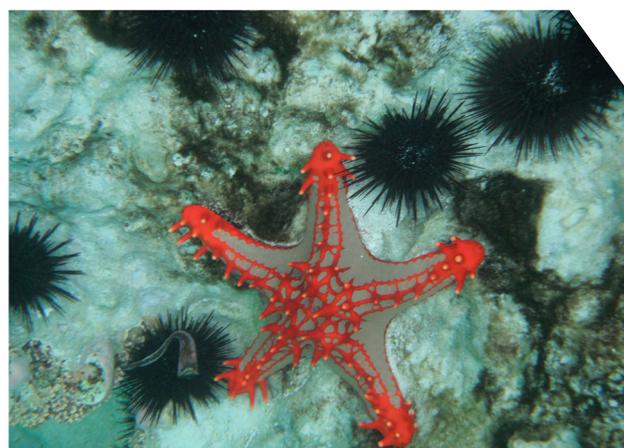
Department of Biology of Organisms

// Point of contact

Prof. dr. Philippe Dubois

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research group Marine Biology (BIOMAR) of the Université Libre de Bruxelles focuses on the bio-ecology of marine benthic invertebrates, especially echinoderms. The following aspects are studied: aquaculture, biodiversity, biogeography including modelling approaches, biomineralisation, development, ecotoxicology, ecophysiology (including energetics), general biology, nutrition, reproduction and symbioses. Research is conducted in both temperate, tropical and Antarctic regions.

The research group is a partner in the Interuniversity Center for Marine Biology (CIBIM).

// Institutional hierarchy

Interfaculty School of Bio-engineering

// Point of contact

Prof. dr. Pierre Servais

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The laboratory of Ecology of Aquatic System (ESA) of the Université Libre de Bruxelles focuses on the study and modelling of the structure and functioning of aquatic systems and their response to natural and anthropogenic changes. For this study, field observations, process level studies under laboratory-controlled conditions and numerical experiments are combined. ESA participates in federal and European marine research projects on advanced modelling and research on eutrophication and has expertise in the optical remote detection of substances in coastal waters.

Overall, ESA performs research on the role of oceans as a buffer in global climate change, aquatic microbial ecology, eutrophication of coastal waters and on toxic and harmful algal blooms, especially *Phaeocystis*.

// Institutional hierarchy

Faculty of Sciences

Department of Biology of Organisms

// Point of contact

Prof. dr. Farid Dahdouh-Guebas

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The laboratory of Systems Ecology and Resource Management of the Université Libre de Bruxelles was founded in 2007. This research group seeks to understand and to predict how and why spatial and temporal dynamics in vegetation and landscape occur, and what the effects are on their ecosystem functions, goods and services. The main focus is on (sub)tropical vegetation and especially on mangrove ecosystems. The lab works in close collaboration with the laboratory of Plant Biology and Nature Management of the Vrije Universiteit Brussel and is the general coordinator of the Erasmus Mundus Masters Course in Tropical Biodiversity and Ecosystems. The group has already published its research in renowned journals such as 'Science' and 'Current Biology'.

In the marine domain, the group focuses on mangroves, with links to neighbouring ecosystems such as coral reefs. The laboratory adopts a retrospective approach, using relevant methods from different disciplines (tropical botany, very high resolution remote sensing and ground truthing, socio-ecological survey research, historic archive research, etc.) and integrative analyses (using GIS, multivariate and multicriteria analyses, etc.), in order to generate outputs relevant for a fundamental understanding of ecosystem functioning (status, resilience), for forecasting changes and for ecosystem management (preservation, restoration ecology). Within this social-ecological framework, the group is also interested in changes in biodiversity and in climate, and on ecological and ethological plant - animal and man - ecosystem interactions. Research is conducted on variable spatial scales from local case-studies in several American, African and Asian countries to global macroecological scales.

// Institutional hierarchy

Faculty of Sciences

Department of Earth Science and Environment

// Point of contact

Prof. dr. Frank Pattyn

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Glaciology unit of the Université Libre de Bruxelles focuses on the study of glaciers and ice caps and their relationship with the climate system. The laboratory has expertise in the development of numerical ice cap models. Validation of these models is performed using land and airborne geophysics, including radio-echo sounding. The field work concentrates on polythermal glaciers and Antarctica. The group also focuses on properties of ice, such as the physicochemical properties of 'interface ice' (ice - bedrock; ice - ocean; ice - atmosphere). This expertise is based on polar expeditions and on the development of analytical techniques for the multiparametric study of ice rich in solid or liquid impurities.

The marine component of the research is related to the study of the dynamics of calving ice caps and the contribution of their melting to the sea level rise. Furthermore, the unit also investigates biogeochemical cycles in sea ice and polar oceans (interaction with atmosphere).

The research group has several publications in the renowned journal 'Nature' and is involved in several national and international marine projects such as the Ice2sea project (to assess the contribution of continental ice to the rising sea level) and the SIBCLim project, which focuses on how ice in polar seas influences the Earth's climate.

// Institutional hierarchy

Faculty of Applied Sciences / Polytechnic School

Laboratories of Image, Signal processing and Acoustics

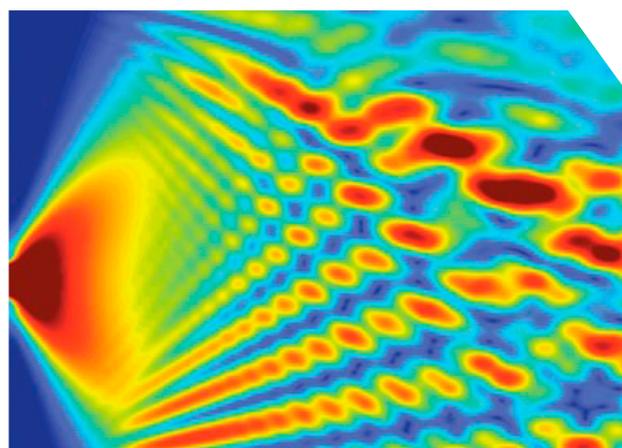
// Point of contact

Prof. dr. Jean-Pierre Hermand

// Research domain and discipline

Natural sciences; Biological sciences

Natural sciences; Earth sciences



Abstract

The laboratory carries out fundamental and applied research on the characterisation of marine/aquatic environments and ecosystems primarily by remote, active and passive acoustic sensing, but also by optical sensing. Since its creation, the lab has been participating in international interdisciplinary projects, primarily on global environmental issues, and has been conducting field experiments at sea on a regular basis in different parts of the world.

