Expert Guide

Marine Research 2023

Expert Guide

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Colophon

The Expert Guide Marine Research 2023 is part of the Compendium for Coast and Sea initiative, a one-stop-shop for all information (scientific, legal, socio-economic, etc.) about 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) and followed up by the Expert Group Compendium for Coast and Sea.

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

Contact:
compendium@vliz.be

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COMPENDIUM KUST & ZEE / COAST & SEA

VLIZ pionier in zeekennis

Vlaanderen verbeelding werkt

west-vlaanderen de gedreven provincie

Introduction

Readers Guide

The Expert Guide Marine Research 2023 is part of the Compendium for Coast and Sea initiative. The 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 aims to showcase the multidisciplinarity/ diversity of marine research in Belgium to foster the development of new and high-level marine research, both in Belgium and abroad. Furthermore, it intends to stimulate the communication and collaboration between MRGs.

The marine research groups mentioned in this Expert Guide comply with the following criteria:

- Based 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 five years with the 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 that are not affiliated 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 which may also conduct marine research, such as administrations, museums, organisations with educational purposes, companies, etc., are not included in the Expert Guide. For more information on the latter, we refer to different cluster initiatives, such as The Blue Cluster, Belgian Offshore Cluster and Belgian Offshore Platform. If you believe your research group or 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: (i) Flemish university associations, (ii) Flemish scientific institutes, (iii) Universities and graduate schools of the Wallonia-Brussels Federation and (iv) Federal scientific institutes. In this guide, institutes and their affiliated research groups are discussed alphabetically based on their English names. In addition to the description of individual MRGs, this publication also discloses interfaculty marine research clusters. These clusters are presented prior to the description of the individual MRGs belonging to their respective universities.

The Expert Guide presents the following information for each MRG: name of the research group, website, institutional hierarchy, point of contact, research domain and discipline, abstract and address. The MRGs are also disclosed online (www.compendiumcoastandsea.be).

Expertise of marine research groups

The Belgian MRGs study a wide range of marine/maritime topics (see Indicator Report Marine Research and Innovation 2023), covering various research domains and disciplines. The visualisation of MRGs according to their locations and research domains highlights the widespread presence of marine research across Belgium (figure 1).

The majority of the MRGs are active in the research domain of natural sciences (64%), followed by engineering and technology (36%), agricultural and veterinary sciences (13%), social sciences (7%), medical and health sciences (4%) and humanities (3%) (the sum of the values exceeds 100% as one MRG can be assigned to several research domains, the same applies to the research disciplines). On the level of the underlying research disciplines, 39% of the MRGs focus on biological sciences and 21% on earth sciences, followed by biotechnology (13%), chemical sciences (13%), civil engineering (10%) and fisheries and aquaculture sciences (10%) (figure 2).

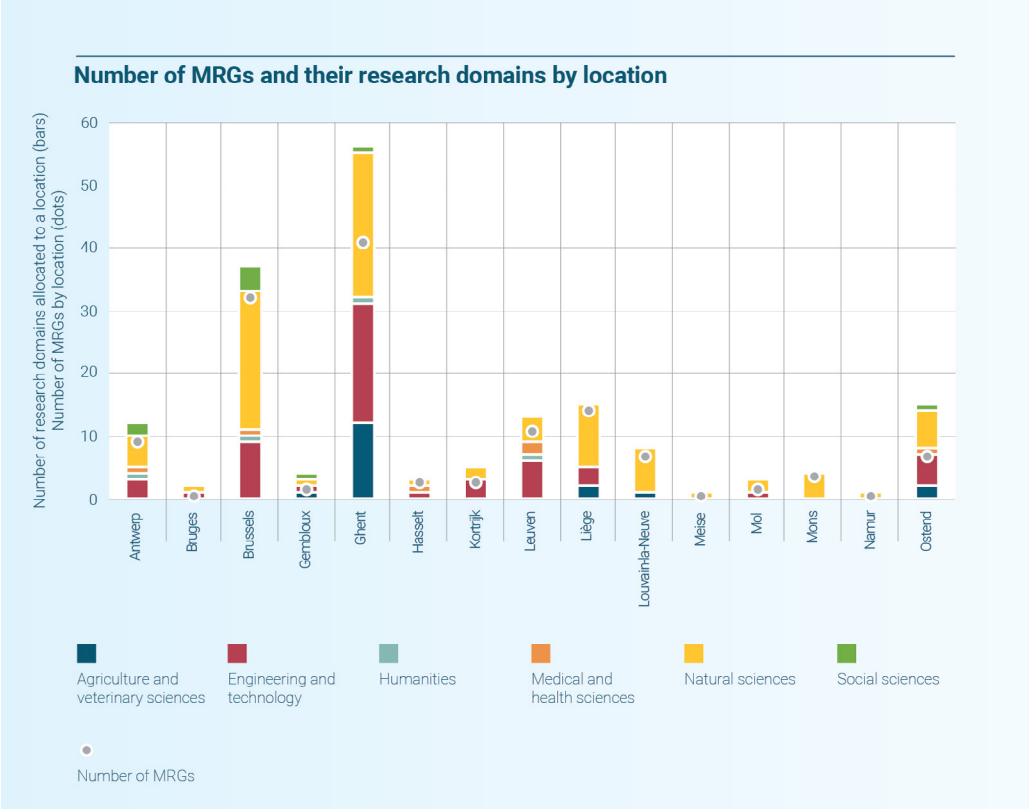

Figure 1. Number of MRGs and their research domains by location (2023). Institutes can be located at several places and institutes can belong to multiple research domains.

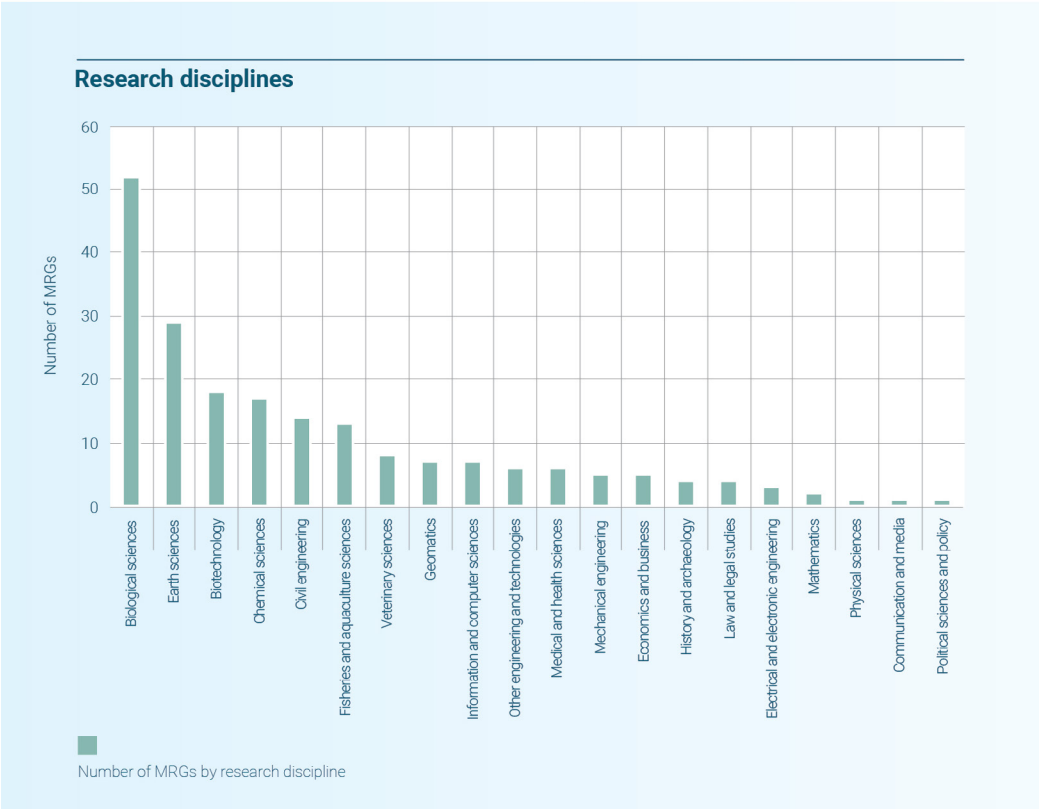

Figure 2. Number of MRGs by research discipline (2023). Institutes can belong to multiple research disciplines.