Current research includes the following topics:

- Use of acoustics to improve our understanding of pelagic and benthic ecosystems;
- Integrated acoustic monitoring of marine habitats to assess primary production and biodiversity (seagrass meadows in the Mediterranean; kelp forests off Tasmania);
- Non-invasive acoustic investigation of fluid mud dynamics and associated processes in estuarine and coastal environments (e.g. Amazon River mouth);
- Design and field testing of submersible digital holographic microscopy for in situ observation of plankton and particles in fisheries surveys (West Africa);
- Passive acoustic sensing of sediment transport in lagoons and coastal environments (e.g. Venice, North Sea beach);
- Acoustic exploration of submarine archaeological sites and geoacoustic characterisation of cultural layers;
- Feature-based acoustic tomography of shelf and coastal ocean processes (Ushant tidal front, Northwest France; deep thermal front, Southeast Brazil);
- Comprehensive assessment of marine sediments by combining hydrographic surveying and geoacoustic inversion (e.g. Caribbean, Mediterranean);
- Development of passive acoustic systems for the characterisation of surface sediment and subsurface layers.

As part of research projects, the group develops methods and algorithms to solve a variety of data assimilation and inverse problems, pioneering the application of optimal control theory and Bayes statistics. Modelling acoustic propagation and scattering to support offshore experiments including the development of approaches for complex media and multiphase materials are core activities of the lab. For some materials, e.g. flint and biological tissue, ultrasonic measurement techniques are developed to determine intrinsic acoustic properties on samples from expeditions. Sedimentological and lithostratigraphic analyses of short sediment cores are carried out in partnership with STEP, ULB and foreign labs. The lab has a well-developed expertise in applying advanced signal processing to sound propagation measurement, soundscape recording, e.g. ship-radiated noise and biological sound production, raw backscatter data from scientific single or multibeam echosounders. Through extensive offshore experimentation, the lab has consolidated expertise in the development of acoustic and oceanographic sensor packages specifically conceived to efficiently fulfill each project's scientific objectives. The staff and partners of the lab are specialised in acoustics, geophysics, marine biology and ecology, applied mathematics, signal and image processing and ocean engineering.

// Institutional hierarchy

Faculty of Sciences

// Point of contact

Prof. dr. Nadine Mattielli

// Research domain and discipline

Natural sciences; Chemical science

Natural sciences; Earth sciences



Abstract

The laboratory G-Time (Geochemistry: Tracing with Isotopes, Minerals and Elements) of the Université Libre de Bruxelles (ULB) was founded in 2001 and was formerly known as the research unit IPE 'Isotopes: Petrology and Environment'. This group conducts research, by means of isotopic measurements, on metal biogeochemical cycles, igneous and sedimentary petrology, palaeoenvironmental reconstruction, and inter-laboratory comparison and isotopic characterisation of standard reference material. Within this scope, the group is specialised in non-traditional stable isotopes such as Fe, Zn, Cu, Cd, etc.

The research group works in close collaboration with other laboratories of the ULB, Université Catholique de Louvain, University of Liège, Royal Museum for Central Africa and the Royal Belgium Institute of Natural Sciences. The group also collaborates with international institutes from France (Toulouse, Grenoble, Lille), the Netherlands (Royal Netherlands Institute for Sea Research), United Kingdom (Oxford), Canada (PCIGR), Portugal, etc.

University of Liège

// MARE Cluster

// Faculty of Veterinary Medicine

- Department of Morphology and Pathology

// Faculty of Sciences

- Centre for Protein Engineering
- Animal Ecology and Ecotoxicology laboratory
- GeoHydrodynamics and Environmental Research group
- Functional and Evolutionary Morphology laboratory
- Chemical Oceanography unit
- Laboratory of Oceanology
- Palaeobiogeology, Palaeobotany and Palaeopalynology laboratory
- Sedimentary Petrology laboratory
- Laboratory of Animal Physiology

// Faculty of Applied Sciences

- Research unit Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis
- Mathematical Modelling and Methods

// Gembloux Agro-Bio Tech

- Microbiology and Genomics unit

// Point of contact

Prof. dr. Jean-Marie Beckers

Prof. dr. Nathalie Fagel

// Number of partners

20

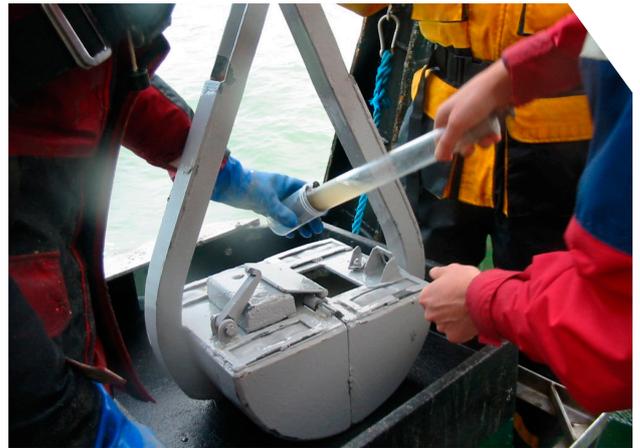


Abstract

The Interfaculty Center for Marine Research of Liège University (MARE) is composed of 20 research groups from 4 faculties (Applied Sciences; Law; Sciences; Veterinary Medicine) conducting both applied (hydrography, marine hydrodynamics, coastal and offshore engineering) and fundamental sciences (marine chemistry, biology and geosciences).

The MARE Group aims to coordinate interdisciplinary research at the different study sites throughout the world ocean by providing a better integration between teams, as well for field work as for modelling. The cluster aims to organise multidisciplinary cells of expertise in order to respond to community requests.

MARE maintains, supports and enlarges the extant set of Master level teaching (Master in Oceanography, Erasmus Mundus Master MER), of a Doctoral School, and of international Conferences and Colloquia (the International Liège Colloquium on Ocean Dynamics and associated Symposia). The latter allow valorisation at national, European and international level of research in the field of identification and knowledge of the fundamental problems that man will face in the future.



Partners

Law Faculty

- Unit of International Economical Law*

Faculty of Veterinary Medicine

- Department of Morphology and Pathology

Faculty of Sciences

- Aquarium Dubuisson*
- Geochemistry and Sedimentary Environments research unit*
- Laboratory of Climatology*
- Centre for Protein Engineering
- Laboratory of Genetics and Physiology of Microalgae*
- GeoHydrodynamics and Environmental Research group
- Geomatics unit*
- Unit for Modelling of Climate and Biogeochemical Cycles*
- Modelling for Aquatic Systems*
- Functional and Evolutionary Morphology laboratory
- Chemical Oceanography unit
- Laboratory of Oceanology
- Laboratory of Petrology, Geochemistry and Petrophysics*
- Mass Spectrometry laboratory*
- Laboratory of Systematics and Animal Diversity*

Faculty of Applied Sciences

- Research unit Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis
- Laboratory of Hydrogeology*
- Mathematical Modelling and Methods

*No marine research group

Research unit Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis

www.anast.ulg.ac.be

// Institutional hierarchy

Faculty of Applied Sciences

Department of Agriculture, Geology, Environment and Construction

Structural Engineering Division

// Point of contact

Prof. dr. ir. Philippe Rigo

// Research domain and discipline

Engineering and technology; Civil engineering



Abstract

The research group Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis (ANAST) of the University of Liège studies multiple aspects of shipping. The research activities of this group concentrate on shipbuilding, maritime transport, modelling of river/maritime and intermodal transport, telematics applied to the management of navigation material, the development of an integrated application software (CAD-CAE) for shipbuilding, optimisation of naval and floating structures, technical-economic comparative analyses on transport modes (incl. intermodality), the development of a transport plan, mathematical modelling of future traffic flow, testing techniques after optimisation in the towing tank, naval hydrodynamics and production simulation (space, flow).

The marine topics studied by this research unit are:

- Shipbuilding and the development of an integrated application software (CAD-CAE) for ship building;
- Development and optimisation of offshore wind turbines (WindSteel, EOL-OS, etc.);
- Development of a real-time and powerful asset integrity management system for offshore wind farms and an adaptive maintenance strategy (HLC-AIMS).

The research group collaborates with many institutes and universities worldwide and participates in several European and international research projects.

// Institutional hierarchy

Faculty of Sciences

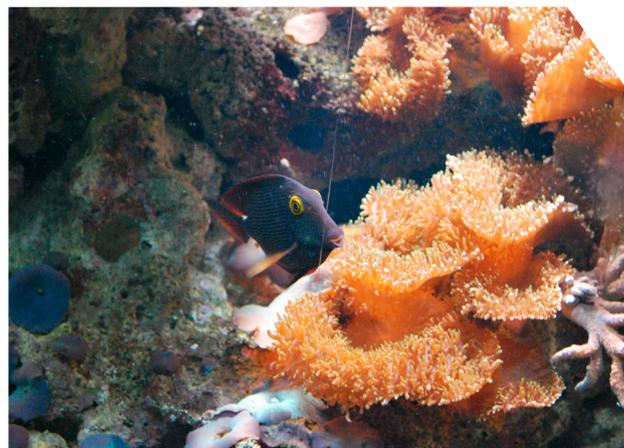
Department of Biology, Ecology and Evolution

// Point of contact

Dr. Matthieu Poulicek

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Animal Ecology and Ecotoxicology laboratory (LEAE) of the University of Liège was founded in 1967 under its former name 'laboratoire de Morphologie, Systématique et Écologie Animales'. The laboratory studies freshwater ecology, marine ecology and ecotoxicology. The former research theme includes the study of the relationship between different plankton species and food selection by the rotifera *Brachionus calyciflorus*. The ecotoxicological focus includes the study of the effect of pollution on an ecosystem and the impact of pollutants on organisms. Furthermore, a central ecotoxicological research theme concerns the study of the endocrine disruption in freshwater invertebrates, with molluscs, rotifers and crustaceans as model organisms and based on proteomic and genomic approaches. The experiments and analyses were performed in the laboratory, as well as in natural ecosystems. LEAE is also specialised in the analyses of organic micropollutants in environmental matrices (water, sediments, organisms). In addition, the group is involved in epidemiological studies in order to evaluate the impact of several xenobiotics on human health in the French Antilles (chlordecone and POPs).

The Marine Ecology unit of the Animal Ecology and Ecotoxicology laboratory performs research on:

- Mediterranean ecosystems: the study of marine bacteria and the impact of ecological changes on those microorganisms, and the changing behaviour of red weeds caused by (human-induced) changes in their environment;
- Coral ecology: the study of the contribution of bacteria and an increasing temperature in the coral bleaching process as well as the study of marine microbial communities associated with corals;
- Malacology: systematics and ecology of molluscs.

The Marine Ecology unit collaborates with several French and Monégasque institutes in the BioCoB project, studying biomarkers for coral bleaching. The unit also participates within the research center STARESO ('Station de Recherches Sous-marines et Océanographiques') on Corsica. Here, benthic and pelagic ecosystems are studied, as well as temporal changes (associated with climate change) in plankton and other organisms. This research is conducted in order to predict how the marine system will respond to future changes.

// Institutional hierarchy

Faculty of Sciences

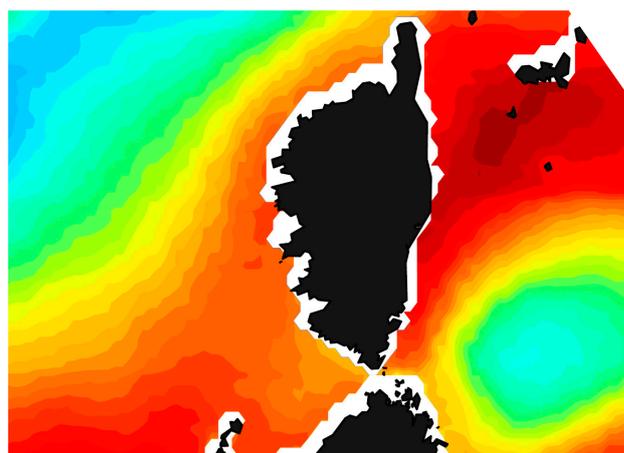
Department of Astrophysics

// Point of contact

Prof. dr. Jean-Marie Beckers

// Research domain and disciplines

Natural sciences; Earth sciences

**Abstract**

The Geohydrodynamics and Environmental Research group (GHER) of the University of Liège was formerly known as 'unité d'Océanographie Physique'. The group focuses on marine and environmental studies and modelling.

In the 70s, in the framework of 'Project Sea', the GHER participated in the study of many different marine sites such as the North Sea, the Black Sea, the Aral Sea, the South China Sea, the Bering Sea, the Persian Gulf and the Mediterranean Sea. Current research activities focus on the merging of statistical data analyses and modelling into assimilated approaches, such as nested coastal models. Model verification using wavelets and other advanced statistical tools is another research focus, as well as cloud filling based on empirical orthogonal functions.

The research group participates in many European projects, such as EROS2000 and EUROMODEL, resulting in the Mediterranean 3D primitive equation hydrodynamic models, and MERMAIDS, MODB, MEDAR and SeaDataNet (in which the oceanographic data base and data analysis tools were elaborated). Furthermore, the GHER team is also responsible for the organisation of the annual International Liège Colloquium on Ocean Dynamics.

// Institutional hierarchy

Faculty of Sciences

// Point of contact

Prof. dr. Paulette Charlier

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Center for Protein Engineering (CIP) is a multidisciplinary research Center of the University of Liège, Belgium. The Center provides complementary approaches for the analysis of structure and function relationships of proteins. Nine closely interacting research teams constitute the framework of the center offering cutting-edge expertise, from isolated proteins to integrated cellular networks, with special reference to antibiotic resistance. Furthermore, CIP also manages two technological platforms for protein expression, purification and analysis, which are both accessible to academic and commercial partners. Since 2011, the CIP is hosting the BCCM/ULC public culture collection of cyanobacteria. It is a member of the Belgian Coordinated Collections of Microorganisms and has received an ISO9001 certification for the public deposits and distribution. Moreover, it proposes services like training or molecular characterisations of cyanobacteria. There are a few marine strains in the collection already.