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KU **Leuven**

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2. Flemish scientific institutes

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3. Universities and graduate schools of the Wallonia-Brussels Federation

Université Libre de **Bruxelles** (ULB)

- **Biogeochemistry and Earth System Modelling** group 122
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University of **Liège** (ULg)

- **Chemical Oceanograpy** unit 134
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- Laboratory of **Food Analysis** 137
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- **Management of Aquatic Resources and Aquaculture** unit 143
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University of **Mons** (UMons)

- Laboratory of **Biology of Marine Organisms and Biomimetics** 158
- **Numerical Ecology** unit 159
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University of **Namur** (UNamur)

- Research unit in **Environmental and Evolutionary Biology** 164

4. Federal scientific institutes

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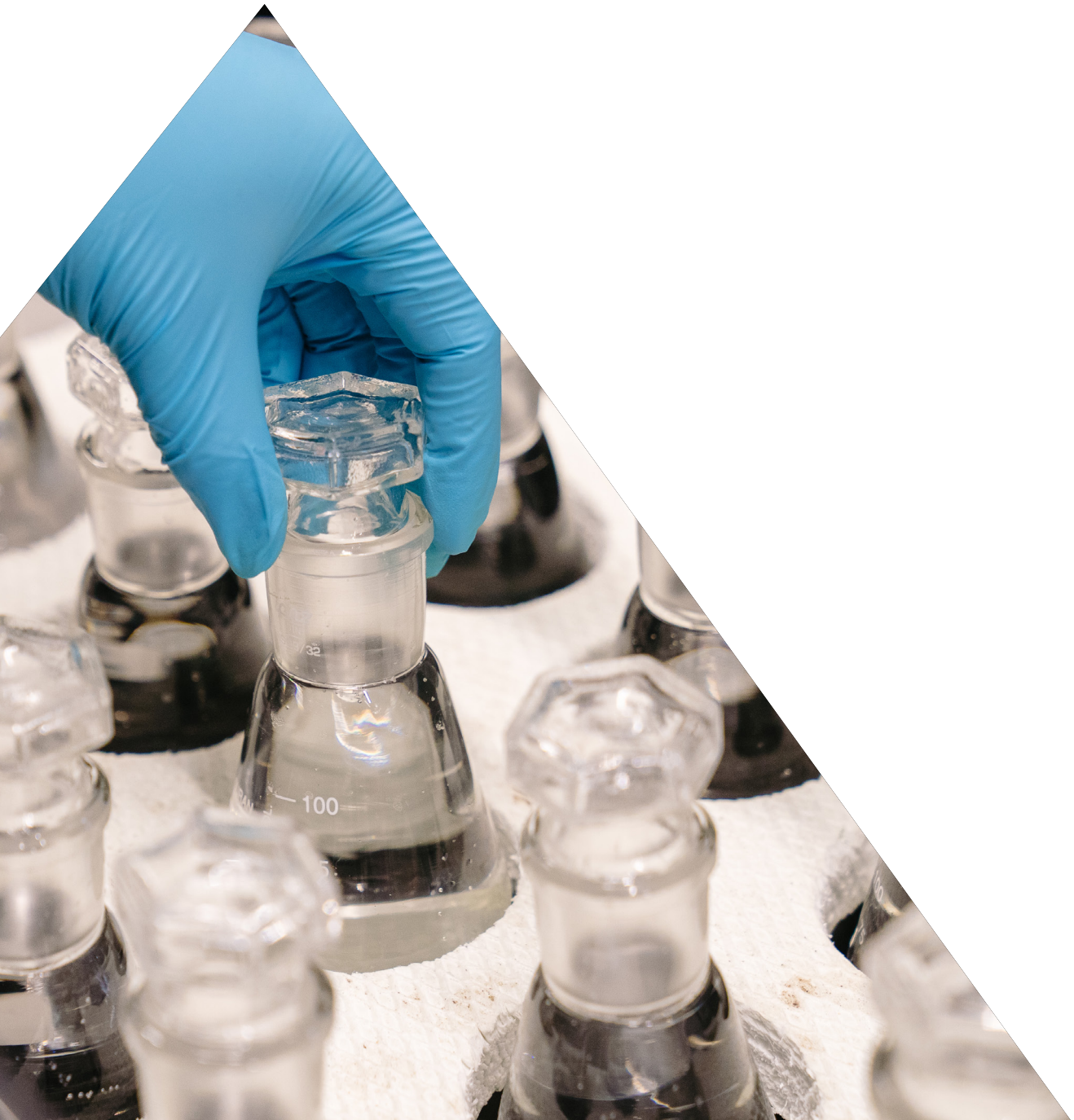
Natural sciences
Medical and Health sciences
Engineering and Technology
Social sciences
Humanities
Agricultural and Veterinary sciences

1 Flemish university associations



Interuniversity clusters

/ OWI-Lab

www.owi-lab.be

// Contact

pieterjan.jordaens@owi-lab.be (business development & innovation)
christof.devriendt@owi-lab.be (scientific research coordinator)

Abstract

OWI-Lab was established in 2010 and stands for On -and Offshore Wind Infrastructure Application Lab. OWI-Lab is a collaboration between wind energy experts within Sirris, VUB and UGent, and aims to initiate, support and execute research, development and innovation (RD&I) projects for the full Belgian wind energy value chain (from development to decommissioning phase). This includes fundamental, applied and industry driven R&D and providing access to testing and demonstration opportunities in real environments. The consortium provides access to unique and real-life test and demonstration infrastructure, operational insights and associated application knowledge to support RD&I for companies active in the on- and offshore wind energy business.

The core activities of OWI-Lab can be summarised as follows:

- Coordination of wind energy R&D in Belgium: keeping an overview and monitoring of the RD&I landscape (Academic and Industrial landscape);
- Provide industry driven RD&I support & services to our industrial peers;
- To be a knowledge & expertise network;
- Representation of Belgian wind energy R&D backbone in EU / international platforms.

Focusing specifically on the offshore component, in 2017, the Innovative Business Network (IBN) 'Offshore Energy Cluster' was rolled out by the OWI-Lab partners for a period of three years to support RD&I projects on offshore wind energy and wave and tidal power applications. This generated innovation dynamics and close cooperation between the industry and the research community.