The marine research is mainly conducted in two divisions: Biochemistry of Extremophiles and Cyanobacterial Diversity, Phylogeny and Biogeography (e.g. planktonic cyanobacteria forming toxic blooms in surface waters and biogeography of polar cyanobacteria (Antarctic and Arctic)). A. Wilmotte is also involved in the environmental protection of the Antarctic.

// Institutional hierarchy

Faculty of Applied Sciences

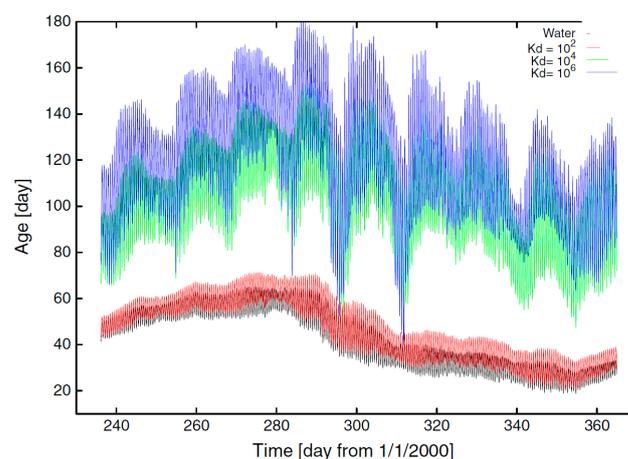
Aerospace and Mechanical Engineering Department

// Point of contact

Prof. dr. ir. Eric Delhez

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The research group Mathematical Modelling and Methods of the University of Liège was founded in 1999, and originates from the research group Geohydrodynamics and Environmental Research (GHER), which still exists. The group mainly concentrates on the development of numerical and mathematical models. The marine research topics of this group include:

- The development of diagnostic instruments;
- Numerical modelling of ocean hydrodynamics;
- Mathematical modelling of hydrodynamic and biogeochemical processes of the ocean, sediment dynamics and transport of heavy metals.

Microbiology and Genomics unit

www.gembloux.ulg.ac.be/microbiologie-et-genomique

// Institutional hierarchy

Gembloux Agro-Bio Tech

Department AGROBIOCHEM

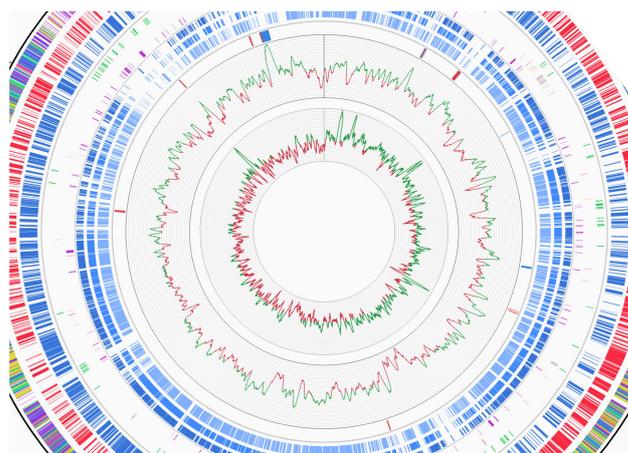
// Point of contact

Prof. dr. Micheline Vandenberg

// Research domain and discipline

Natural sciences; Biological sciences

Engineering and technology; Biotechnology



Abstract

The Microbiology and Genomics unit has over 30 years of experience in the field of physiology, classical and molecular genetics of microorganisms, especially yeast *Saccharomyces cerevisiae*. Recently, the laboratory has also focused on metagenomics and metatranscriptomics applied to microorganisms which colonise different ecosystems (forest or agricultural soil, digestive fluids of insects or mammals, water from ponds or wastewater treatment plant, microflora of seaweed, etc.). This approach makes it possible to find new enzymes with new functional properties which are better adapted to agro-industrial applications, but also to better understand the interaction of microbial communities (bacteria and fungi) with their environment.

The marine aspect of the research focuses on enzymes produced by marine microorganisms and more particularly by those living in symbiosis with algae.

// Institutional hierarchy

Faculty of Veterinary Medicine

// Point of contact

Prof. dr. Thierry Jauniaux

// Research domain and discipline

Agricultural and veterinary sciences; Veterinary sciences



Abstract

The marine research of the department of Morphology and Pathology of the University of Liège focuses on the pathology of seabirds and marine mammals, fish diseases, the diagnosis of animal diseases, microorganism identification and animal health. Since 1991, more than 1,500 necropsies have been performed on marine mammals stranded on the Belgian, Northern France and Dutch coastlines, which include more than 20 large cetaceans such as sperm whales *Physeter macrocephalus*, humpback whales *Megaptera novaeangliae*, fin whales *Balænoptera physalus* and minke whales *Balænoptera acutorostrata*.

Within the marine domain, this group conducts research on the following topics:

- The quality of life of populations of harbour porpoises and harbour seals in the Northeast Atlantic (focusing on genetic and ecological aspects);
- The causes of death of marine mammals and the health of their populations;
- Diagnosis of animal diseases;
- The effect of pollutants on marine mammals.

The group will expand its focus on (1) zoonotic pathogens infecting animals (marine top predators) and humans, (2) the role of parasites and parasite intermediate hosts and (3) the impact of pollutants on marine mammal diseases. Some challenges faced by the group include the creation of new partnerships from which to obtain animal samples, the expansion of the Belgian Marine Mammal Biobank to a European level, the improvement of microorganism identification methodologies, the European standardisation of post-mortem investigations and the diagnosis of animal diseases.

The department participates in several national and international programmes and collaborations focusing on stranded marine mammals in order to investigate their cause of death, examine the role of pathogens and pollutants and to improve their protection.

// Institutional hierarchy

Faculty of Sciences

Biology, Ecology and Evolution Department

// Point of contact

Prof. dr. Eric Parmentier

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The complexity of biodiversity is so high that its understanding requires a multidisciplinary approach and a variety of techniques in the fields of biology, mathematics and physics. By combining comparative and experimental methods, studies in the laboratory and in the field, the Functional and Evolutionary Morphology laboratory aims to tackle different kinds of biological questions using morphology as a common basis. The laboratory has a long-standing tradition in the study of fish musculo-skeletal systems in Teleosts and in arthropod skeletal structures. Different projects are currently in development:

- The biodiversity of sound production mechanisms, the related behaviours, the meaning of the calls and hearing abilities in teleost fishes;
- The mechanisms and the dynamics of evolutionary diversification in different fish taxa;
- The biology of deep-sea arthropods.

From a practical point of view, the current research includes the following marine topics:

- Understanding of the relationships between Carapidae fish (Ophidiiformes) and their invertebrate hosts (sea cucumber, sea star, bivalve, etc.);
- Study of the different factors explaining the biodiversity of Pomacentridae;
- The acoustic communication and mechanisms in different teleost taxa;
- Use of sound communication in aquaculture;
- Coral reef monitoring using passive acoustics.

The research unit cooperates closely with several universities and scientific institutes on a national and an international level.

// Institutional hierarchy

Faculty of Sciences

Department of Astrophysics, Geophysics and Oceanography

// Point of contact

Dr. Alberto Vieira Borges

// Research domain and discipline

Natural sciences; Chemical sciences

Natural sciences; Earth sciences



Abstract

The Chemical Oceanography unit of the University of Liège originates from the Oceanology laboratory and became an independent research unit within the department of Astrophysics, Geophysics and Oceanography in 1996. The research group studies biogeochemical cycles in oceans, coastal zones and estuaries, from tropical to polar environments, with an emphasis on greenhouse gases such as CO₂, CH₄, N₂O and dimethyl sulfide (DMS). Key events since the establishment of the group include a publication in the renowned journal 'Science' about CO₂ emission from European estuaries (Frankignoulle et al., 1998 - Science), a publication on the first synthesis of CO₂ fluxes in coastal environments (Borges, 2005 - Estuaries), a publication on the first estimates of gas exchange between sea ice and the atmosphere (Delille et al., 2007 - Limnology and Oceanography) and the first measurements of CO₂ fluxes by eddy-covariance on Antarctic sea ice.

Within the marine and estuarine fields, this group performs research on the biogeochemistry of different systems, such as the Scheldt Estuary, the Belgian coastal zone, the North Sea, the Bay of Biscay, Iberian coastal upwelling systems, the Mediterranean Sea, mangrove ecosystems, tropical estuaries, sea ice (Arctic and Antarctic) and the Southern Ocean. Biogeochemistry studies are also performed on coccolithophores, *Posidonia oceanica* meadows and macrophyte coastal habitats. The group also studies the effects of ocean acidification on marine biogeochemistry, the global synthesis of CO₂ fluxes in continental shelves and the global synthesis of CO₂ and CH₄ fluxes in estuaries. In the future, the Chemical Oceanography unit will continue to study greenhouse gases with a particular emphasis on establishing long-term time series.

The Chemical Oceanography unit collaborates with some renowned national and international universities and institutes such as the Vrije Universiteit Brussel, KU Leuven University, Université Libre de Bruxelles, Bordeaux-I (France), the Royal Netherlands Institute for Sea Research (NIOZ) and the Dalhousie University (Canada). The research group also participates in several marine research projects, such as the European COCOS-project (to improve the exchange of datasets between projects), CARBO-OCEAN (concerning an integrated assessment of marine carbon sources and sinks), PEACE (role of pelagic calcification and export of carbonate production in climate change) and the CANOPY-project (to assess the potential role of the Southern Bight of the North Sea and the heavily polluted estuarine plumes, as sources or sinks of atmospheric CO₂).

// Institutional hierarchy

Faculty of Sciences

Biology, Ecology and Evolution Department

// Point of contact

Prof. dr. Sylvie Gobert

// Research domain and discipline

Natural sciences; Earth sciences

Natural sciences; Biological sciences



Abstract

The laboratory of Oceanology of the University of Liège studies a variety of topics such as seagrass ecology, trophic ecology, marine ecotoxicology, the development of tools for the detection of pollution, coastal management, understanding of short- and long-term plankton variability and stable isotopes applications.

This research unit published studies related to the following marine topics:

- Seagrass ecology;
- The ecotoxicology of marine vertebrates (trace element, organic and emergent pollutants);
- The use of stable carbon and nitrogen isotopes in animal and plant ecology;
- Long-term study of Mediterranean phyto- and zooplankton, including jellyfishes;
- Use of planktonic and benthic ecosystem as indicators of water quality;
- Macrophytodetritrus dynamic and ecology.

Many projects are linked to the oceanographic station STARESO (ULg) and therefore take place in the Mediterranean, but reserach is also conducted in the north temperate zone (Northern Atlantic, North Sea), Arctic, Southern Ocean and West Indian Ocean.

The laboratory has participated in national and international projects dealing with oceans such as the European (FP7) project SESAME (assessing and modelling ecosystem changes of Mediterranean and Black Sea ecosystems), the Belspo project PEACE (to study the role of pelagic calcification and export of carbonate production in climate change) and the European MEDSEA project (dealing with Mediterranean Sea acidification due to the changing climate). The laboratory is participating to the VERSO (ecosystem responses to global change) and RECTO (refugia and ecosystem tolerance) projects (Brain-Be, BELSPO) which focus on the Southern Ocean and the FNRS project COBICO (conservation biology of black corals, Madagascar). Our team is involved in the Science education project "Marine Mammals science education" funded by EU. The research group collaborates with many institutes in and outside Belgium. The laboratory is involved in the Master Erasmus Mundus MER as main partners and in the Master Erasmus Mundus IMBRSea as Associated partner.

/ Palaeobiogeology, Palaeobotany and Palaeopalynology laboratory

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// Institutional hierarchy

Faculty of Sciences

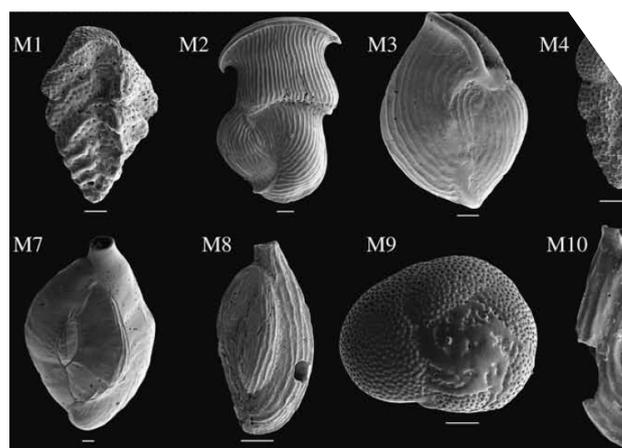
Department of Geology

// Point of contact

Prof. dr. Emmanuelle Javaux

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Palaeobiogeology and Astrobiology team of the Palaeobiogeology, Palaeobotany and Palaeopalynology laboratory (PPP) performs research on the evolution of the early biosphere in marine environments, with emphasis on the topics palaeobiogeology (the study of the early traces and evolution of life and the evolution of the interaction between the biosphere and the geosphere during the Precambrian) and astrobiology (biosignatures and habitability).

PPP studies the following marine topics:

- Evolution of the Precambrian biosphere (4 to 0.5 billion years ago) in relation with environmental changes (redox conditions, glaciations, tectonics, nutrient availability, etc.);
- Origin, evolution, palaeobiology and palaeoecology of early eukaryotes and diversification of prokaryotes, in particular cyanobacteria;
- Macro- to nano-scale analyses (microscopy, microchemistry) of fossilisation processes and determination of biological affinities of microfossils;
- Geobiology: microbial mats in siliciclastics from recent extreme environments (Antarctica) to the Precambrian (prokaryotes and protists) and preservation of biosignatures (diagenesis, metamorphism);
- Characterisation of biosignatures for palaeobiology and astrobiology.