OWI-Lab

Gaston Geenslaan 8
3001 Heverlee

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Partners

Non-profit organisations

- Sirris
- Agoria

Universities

- Vrije Universiteit Brussel (VUB)
- Ghent University (UGent)

Antwerp University Association

Antwerp Maritime Academy

www.amacademy.be

// Contact

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// Research domain & discipline

Engineering and technology: Civil, electrical and electronic, and mechanical engineering
Natural sciences: Chemical sciences
Social sciences: Law and legal studies, economics and business

Abstract

Antwerp Maritime Academy (AMA) is the only academy in Belgium which provides education in Nautical Sciences and Marine Engineering at bachelor and master level. The courses are taught in Dutch and French. They meet stringent international quality-standard requirements set by the International Maritime Organisation, which allows AMA to offer certificates that are fully compliant with IMO STCW-standards (Standards of Training, Certification and Watchkeeping). 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. The certificates grant access to the onboard functions mentioned below, as well as 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 start as Junior Engineering Officer;
- Master Marine Engineering (from 2024 onwards): Graduates have access to management jobs onboard a vessel (e.g. chief engineer).

AMA also offers a Postgraduate in Hydrography.

AMA focuses on applied and practice-based research. The multi-disciplinary team of lecturers are involved in a large variety of research domains such as language and communication, corrosion and biofouling, sustainable transport and hydrography. From 2024 onwards, the campus will host a full mission simulator adapted for research needs. Students are actively involved in ongoing research projects by bachelor and master projects.

AMA

Noordkasteel-Oost 6
2030 Antwerpen

Behavioural Ecology and Ecophysiology group

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

// Contact

marcel.eens@uantwerpen.be

// Institutional hierarchy

Faculty of Science
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The main research interest of the Behavioural Ecology and Ecophysiology (BECO) group is the study of the causes and consequences of 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. The research group studies behaviour from four perspectives (mechanisms, development, adaptive function, phylogeny) simultaneously, thus using an integrative and interdisciplinary framework and applies theoretical and methodological insights from animal behaviour and behavioural ecology to conservation biology and global change biology. The overarching aim of BECO's 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 several gull species and magnificent frigatebirds using both field observations/ experiments and GPS tracking technologies. The group also studies the role of different seabird species as biomonitors of pollution and environmental change. Within this context, the group explores 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.

BECO

Campus Drie Eiken
Building D, D1.21
Universiteitsplein 1
2640 Antwerpen

ECOSPHERE research group

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

// Contact

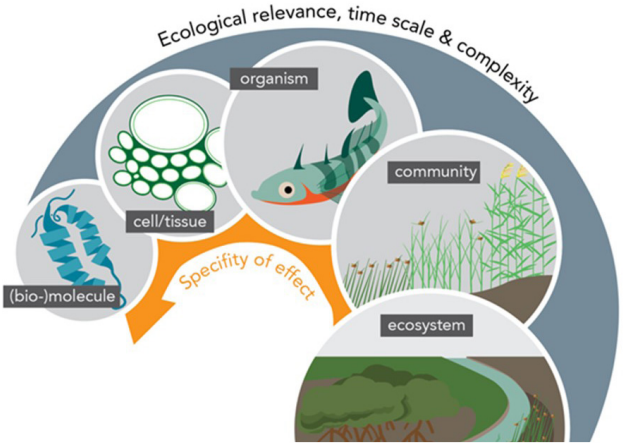
gudrun.deboeck@uantwerpen.be

// Institutional hierarchy

Faculty of Science
Department of Biology

// Research domain & discipline

Natural sciences: Biological and chemical sciences



Abstract

The ECOSPHERE research group has grown organically from the former ECOBE (Ecosystem Management) and the SPHERE (Systemic Physiological and Ecotoxicological Research) groups and combines the strengths of the available expertise in fundamental and applied research in aquatic ecotoxicology, ecophysiology and ecology. The research group aims to underpin environmental management decisions with fundamental knowledge at different levels of organisation, from cell to ecosystem.

The group combines laboratory experiments, field investigations, and mathematical modelling and goes beyond the impact studies towards solution-based research (mitigation and nature-based solutions). Within this framework, ECOSPHERE focuses on the interactions between organisms and physicochemical factors on all levels of biological organisation. Our main research themes are:

- integrated water management and ecosystem services;
- water and soil risk assessments;
- macro- and micronutrients for healthy ecosystems;
- bioavailability and accumulation of macro- and microcontaminants;
- physiological and molecular stress and toxicity mechanisms and their consequences for organismal fitness and survival.

ECOSPHERE offers ecotoxicological and water quality risk assessments, as well as geospatial analysis and modelling of coastal and marine ecosystems with applications to ecosystem restoration. The group quantifies and maps the impact of changes in land, soil and water management on the supply of ecosystem services. ECOSPHERE designs, assesses and monitors Nature Based Solutions for societal challenges related to climate change, such as buffering drought and flood risks, and carbon sequestration.

ECOSPHERE

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Building C
Universiteitsplein 1
2610 Wilrijk

Research group **Geobiology**

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

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filip.meysman@uantwerpen.be

// Institutional hierarchy

Faculty of Science
Department of Biology

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Earth sciences

Abstract

The research group Geobiology performs fundamental and applied research at the intersection between geology and biology. Their prime objective is to generate profound insights about the interactions between the biosphere on the one hand, and the geosphere, hydrosphere and atmosphere on the other hand. As part of their societal mission, they adopt a 'solution-based' perspective, investigating how biology and natural systems can offer biology-based solutions to important societal challenges. Research examples include the investigation of electrical microbial systems in the seafloor (seafloor microbes that generate and conduct electricity), climate change mitigation by CO_2 drawdown in coastal environments, ocean alkalinisation and the conversation and restoration of wetlands and heathlands to act as a biodiversity trove and carbon sink.

Geobiology

Campus Drie Eiken
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2610 Wilrijk

Natural Products & Food Research and Analysis - Pharmaceutical Technology

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

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// Institutional hierarchy

Faculty of Pharmaceutical, Biomedical and Veterinary Sciences
Department of Pharmaceutical Sciences

// Research domain & discipline

Engineering and technology: Biotechnology
Medical and health sciences: Medical and health sciences
Natural sciences: Biological and chemical sciences

Abstract

The mission of the research group Natural Products & Food Research and Analysis – Pharmaceutical Techology (NatuRAPT) is to make a contribution to human health by increasing our knowledge on medicinal plants and food plants, including the chemical profiling of their constituents and metabolites, the development of methods to assure their quality, optimalisation of their formulation to guarantee and improve bioavailability, and evaluation of their health effects. The research group is active in the field of medicinal plants, natural products and functional food science.

The marine component includes the study of secondary metabolites (triterpene glycosides) from sea cucumbers, which can serve as chemotaxonomical markers.

NatuRAPT

Universiteitsplein 1
2610 Wilrijk

Sustainable Energy, Air and Water Technology group

www.uantwerpen.be/en/research-groups/sustainable-energy

// Contact

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// Institutional hierarchy

Faculty of Science
Department of Bioscience Engineering

// Research domain & discipline

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

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Abstract

The Sustainable Energy, Air and Water Technology group (DuEL) focuses on four domains:

- solar to chemical energy;
- gas treatment and CO_2 solutions;
- water treatment and nutrient valorisation;
- systems analysis and sustainability assessment.

The group aims to improve aquaculture practices, explore sustainable energy sources and develop innovative biotechnological solutions for various applications. The research cover various topics such as the use of purple bacteria as a protein ingredient in shrimp feed, the optimisation of microalgae production for protein and nutritional value, the exploration of hydrogen fuel production from seawater, the challenges of using hydrogen for maritime applications, etc.

Fact sheet not validated by research group

DuEL

Campus Groenenborger
V building, 6th floor
Groenenborgerlaan 171
2020 Antwerpen

Toxicological centre

www.uantwerpen.be/en/research-groups/toxicological-centre

// Contact

hugo.neels@uantwerpen.be

// Institutional hierarchy

Faculty of Pharmaceutical, Biomedical and Veterinary Sciences

// Research domain & discipline

Natural sciences: Chemical sciences

Abstract

The Toxicological centre 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 Federal Public Service 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.