// Institutional hierarchy

Faculty of Sciences

Department of Geology

// Point of contact

Prof. dr. Frédéric Boulvain

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Sedimentary Petrology laboratory of the University of Liège mainly studies Palaeozoic and Mesozoic carbonate-containing sediments. The research topics studied include reef and littoral sedimentation processes, basin dynamics, magnetic susceptibility, microbiological interference with sedimentation and diagenesis of carbonates.

Research topics related to the marine field are:

- Sedimentation processes and variations in magnetic susceptibility of sediments in order to reconstruct the palaeoenvironment. Changes in magnetic susceptibility are also used to detect sea level variations;
- Palaeozoic and Mesozoic coral reefs, mounds and atolls.

This group collaborates closely with the Royal Belgian Institute for Natural Sciences (RBINS).

// Institutional hierarchy

Faculty of Sciences

Department of Biology, Ecology and Evolution; UR InBios

// Point of contact

Prof. dr. Jean-Christophe Plumier

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The laboratory of Animal Physiology studies the effects of oxidative stress on tissue organisation and dynamics as well as on cell physiology of symbiotic cnidarians (reef-building corals, sea anemones, jelly-fishes) and examines strategies to improve the functional recovery following tissue damage.

University of Mons

// Faculty of Sciences

- Laboratory of Biology of Marine Organisms and Biomimetics
- Numerical Ecology of Aquatic Systems group
- Proteomic and Microbiology unit

/ Laboratory of **Biology of Marine Organisms and Biomimetics**

www.bio-mar.com

// Institutional hierarchy

Faculty of Science

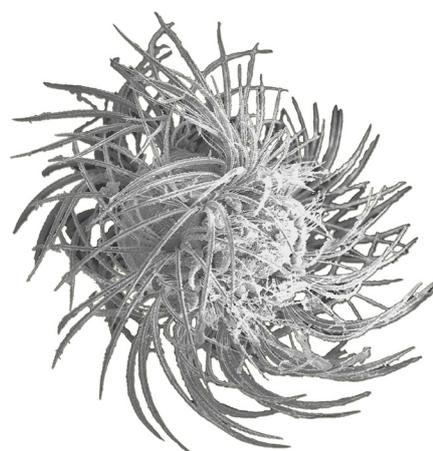
Department of Biology / Research Institute for Biosciences

// Point of contact

Prof. dr. Igor Eeckhaut

// Research domain

Natural sciences; Biological sciences



Abstract

The research carried out within the Biology of Marine Organisms and Biomimetics unit focuses on three main axes: (1) socio-ecological aquaculture, (2) symbiosis and diseases and (3) biological materials and biomimetics. 'Socio-ecologic aquaculture' research addresses issues on aquacultures, particularly sea cucumber, algae and coral aquacultures, of which certain stages can be managed by poor coastal communities. Historically, the group experienced great success with the development of sea cucumber aquaculture and most of their aquaculture related publications deal with this subject. Particular interest has been paid to the development of a method to allow cultivation of sea cucumbers in locally managed farms all year round. This method is patented since 2002, which led to the development of Madagascar Holothurie SA in 2008, the first trade company based on sea cucumber aquaculture in Madagascar. In 2013, the group opened the Polyaquaculture Research Laboratory in Madagascar in collaboration with the Halieutic Institute and Marine Science of the University of Toliara.

The 'symbiosis and diseases' axis performs research on parasitic, commensal or mutualist relations of marine organisms. The life cycle, etiology and phylogeny of symbiotic prokaryotes and various symbiotic eukaryotes (e.g. ctenarians, flatworms, polychaetes, myxozoa, molluscs, echinoderms, fish) are studied in order to better understand the factors affecting or regulating the symbiotic interactions including those in diseases. A variety of analytic methods are used and include electron microscopy (TEM and SEM), DNA phylogeny and mass spectrometry.

The 'biological materials and biomimetics' approach focuses on the different protein-based biomaterials with a special emphasis on adhesion mechanisms developed by marine invertebrates. The aim of this research is to gain a detailed knowledge of biological adhesives in order to develop synthetic counterparts. The adhesive systems of marine organisms differ by their mode of operation, their structure and the characteristics of their adhesive proteins. They are therefore complementary biological models for the study of bioadhesion in the marine environment.

The unit is part of the Interuniversity Center for Marine Biology (CIBIM).

/ Numerical Ecology of Aquatic Systems group

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// Institutional hierarchy

Faculty of Sciences

Department of Biology / Research Institute for Biosciences

// Point of contact

Prof. dr. Philippe Grosjean

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Numerical Ecology of Aquatic Systems group of the University of Mons studies hermatypic corals in artificial mesocosms. The research focus is on the adaptation potential of these animals to environmental changes (temperature, acidification and eutrophication). Furthermore, the research group also develops scientific software to automate the identification of plankton and for biostatistic purposes. The group is part of the UMONS Research Institute for Biosciences and of the Interuniversity Center for Marine Biology (CIBIM).

/ Proteomic and Microbiology unit

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// Institutional hierarchy

Faculty of Sciences

Department of Biology / Research Institute for Biosciences

// Point of contact

Prof. dr. Ruddy Wattiez

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Proteomic and Microbiology unit of the University of Mons performs genetic and metabolic analyses on different types of organisms. This includes molecular studies, proteomic characterisations, functional analyses, etc.

In the marine field, the groups studies topics such as:

- Identification and quantification of carbonylated proteins in the UVB-resistant marine bacterium *Photobacterium angustum* S14;
- Links between bacterial communities in marine sediments and trace metal geochemistry;
- Characterisation of the carbohydrate fraction of the temporary adhesive secreted by the tube feet of the sea star *Asterias rubens*;
- LAS degradability by marine biofilms derived from seawater in Spain and Sweden;
- Metaproteogenomic insights of contaminated microbial communities in marine and freshwater environments;
- Efflux of metals from contaminated marine sediments due to bacterial remineralisation of phytodetritus.

The group is a member of the UMONS Research Institute for Biosciences.

University of Namur

// Faculty of Sciences

- Research unit in Environmental and Evolutionary Biology

// Institutional hierarchy

Faculty of Sciences

Department of Biology

// Point of contact

Prof. dr. Patrick Kestemont

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The research unit in Environmental and Evolutionary Biology (URBE) of the University of Namur studies aquatic organisms and environments (both marine and fresh water), at all integration levels, from molecules to ecosystems. Rather than focusing on specific molecular and cellular approaches of life, URBE investigates the biochemistry, physiology, evolution and ecology of living organisms.

The main research topics include the analyses of physiological, biochemical and molecular responses of organisms to environmental disturbances (pollutions, climate warming, etc.), to molecular ecology and evolutionary genetics, as well as to the ecology of microbial, plant and animal communities in lakes and rivers. Fundamental and applied research is also carried out in the field of aquaculture and on the management of aquatic environments in temperate and tropical regions.