Toxicological centre

Campus Drie Eiken
Building S
Universiteitsplein 1
2610 Wilrijk

Fact sheet not validated by research group

Department of **Transport and Regional Economics**

www.uantwerp.be/tpr

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thierry.vanelslander@uantwerpen.be

// Institutional hierarchy

Faculty of Business and Economics

// Research domain & discipline

Social sciences: Economics and business

Abstract

The department of Transport and Regional Economics (TPR) is committed to be an international centre of excellence for fundamental and applied academic training, research and service provision in transport economics, logistics and regional economics. Its mission is to enhance transport and logistics for our society and the business community. It contributes in developing activating, student-centred and competence-driven programme components and study programmes of the faculty Business and Economics and advanced master's programmes within the Centre for Maritime and Air Transport Management (C-MAT), inclusive master classes, taking future challenges into account. Its research results in theories, innovative and sustainable applications and instruments to enhance existing academic knowledge, transport policy and supply chain environments. Therefore, TPR conducts innovative and multi/inter-disciplinary research within an international context and organises educational programs from bachelor up to PhD level. TPR pursues results that are academically sound, economically viable and supporting sustainable development. It values a critical and an independent approach and an open communication. TPR's research activities unfold within a framework of programs stimulated by the university, public authorities at all policy levels, non-profit organisations as well as private or semi-private actors.

Project research plays a key role in gaining scientific knowledge. The department aims at a wide array of research projects, incorporating longer term fundamental research projects, as well as contracts with diverse promotors and limited assignments intended for immediate application. Business knowledge also involves to a large extent policy advice, consulting and individual research of the department members. This way, in the past years, a lot of research was performed for companies, and high-standing research was done into the evaluation of transport investments, mobility policy, tourism, the maritime and port sector, and spatial aspects and city policy.

The lines of research pursued by TPR are located on the interface of general and business economics. The rich set of tools that the fields of transport and spatial economics offer are apparent in the broad range of research procedures applied. These include strategic analyses, methods of economic research and assessment, information gathering and analysis, operational research, model-based analysis, forecasting and simulations.

The research activities unfold within the framework of programmes instigated by the university and the authorities (regional, federal and European) as well as specific assignments from the public and private sectors. The topics covered relate to:

- the interaction between transport and economics;
- freight transport;
- the port and maritime sector;
- the air transport business and markets;
- urban logistics and distribution;
- the assessment of infrastructure projects;
- strategic analyses and policy recommendations (private companies, authorities);
- interaction between transport and physical planning;
- urban studies and regional economics.

TPR

Prinsstraat 13
2000 Antwerpen

Centre for **Urban History**

www.uantwerpen.be/en/research-groups/centre-urban-history

// Contact

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// Institutional hierarchy

Urban Studies Institute

// Research domain & discipline

Humanities: History and archaeology

Abstract

The centre for Urban History (CSG) is an international acknowledged research centre focusing on urban societies, structures and processes in historical perspective. It approaches 'urban history' as a part of an inclusive field of 'urban studies', comprising interdisciplinary insights from urban sociology, cultural studies, demography, economic geography, planning and architecture, urban governance and environmental sciences. Cities originate and flourish in permanent interaction not only with each other, but also with their specific natural setting and the agrarian hinterland that surrounds them. A modern historical understanding of urban growth and development hence also requires the in-depth study of both urban-nature and town-countryside relationships. Hence, the CSG also focuses on the history of water and flood protection; coastal wetland development; urban sanitation; urban green space; nutrient flows between city and countryside; common wasteland management; rural industries and peri-urban agriculture.

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

- the study of the causes, impact and perception of historical flood disasters (Soens; Jongepier);
- the historical study of polders and water-meadows in the North Sea area (as a bottom-up organisation for coast and river water management) (Soens, De Coster);
- the study of sailors, fishermen and maritime professionals (from the Middle Ages to the 20th century (Greefs, Walschap, Loockx);
- broader research on coastal development during the last millennium (mainly the interaction between natural and human dynamics) (Soens, De Block);
- the study of peat development and excavation (Jongepier, De Coster);
- the study of heritage aspects of coastal and river landscapes (focusing on the integration of natural values and cultural historical values) (Soens).

Centre for Urban History

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2000 Antwerpen

Vrije Universiteit
Brussel

Acoustics and Vibration research group

https://avrg.vub.be

// Contact

christof.devriendt@vub.be

// Institutional hierarchy

Faculty of Engineering

// Research domain & discipline

Engineering and technology: Civil and mechanical engineering, information and computer sciences

Abstract

The Acoustics and Vibration research group (AVRG) is a leading research group conducting fundamental and applied research in the broad field of acoustics and vibration, with special emphasis on the development of advanced testing and monitoring methodologies with application in mechanical engineering (Experimental and Operational Modal Analysis, Damage Assessment and Structural Health Monitoring, Condition and Performance Monitoring, Additive Manufacturing Modelling and Control, Optical Measurement Techniques).

Since 2011 AVRG is the research coordinator of the Offshore Wind Infrastructure lab (OWI-lab), a collaboration between UGent, Sirris and VUB. The mission of OWI-lab is to coordinate research and development in the field of offshore wind energy in Flanders.

In the topic of monitoring offshore wind energy AVRG played a pioneering role and is currenlty leading several research projects, within all Belgian offshore wind farms, with the aim to reduce the cost of offshore wind energy. Both by developing physics-based and data-driven modelling tools for condition monitoring of the machinery and structural health monitoring of the foundations the research aims to reduce the operation and maintenance costs, optmising the lifetime and improve the design of offshore structures. The group has developed an extensive track-record in performing both long-term and instantaneous dynamic measurements on offshore wind turbines and vessels.

AVRG

Z-building - Room ZW104
Pleinlaan 2
1050 Elsene

Research group **Analytical, Environmental and Geochemistry**

https://amgc.research.vub.be

// Contact

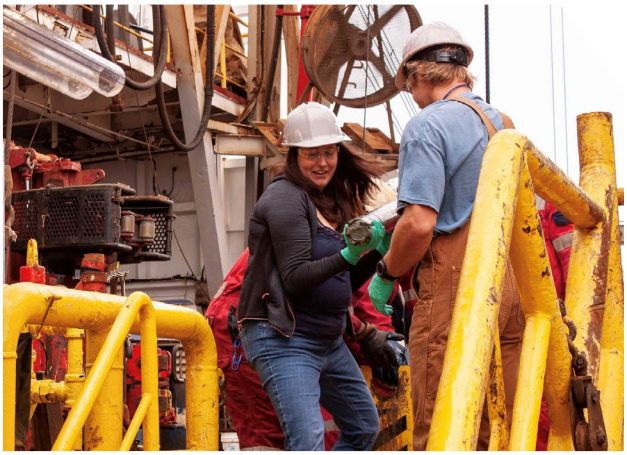
phclaeys@vub.ac.be

// Institutional hierarchy

Faculty of Science and Bioengineering Sciences
Department of Chemistry

// Research domain & discipline

Natural sciences: Chemical and earth sciences



Abstract

The research group Analytical, Environmental and Geochemistry (AMGC) specialises 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, $^{18}O/^{16}O$, $^{87}Sr/^{88}Sr$, 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 quantication 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;
- 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 high resolution inductive coupled plasma mass spectrometry (HR-ICP-MS);
- the determination of stable isotopes of hydrogen, oxygen, carbon and nitrogen using stable isotope mass spectrometry (IRMS);
- 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;
- 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 (FTIR) spectroscopy to determine functional groups. Ongoing research addresses, among others, 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.

AMGC

Pleinlaan 2
1050 Elsene

Artificial Intelligence lab

https://ai.vub.ac.be/topics

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// Institutional hierarchy

Faculty of Sciences and Bioengineering Sciences
Computer Science Department

// Research domain & discipline

Engineering and technology: Information and computer sciences

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Abstract

The Artificial Intelligence laboratory has expertise in computational creativity, emergent communication and language, computational construction grammar, reinforcement learning, game theory, preference handling, computational biology, computer vision and deep learning, learning in multi-agent systems, and machine learning for data mining. They focus on developing computational systems that exhibit creative behaviours, self-organising languages, mapping natural language to meaning representations, and self-learning systems. They also analyse human decision-making strategies, study social dilemmas and participant decision-making, apply data-analytical and simulation techniques to biological systems, and explore computer vision and deep learning in various domains. Their research extends to decentralised systems, cognitive AI, and the evolution of speech using AI methods.

In the marine field, the group explores the following topics:

- vocal plasticity in harbor seal pups, investigating the potential for changes in their vocalisations over time;
- developing a framework for automatically and continuously classifying Supervisory Control and Data Acquisition (SCADA) data from an offshore wind farm into different design load cases. By analysing the data, the effects of wake on the loading conditions experienced by wind turbines is assessed. This data-driven approach using sensor-equipped turbines allows for a more detailed understanding of the loading events throughout the turbines' lifetime, which can inform future design iterations for improved optimisation based on realistic conditions.

AI-lab

Pleinlaan 9, 3th floor
1050 Brussel

Fact sheet not validated by research group

Brussels School of Governance

https://brussels-school.be

// Contact

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// Research domain & discipline

Social sciences: Law and legal studies, political sciences and policy

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Abstract

The Brussels School of Governance (BSoG) carries out interdisciplinary research, organises fully accredited higher education programmes and delivers a broad range of academic services in various policy-relevant fields, including energy and environment, security and diplomacy, migration and diversity, and digitalisation and democracy. The School is an alliance between the Institute for European Studies (IES, VUB) and the Vesalius College.

The major focus of the institute is on the study of EU institutions, policies and law within the context of globalisation and international and comparative law and politics. Research projects share a common focus on the role of the EU as a global actor and on the interaction between the internal and external dimensions of EU policies and between EU policies and the policies of other international organisations. To this end, the IES aims to develop an interdisciplinary approach, involving not only legal and institutional expertise but also economic, social and political analysis. It focuses on forward-looking research and aims to produce policy-relevant results of interest to national and European decision-makers and the international academic community.

Marine topics studied by BSoG include:

- the international and EU environmental regulation in the development of marine renewable energy;
- marine security.

BSoG

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1050 Brussel

Ecology and Biodiversity research unit

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// Institutional hierarchy

Faculty of Science and Bioengineering Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological and earth sciences

Abstract

The Ecology and Biodiversity research unit is currently in a phase of transition, following the retirement of Prof. dr. Nico Koedam (emeritus). The research group has ca. 30 years experience with developing projects on coastal foundation species, predominantly mangroves and seagrasses. The group has broad experience with research on mangrove functional physiology, mangrove ecology, dispersal ecology, biogeography and conservation (management), including socio-ecological systems, in close collaboration with Prof. dr. Farid Dahdouh-Guebas (Université Libre de Bruxelles and VUB). Currently, the work by Prof. dr. em. Nico Koedam and Prof. dr. em. Ludwig Triest is continued and further developed by Prof. dr. Tom Van der Stocken (VUB and NASA-Caltech Jet Propulsion Laboratory, JPL), in close collaboration with the mangrove research team at ULB and with Prof. dr. Bram Vanschoenwinkel at VUB (spatial ecology). While the general theme of research activities consists of the global ecology and biogeography of coastal wetland species, an important focus is on the interactions between mangroves (and also seagrasses) and climate change, using a multi-scale (local-to-global), multi-method approach. This includes climate-driven changes in their geographic distribution, their contribution to the marine and global carbon cycles, realised and fundamental niche estimates, as well as changes in ocean properties that may influnce the dispersal ecology in these systems, using in situ and ex situ experiments, numerical modelling, remote sensing, citizen science, and historical accounts (a.o. logbooks and photographs). In various projects collaboration (within Belgium) with VLIZ, the Royal Museum for Central Africa, UGent, and UHasselt is consolidated.

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.

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

Research group of **Electrochemical and Surface Engineering**

https://surf.research.vub.be

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// Institutional hierarchy

Faculty of Engineering
Department Materials and Chemistry

// Research domain & discipline

Engineering and technology: Electrical and electronic, and mechanical engineering

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Abstract

Research at the Electrochemical and Surface Engineering research group (SURF) deals with 'electrochemistry' and 'surfaces' and their interaction. The key research topics can be mapped into four overlapping themes:

- corrosion technology;
- electrochemical modelling;
- electrochemical and surface processes;
- multifunctional surfaces and new materials.

SURF's approach to deal with both fundamental and application driven aspects is one of combining experimental and modelling techniques. Experimental techniques are oriented towards surface and electrochemical characterisation. The group combines expertise in both electrochemical methods and in-situ and ex-situ surface analytical techniques. modelling in SURF's context means construction of models and developing numerical tools to handle the mathematics behind the models.

The marine research focuses on corrosion of offshore structures (foundations).

Fact sheet not validated by research group

SURF

Pleinstraat 2
1050 Brussel

Department of **Hydrology and Hydraulic Engineering**

https://hydr.vub.be

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// Institutional hierarchy

Faculty of Engineering

// Research domain & discipline

Engineering and technology: Civil engineering and geomatics

Abstract

The department of Hydrology and Hydraulic Engineering has since its start pursued a strong interest in numerical simulation techniques and computer applications. This resulted in an expertise in development and use of hydrological modelling techniques. In the development, application and visualisation of these models and their results, GIS and remote sensing is implemented. Research projects on Flemish, Belgian and European level have been executed with financing from Flemish, Belgian and EU scientific programmes, as well as directly from administrations and industry. The research activities are focused on development, calibration and validation of modelling techniques for:

- simulation and forecasting of the hydrological processes on a river basin scale;
- simulation and analysis of processes controlling runoff and quality of surface water;
- hydrodynamics and sediment transport as well as lithologic and geomorphologic evolution in aquatic environment;
- assessment of quantity and quality of groundwater flow and regional groundwater reservoirs;
- techniques to forecast and improve integrated water management practices on a regional scale;
- research on ecohydrology to quantify interactive processes between water and the environment, strongly linked with GIS and remote sensing techniques.

In the marine and estuarine fields, the research is centered on:

- engineering works of waterway, such as river margins and banks, navigation channel deepening and dredging;
- siltation, sedimentation and erosion in areas of harbours, ports, dykes, dams, seawalls and coast protective structures;
- effects of grey, blue-green infrastructures on structure-process interaction and resulted impact on ecosystem functionality, naturality, and safety.

HYDR

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Centre for **International Law**

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// Institutional hierarchy

Faculty of Law and Criminology
Department of Public Law

// Research domain & discipline

Social sciences: Law and legal studies

Abstract

The centre for International Law is the successor of the International Law department, and originates from the merge of three former institutes (1990s): 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 Section of International and European Law (IERE) within the department of Public Law.

The centre mainly performs research on the following areas:

- law of the sea;
- human rights and humanitarian law;
- international economic law;
- diplomatic law and the laws of Central and Eastern European countries.

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.