Federal scientific
institutes



Federal scientific institutes

// Royal Belgian Institute of Natural Sciences

- Operational Directorate Earth and History of Life
- Operational Directorate Natural Environment
- Operational Directorate Taxonomy and Phylogeny

// Other Federal scientific institutes

- Royal Museum for Central Africa
- Royal Military Academy
- Royal Observatory of Belgium
- Belgian Nuclear Research Centre

// Institutional hierarchy

Royal Belgian Institute of Natural Sciences (RBINS)

// Point of contact

Dr. Pascal Godefroit

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Operational Directorate Earth and History of Life is part of the Royal Belgian Institute of Natural Sciences (RBINS) which was founded in 1846 under its former name, the 'Koninklijk Natuurhistorisch Museum van België' (Royal Belgian Natural History Museum). The Directorate conducts fundamental and applied research in the fields of geology, palaeontology, bioarchaeology and human evolution.

Three multidisciplinary research programmes can be distinguished:

- Researchers from the Geological Survey of Belgium study the evolution of the lithosphere, the geological component of our environment and its mineral and energy resources. This group also provides scientific expertise within EuroGeoSurveys;
- The 'Palaeobiosphere Evolution' programme conducts research with regard to the evolution of the biosphere and its interactions with the geosphere: the biodiversity and evolution of fossil flora and fauna, the reconstruction of fossil environments and palaeoclimatology;
- Researchers on the 'Quaternary Environments and Humans' programme study the physical and cultural aspects of human evolution, as well as the interactions between humans and their physical and biotic environment in the past. Funded by the regions, the group also provides expertise in the field of archaeosciences.

In each of these research programmes marine themes are covered:

- In the Geological Survey of Belgium research is conducted on the dynamics of sedimentary basins, studying *inter alia* the stratigraphy and sedimentology of marine records. The Geological Survey also focuses on the reconstruction of the geological history of natural hazards (tsunamis) and the reconstruction of the oceanic geochemical fluctuations and biotic turnovers;
- The research programme 'Paleobiosphere Evolution' studies the evolution and dynamics of marine palaeoecosystems during critical periods in the history of life on earth, through the integration of palaeobiological, geophysical and geochemical information. Furthermore, research is conducted on the origin and early diversification of cetaceans during the Eocene, as well as the evolution of marine mammal faunas (cetaceans, sirenians and pinnipeds) in the North Sea basin during the Neogene;
- The 'Quaternary Environments and Human' programme focuses on the reconstruction of the changing environments of low-lying coastal plains during the Pleistocene and Holocene. Finally, the evolution of fish exploitation and trade are studied.

// Institutional hierarchy

Royal Belgian Institute of Natural Sciences (RBINS)

// Point of contact

Dr. Patrick Roose

// Research domain and discipline

Engineering and technology; Geomatics

Engineering and technology; Information and computer sciences

Natural sciences; Earth sciences

Natural sciences; Biological sciences

Natural sciences; Chemical sciences



Abstract

The Operational Directorate Natural Environment (OD Nature) envisages being a centre of excellence in fundamental and applied research of biodiversity and ecosystems in support of the protection and sustainable management of the natural environment.

To realise this vision, the OD Nature has a fourfold mission:

- To study the biotic and abiotic components of the natural environment and the interactions of the systems that form part of it;
- To provide scientific expertise including running a monitoring program for the North Sea and capacity building in the field of biodiversity in developing countries;
- To manage and improve databases and major scientific instruments such as the RV Belgica;
- to represent the Federal state in international bodies and instruments.

Around 100 collaborators are spread over 3 locations, two in Brussels and one in Ostend. They have a large and diverse expertise and a strong reputation in their fields that include ecology, molecular biology, nature conservation and protection, biodiversity, chemistry, hydrodynamics, modelling, databases and image processing. This expertise is applicable to marine, freshwater and terrestrial environments worldwide.

RBINS has a long tradition of scientific research in the marine environment (with special focus on the North Sea) with scientists from the former MUMM (Management Unit of the North Sea Mathematical Models). The North Sea waters and sediments are both rich and diverse in life, and form a sensitive ecosystem that is under heavy pressure from intense human activities. Therefore, the scientific marine research carried out serves not only to learn more and better understand the sea, but also to better protect it and make predictions for the near and more distant future. The OD Nature marine research concentrates on the following subjects: marine mammals, exotic species, jellyfish, sea birds and bats, hard substrates, underwater noise, hydrodynamic models, sediment transport models, ecological models, remote sensing, marine geology, marine chemistry and Antarctic biodiversity. OD Nature also coordinates and manages the RV Belgica and is responsible for the Belgian North Sea Aerial Survey program tracing marine pollution.

The ultimate aim of all OD Nature research is biodiversity and ecosystem conservation.

// Institutional hierarchy

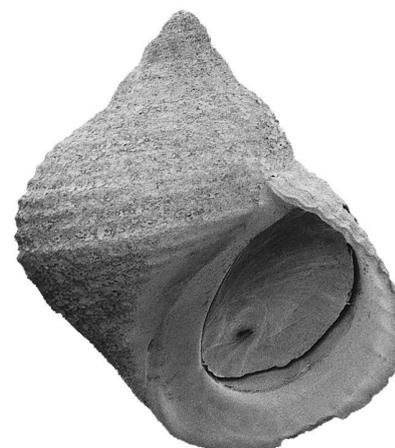
Royal Belgian Institute of Natural Sciences (RBINS)

// Point of contact

Prof. dr. Thierry Backeljau

// Research domain and discipline

Natural sciences; Biological sciences



Abstract

The Operational Directorate Taxonomy and Phylogeny is part of the Royal Belgian Institute of Natural Sciences (RBINS) which was founded in 1846 under its former name, the 'Koninklijk Natuurhistorisch Museum van België' (Royal Belgian Natural History Museum). This Directorate conducts research on animal biodiversity and evolution, and more specifically, speciation, adaptation, biotic interactions and integrative taxonomy. Particular attention is paid to the identification of new taxa (primarily via DNA barcoding), the impact of invasive species, the importance of chemical communication in insects, the effects of habitat disruption, the reconstruction of phylogenetic relations and the creationism versus evolution debate.

A limited number of marine taxa are studied in this group. Echinoderms (Echinodermata) (in conjunction with the scientific service "Heritage"), crustaceans (Crustacea), molluscs (Mollusca), annelids (partim: Oligochaeta) and sponges (Porifera). The Directorate performs field work in various parts of the world. Especially the work in Antarctica and the Southern Ocean has a marine focus. The research group is for example involved in SCAR-MarBIN 'the Antarctic Marine Biodiversity Information Network'.

// Institutional hierarchy

Federal scientific institute

// Point of contact

Dr. Guido Gryseels

// Research domain and discipline

Natural sciences; Earth sciences

Natural sciences; Biological sciences



Abstract

The Royal Museum for Central Africa (RMCA), created from the colonial section of the world exhibition of 1897, has become an international scientific research institute, a museum famed for its exhibitions, and an intercultural meeting place.