Centre for International Law

Pleinlaan 2
1050 Brussel

Management and Strategy cluster

www.vub.be/en/research/department-of-business#mast:-management-and-strategy

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// Institutional hierarchy

Faculty of Business and Economics
Department of Business

// Research domain & discipline

Social sciences: Economics and business

Abstract

The Management and Strategy (MAST) cluster conducts research and advisory work in various 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 circular transition and how this takes place in ports. This includes, amongst others, the circular maturity of ports, the monitoring of the circular transition, and the role of stakeholers in the circular transition for ports.

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.

MAST

Pleinlaan 2
1050 Brussel

Research group **Marine Biology**

https://we.vub.ac.be/en/ecology-and-biodiversity/research#Marine%20Biology

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// Institutional hierarchy

Faculty of Science and Bioengineering Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The research group Marine Biology specialises in (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 re-colonise 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.

Marine Biology

Pleinlaan 2
1050 Brussel

Research group **Physical Geography - Ice and Climate**

https://fard.research.vub.be

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philippe.huybrechts@vub.be

// Institutional hierarchy

Faculty of Sciences and Bioengineering Sciences
Department of Geography

// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The research group Physical Geography (FARD) was founded in 1970. The original research, concentrated on glaciology and quaternary geology (since 1985), 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 thermomechanical modelling of the continental cryosphere (Antarctica, Greenland and Quaternary ice sheet), regional Antarctic ice sheet dynamics (modelling, field work), and numerical modelling of Arctic ice caps and alpine mountain glaciers supported by fieldwork in Switzerland, the Russian Federation (the Caucasus), and Kyrgyzstan (High Mountain Asia). Of specific interest is a better understanding of the role and dynamics of land ice in relation to the climate and its consequences for global sea level. The research group Physical Geography - Ice and Climate is also strongly involved in the IPCC reports regarding the themes 'cryosphere', 'sea level' and 'polar ice sheets'.

FARD

Pleinlaan 2
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Ghent University

UGent **Aquaculture R&D Consortium**

www.ugent.be/bw/asae/en/research/aquaculture/research/aquaculturecconsortium

// Contact

peter.bossier@ugent.be

Abstract

Aquaculture research at Ghent University dates back to early 1970s with research on the brine shrimp Artemia and its crucial role as live food organism in the larval culture of the main cultured marine fish and shellfish. Since the Artemia Reference Center its establishment in 1978, this center has continuously sought to develop multidisciplinary research with various other departments on a wide range of topics such as microbiology, analytical chemistry, pathology, histology, nutritional studies, socio-economic aspects of development cooperation, ecology, food safety and food security.

At present 14 departments from 4 faculties are involved in aquaculture related research, education or development cooperation. This has yielded a long list of joint A1 publications and ongoing or finished PhD studies. This group of research units have grouped into this consortium in order to strengthen mutual objectives. The main objectives of the consortium are:

- coordinating and increasing research cooperation between members;
- increasing visibility and attractivity for prospective postgraduate students and PhD students;
- supporting the valorisation of new developments with potential for commercial applications;
- strengthening the identity of the research group as a project partner.

UGent Aquaculture R&D Consortium

Coupure Links 653
9000 Gent

Partners

Faculty of Bioscience Engineering

- Agriculture Economics
- Laboratory for Aquaculture and Artemia Reference Center *
- Research group Aquatic Ecology *
- Laboratory for Immunology and Animal Biotechnology *
- Center for Microbial Ecology and Technology *
- Food Microbiology and Food Preservation *

Faculty of Sciences

- Bio-informatics and Systems Biology
- Research group Evolutionary Morphology of Vertebrates *
- Marine Biology research group *
- Laboratory of Microbiology *
- Laboratory of Protistology and Aquatic Ecology *

Faculty of Veterinary Medicine

- Department of Morphology *
- Pathology, Bacteriology and Poultry Diseases
- Virology, Parasitology and Immunology

* Group is a marine research group

// Contact

margriet.drouillon@ugent.be

Abstract

BLUEGent is Ghent University's business development center covering the field of Aquaculture and Blue Life Sciences. BLUEGent groups over 400 scientists from six faculties who are active in the following domains: (i) Blue tourism & health, (ii) Coastal management, (iii) Healthy oceans, (iv) Marine resources & bioprospecting, (v) Multi-use of marine space and (vi) Sustainable seafood.

BLUEGent functions as a direct interface between its members and the industry, governments and social organisations. As such, BLUEGent identifies and initiate multidisciplinary research projects that can benefit the industry and/or society, and actively monitors new research findings with economic potential and matures them to market readiness. Further, BLUEGent provides interdisciplinary scientific and technological expertise, collaborative research, training, innovations and financing options for R&D to its partners. BLUEGent is also the lead partner of BIOMARES, an interdisciplinary cluster focusing on demand driven R&D and technology transfer in the field of marine biorefining and marine bioactives.

BLUEGent

Coupure Links 653
Building F
9000 Gent

Partners

Faculty of Sciences

- Laboratory for Applied Geology and Hydrogeology *
- Atomic and Mass Spectrometry group
- Research group Evolutionary Morphology of Vertebrates *
- Marine Biology research group *
- Laboratory of Microbiology *
- Palaeontology and Palaeo-environments research group *
- Phycology research group *
- Pore-scale Processes in Geomaterials Research Group (PProGRess)
- Laboratory of Protistology and Aquatic Ecology *
- Terrestrial Ecology unit *

Faculty of Medicine and Health Sciences

- Research unit of Exercise Physiology and Sports Training
- Research group Public Health Nutrition

Faculty of Bioscience Engineering

- Laboratory of Aquaculture and Artemia Reference Center *
- Research group BIOMATH
- Blue Growth research lab *
- Environmental Organic Chemistry and Technology *
- Laboratory of Environmental Toxicology and Aquatic Ecology *
- Laboratory for Immunology and Animal Biotechnology *
- Center for Microbial Ecology and Technology *
- Sustainable Systems Engineering research group *

Faculty of Engineering and Architecture

- Maritime Technology division *

Faculty of Veterinary Medicine

- Laboratory of Chemical Analysis
- Department of Morphology *
- Laboratory of Veterinary Pathology *
- Laboratory of Virology

Faculty of Law and Criminology

- Maritime Institute *

* Group is a marine research group

EnerGhentic

www.EnerGhentIC.ugent.be

// Contact

judith.ooms@ugent.be

Abstract

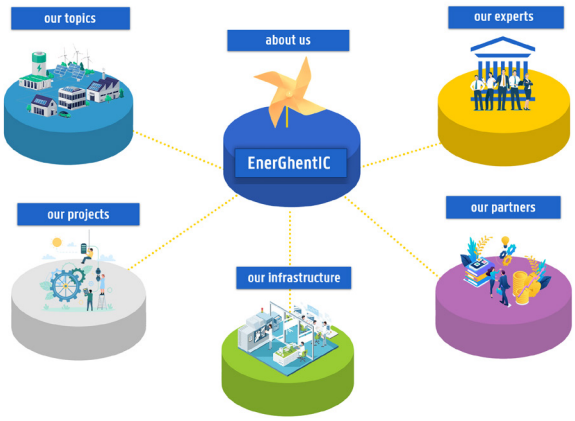
EnerGhentIC is the interdisciplinary community of Ghent University researchers working on the energy challenge. The three main activities include:

- 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 transition require a multidisciplinary approach. Therefore, EnerGhentIC groups researchers from different faculties across Ghent University. The EnerGhentIC community tackles many major energy topics, from energy generation to logistics and end use. Within the broader topic 'renewables' and the specific topic on 'offshore wind' seven research groups are active in Offshore Wind and Ocean Energy (wave & tidal energy) in a broad sense. Research is focusing on both technical (e.g. modelling, geotechnics, impact studies, etc.) and non-technical (e.g. economics, governance, law, etc.) topics.

EnerGhentIC

Sint-Pietersnieuwstraat 41
9000 Gent



Partners

Faculty of Engineering and Architecture

- Transport Technology
- Fluid Mechanics
- Electrical Energy Laboratory
- Dynamic Systems and Controls
- Mechanics of Materials and Structures
- Maritime Technology division *
- Coastal Engineering, Bridges and Roads unit *

* Group is a marine research group

Marine@UGent

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Abstract

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 72 marine-oriented research groups of UGent University 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 blue biotechnology, building with nature, sustainable seafood, maritime shipping and logistics, healthy oceans, offshore energy and multi-use of oceans.

Marine@UGent has developed a clear R&D Blue Growth strategy aiming to enhance its collaborations with the marine/maritime industry, government policies and society as a whole and to boost valorisation of marine and maritime research. In this context, Marine@UGent is designing and realising multifunctional core facilities at Ostend Science Park and commits to lifelong learning trajectories.

Partners

Faculty of Bioscience Engineering

- Research group Agro-food Marketing and Consumer Behavior *
- Laboratory of Analytical Chemistry and Applied Ecochemistry
- Laboratory of Aquaculture and Artemia Reference Center *
- Research group Aquatic Ecology *
- BIOBIX lab
- Research group BIOMATH *
- Blue Growth research lab *
- Environmental Organic Chemistry and Technology *
- Laboratory of Environmental Toxicology and Aquatic Ecology *
- Laboratory for Food Chemistry and Human Nutrition
- Laboratory of Food Microbiology and Biotechnology
- Laboratory of Food Microbiology *
- Department of Food Technology, Safety and Health
- Laboratory of Forest Management and Spatial Information Techniques
- Department of Green Chemistry and Technology
- Heterocyclic Synthesis and Chemical Modification of Renewable Resources research group
- Laboratory for Immunology and Animal Biotechnology *
- Research unit KERMIT *
- Center for Microbial Ecology and Technology *
- Particle and Interfacial Technology group *
- Laboratory of Plant Ecology *
- Research group Soil Spatial Inventory Techniques
- Research Group Sustainable Systems Engineering
- Thermochemical Conversion of Biomass *

Faculty of Veterinary Medicine

- Laboratory of Chemical Analysis
- Laboratory of Immunology
- Department of Morphology *
- Department of Pathobiology, Pharmacology and Zoological Medicine *
- Laboratory of Virology

Marine@UGent

Ostend Science Park
Wetenschapspark 1
8400 Oostende

Partners (continuation)

Faculty of Pharmaceutical Sciences

- Laboratory of Pharmaceutical Biotechnology
- Laboratory Pharmaceutical Care
- Laboratory of Pharmaceutical Microbiology

Faculty of Medicine and Health Sciences

- Research unit of Exercise Physiology and Sports Nutrition
- Research group Nutrition and Food Safety

Faculty of Engineering and Architecture

- Institute of Biomedical Engineering and Technology
- Electrical Energy laboratory
- Engineering
- Coastal Engineering, Bridges and Roads unit *
- Geotechnics laboratory *
- Hydraulics laboratory *
- Magnel-Vandepitte laboratory *
- Maritime Technology division *
- Department of Materials, Textiles and Chemical
- Center for Mobility and Spatial Planning
- Soete Laboratory *
- Research group Sustainable Materials Science

Faculty of Arts and Philosophy

- Department of Archaeology *
- HPIMS - Henri Pirenne Institute for Medieval Studies

Faculty of Political and Social Sciences

- Center for Journalism Studies
- Department of Political science

Faculty of Psychology and Educational Sciences

- Department of Experimental Clinical and Health Psychology

Faculty of Law and Criminology

- Maritime Institute *

Faculty of Sciences

- Research group Agro-food Marketing and Consumer Behavior *
- Laboratory for Applied Geology and Hydrogeology *
- Atomic and Mass Spectrometry group *
- Research group Evolutionary Developmental Biology *
- Research group Evolutionary Morphology of Vertebrates *
- Geomatics - Cartography and GIS - 3D Data Acquisition *
- Marine Biology research group *
- Laboratory of Microbiology *
- Research group Nematology
- Palaeontology and Palaeo-environments research group *
- Phycology research group *
- Center for Plant Systems Biology *
- Polymer Chemistry and Biomaterials research group
- Research unit Pore Scale Processes in Geomaterials
- Laboratoy of Protistology and Aquatic Ecology *
- Renard Centre of Marine Geology *
- Terrestrial Ecology unit *

* Group is a marine research group

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

https://agecon.ugent.be/agro-food-marketing-and-consumer-behavior

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// Institutional hierarchy

Faculty of Bioscience and Engineering
Department of Agricultural Economics

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences

Abstract

The research group Agro-food Marketing and Consumer Behavior integrates expertise in the scientific disciplines of economics, sociology, agro-food marketing, consumer behaviour, market and marketing research, risk perception, communication, health promotion, and health education.This expertise has been demonstrated in recent high-quality studies on consumer behaviour towards (sea)food, functional foods, nutrition and health claims, nutrition labelling, sustainability and on the role of health-related information on food choice and dietary behaviour. This group has extensive expertise in performing cross-cultural consumer studies and has been a key partner with research and management responsibilities in over 15 EU-funded research projects. This includes involvement in the EU-FP6 Integrated Projects SEAFOODplus, TRUEFOOD, QPORKCHAINS and PROSAFEBEEF, the EU-FP7 Collaborative Projects EATWELL, FOODRISC, ACROPOLIS, SOLID, CLYMBOL, ECsafeSEAFOOD, PHYTOME and FOODINTEGRITY and the EU-H2020 projects PROMISS, PROFUTURE, SEAFOODTOMORROW and ECsafeSEAFOOD. Within the domain of seafood, the research group focuses on:

- consumer acceptance of technological innovation in the (sea)food chain;
- trends and changes in consumers' (sea)food choices;
- impacts of ethical and sustainability considerations of consumers and citizens;
- impacts of communication and labelling on (sea)food choice;
- perception of safety, health and sustainability of (sea)food and (sea)food production.

Agro-food Marketing and Consumer Behavior

Coupure Links 653
Building A.1.093
9000 Gent

Laboratory of **Animal Nutrition and Animal Product Quality**

www.ugent.be/bw/asae/en/research/lanupro

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Animal Sciences and Aquatic Ecology

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Natural sciences: Biological sciences

Abstract

The laboratory of Animal Nutrition and Animal Production Quality (LANUPRO) focuses on three research disciplines:

- ruminant nutrition and microbial metabolism;
- monogastric nutrition;
- carcass and meat quality.

The group occasionally analyses fish or marine products, but the main focus is on farm animals.

In the marine field, the research and laboratory analyses involve:

- fish muscle food characteristics (fatty acids, heme-Fe, intrinsic antioxidants), in interaction with other foods and food compounds, that relate to the formation of lipid and protein oxidation products during gastrointestinal digestion;
- the potential of algae in animal nutrition for improving animal health or production, for reducing methane production in the rumen, and for enhancing the long chain n-3 PUFA content of animal-source foods;
- analysis of fatty acids and lipid oxidation products on marine products samples as service for third parties.