The Museum holds an exceptional and world-renowned patrimony which, besides ethnographic collections, the full archives of Stanley and the biggest xylarium in Europe, contains 10 million zoological specimens. The Biology department of the Royal Museum for Central Africa (RMCA) manages an extensive collection of Afrotropical organisms. Furthermore, the department conducts research at an international level both on collection specimens and on species in their natural environment in order to attain a better understanding of African biodiversity. The department consists of four divisions: Wood Biology, Biological Collection and Data Management, Invertebrates and Vertebrates.

The marine research is situated in the Vertebrates and Invertebrates divisions.

- The Vertebrates division conducts research in the field of ichthyology and more specifically on the systematics and ecology of African fish species. This group is involved in FishBase: the largest worldwide fish encyclopedia and scientific data source on fish. The RMCA is responsible for the African brackish and freshwater fish (www.FishBaseForAfrica.org);
- In the Invertebrates division, the taxonomy of sea cucumbers is studied.

// Institutional hierarchy

Federal scientific institute

// Point of contact

lt.-col. Thierry Deprez

// Research domain and discipline

Engineering and technology; Electrical and electronic engineering

Engineering and technology; Geomatics

Engineering and technology; Information and computer sciences



Abstract

The Royal Military Academy (RMA) is a military institution of university education responsible for the basic academic, military and physical training of future officers, and for the continuing advanced training of officers during their active career in the Defence department.

The RMA also conducts research which is predominantly aimed at solving military problems. In addition, security and safety problems are also eligible. Finally, in a much broader sense, strategic issues such as energy independence can be considered.

The marine research topics are situated in the field of remote sensing in the broad sense. Research is conducted in the field of mine counter measure, for instance to increase the performance of existing sonars and gradiometers. It *inter alia* also concerns research on air- and space-borne sensors such as scatterometers which are radar instruments, measuring the wind speed and direction above water surfaces.

// Institutional hierarchy

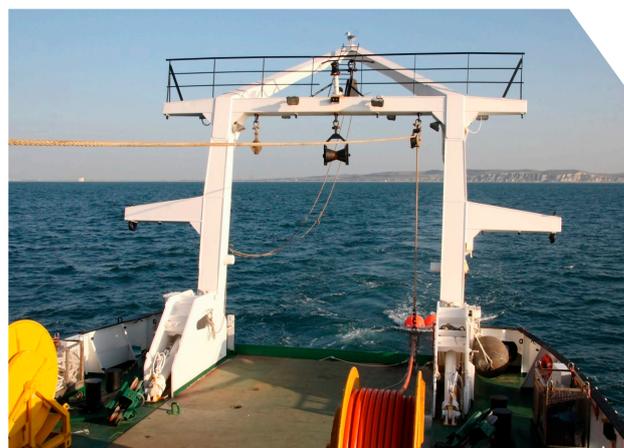
Federal scientific institute

// Point of contact

Dr. Ronald Van der Linden

// Research domain and discipline

Natural sciences; Earth sciences



Abstract

The Royal Observatory of Belgium (ROB) is a federal scientific research institute, which also provides a wide range of services. Researchers study the planet Earth and other, near and distant objects in space. Scientists at the observatory are involved in the following fields: astronomy, astrophysics, geophysics, seismology, space geodesy, space weather and solar physics. The ROB also collaborates with many international centres.

The marine aspect of the research activities focuses on three topics:

- Seismological research on fault systems in the North Sea (Strait of Dover);
- The application of oceanographic research on planets and their satellites;
- The determination of long-term ground movement and deformation of the earth's crust at local, regional and global scale, also impacting the marine environment.

// Institutional hierarchy

Federal scientific institute

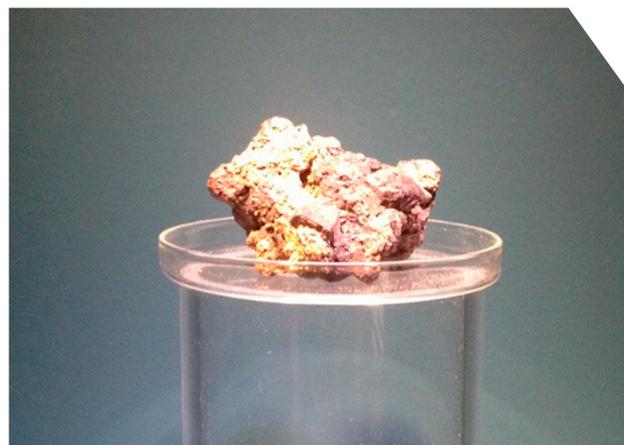
// Point of contact

Dr. Eric van Walle

// Research domain and discipline

Natural sciences; Biological sciences

Social sciences; Political sciences and policy



Abstract

The Belgian Nuclear Research Centre conducts high-level fundamental and applied research in various domains. The research activities are concentrated into 3 scientific institutes:

- Institute for Nuclear Materials Science (NMS) - development and assessment of new and existing materials for their suitability in nuclear applications. The research realises the scientific (physical, chemical, phenomenological) and technical (experimental, empirical) follow-up and prediction of reliable functioning of the materials in their given working conditions;
- Institute for Advanced Nuclear Systems (ANS) - research on the development and the testing of technologies and instrumentation for new reactors. New nuclear measuring techniques, reactor modelling and reactor safety are also examined. These competences are aimed at the realisation of an innovative research installation;
- Institute for Environment, Health and Safety (EHS) - focus on potential effects of ionising radiation on our health and the environment and study the behaviour and the impact of radioactive materials in air, geosphere and biosphere. Radiation protection, decommissioning and waste disposal are the main pillars. This institute also pays attention to services, safeguards and policy support, and examines the integration of social and ethical aspects in nuclear applications.

The marine research is based on the Biosphere Impact Studies unit within the institute EHS and focuses on marine radioecology and aquatic dispersion modelling with significant contributions to modelling the effects of the Fukushima nuclear accident (but also e.g. assessment of the dispersion and impact from releases from Sellafield). Marine radioecology has traditionally focused on transfer and impact of radionuclides in marine biota. The team was part of the UNSCEAR team performing the first international assessment of the impact of accidental discharges from the Fukushima accident to the marine environment, and they collaborate with IAEA for the MODARIA programme, modelling the impact of radiation on populations of non-human biota. For dispersion modelling, the focus is on modelling the transport of radionuclides across the continuum river - estuary - coastal zone with focus on Belgian estuaries and coastline potentially receiving accidental releases from nuclear reactors. Main research interests therefore lie on measuring the transfer of radionuclides from the environment to living organisms and assessing the radiological effects, with key publications on to this topic. In addition, the group LRM (low-level radioactivity measurements) can deal with radiometric analysis. LRM is a member of the ALMERA network of IAEA and contributes via the Belgian Agency of Nuclear Control (FANC) to the determination of radioactive substances in the North Sea in the framework of the OSPAR convention. The expert group NST (Nuclear Science and Technology Studies) can deal with the social aspects of marine research (e.g. following contamination of the marine environment).