LANUPRO

Coupure Links 653
Building F
9000 Gent

Laboratory for **Applied Geology and Hydrogeology**

www.ugent.be/we/geologie/en/research/organization/applied-geology-and-hydrogeology

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thomas.hermans@ugent.be

// Institutional hierarchy

Faculty of Sciences
Department of Geology

// Research domain & discipline

Engineering and technology: Other engineering and technology
Natural sciences: Earth sciences

Abstract

The laboratory for Applied Geology and Hydrogeology was founded in 1970 and was formerly known as 'Leerstoel Toegepaste Geologie' (Chair Applied Geology). 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 and is still involved in this research (recent update of the salinisation map with airborne electromagnetic data), including foreign countries (e.g. Libya, Palestine, Tanzania, Bangladesh, Vietnam). The laboratory also extended is research to offshore exploration, with the investigation of submarine groundwater discharge along the Belgian shore, and to the estimation of turbidity using multibeam backscattered data.

Research at the laboratory is related to hydrogeology, hydrogeochemistry, and applied geophysics, with special emphasis on hydrogeophysics. For quantitative aspects, its research is concentrating on groundwater recharge, groundwater exploitation and sustainability, in relation to climate and specific groundwater utilisation practices, both in Flanders and in developing countries. The laboratory is also involved in research related to shallow geothermal energy. Quantitative assessment of hydrogeological resources is often done through groundwater models, with a particular emphasis on the role of geological heterogeneity and the development of new methodologies to quantify the uncertainty related to hydrogeological predictions. From the qualitative point of view, the natural baseline quality of aquifers is studied; against this natural background, pollution is investigated, specifically focusing on diffuse pollution (mostly by nitrates). The research unit has been involved in several European projects related to natural baseline chemistry of groundwater, which have supported the development of the EU Groundwater Directive. The group is active in the application and development of innovative geophysical imaging techniques with a special emphasis on the geophysical monitoring of natural processes and active experiments (e.g., heat tracing experiments). In recent years, an increasing focus has been towards Africa, where groundwater exploitation, pollution and the problem of sustainability of groundwater resources are even more directly crucial for life than in the industrialised world.

Applied Geology and Hydrogeology

Krijgslaan 281
Building S8
9000 Gent

Laboratory of **Aquaculture and Artemia Reference Center**

www.ugent.be/bw/asae/en/research/aquaculture

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Animal Sciences and Aquatic Ecology

// Research domain & 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 laboratory engaged in a multidisciplinary collaboration effort with (inter)national research institutes in the framework of Research and Development (R&D) projects. The knowledge on larval culture of molluscs has been used in the last ten years to develop a new research area focusing on offshore mollusc aquaculture, exploring the possibilities of near and offshore mollusc production. The lab's research also focuses significantly on the circular and blue bioeconomy, investigating ways to transform fish waste into high-quality products.

The laboratory is the coordinator of the UGent Aquaculture R&D consortium and member of BLUEGent, a valorisation consortium. The group coordinates the International Master of Science in Aquaculture and the Erasmus Mundus Master of Science in Health management in Aquaculture.

Laboratory of Aquaculture and ARC

Coupure Links 653
Building F
9000 Gent

Research group **Aquatic Ecology**

www.ugent.be/bw/asae/en/research/aeco

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Animal Sciences and Aquatic Ecology

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture science
Engineering and technology: Information and computer sciences
Natural sciences: Biological sciences
Social sciences: Political sciences and policy

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Abstract

The research group Aquatic Ecology (AECO) focuses on innovative technologies for a more efficient and reliable exploitation of water systems in a context of sustainable development. Marine research topics dealt with by AECO include:

- analysis of risks and benefits of the consumption of fisheries products;
- sustainability analysis of marine systems;
- fish monitoring based on camera-systems and telemetry;
- innovation in monitoring and modelling to support decision-making in fisheries and biodiversity protection;
- optimisation of plastic clean-up technologies;
- analysis of the ecosystem functions of mangroves;
- multifunctional analysis and optimisation of marine systems in relation to land-use and multi-stakeholder exploitation;
- recirculation aquaculture systems for sea horse production;
- fisheries analysis based on data mining and artificial intelligence.

AECO

Coupure Links 653
Building F
9000 Gent

Department of **Archaeology**

www.ugent.be/lw/archeologie/en/research

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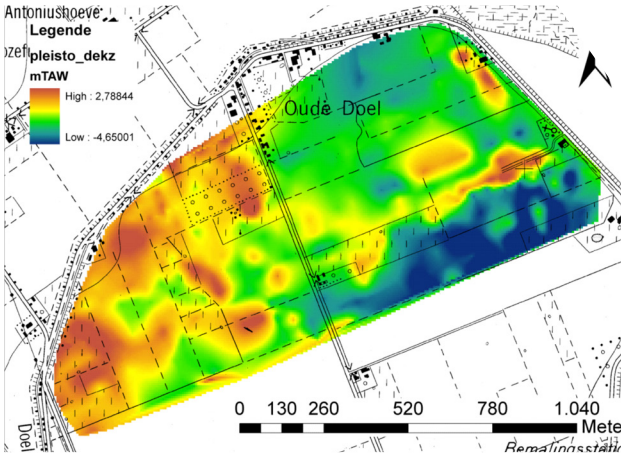
// Institutional hierarchy

Faculty of Arts and Philosophy

// Research domain & discipline

Humanities: History and archaeology



Abstract

The department of Archaeology 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.

Fact sheet not validated by research group

Archaeology

Sint-Pietersnieuwstraat 35 (Ufo)
9000 Gent

Atomic and Mass Spectrometry group

www.ams.ugent.be/atomic-and-mass-spectrometry-research-group

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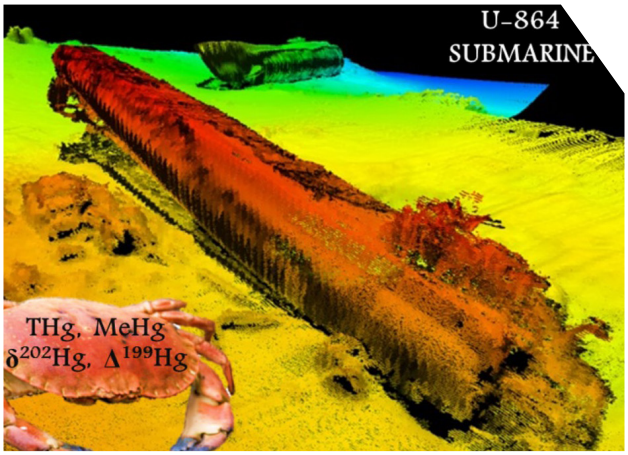
// Institutional hierarchy

Faculty of Sciences
Department of Chemistry

// Research domain & discipline

Natural sciences: Chemical sciences



Abstract

The Atomic and Mass Spectrometry group (A&MS) is specialised in the development of methods for the determination, elemental speciation and isotopic analysis of (trace) metals and metalloids via inductively coupled plasma mass spectrometry (ICP-MS) 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.

A first type of application, is high-precision isotopic analysis of target elements using multi-collector ICP-mass spectrometry, e.g. (i) isotopic analysis of mercury for assessing pollution around a WWII submarine wreck, for distinguishing between several sources of Hg pollution in sediments or biota, or for unraveling the Hg metabolism in marine mammals or (ii) isotopic analysis of Chlorine and Bromine in seawater for studying sea ice formation.

A second application is elemental mapping for documenting the distribution of elements in a sample in two (and sometimes even three dimensions) in a quantitative way using laser ablation – ICP-MS (LA-ICP-MS). In the context of the marine sciences, biomineral samples, such as bivalve and oyster shells, fish otoliths, foraminifera, etc. can be analysed.

A third application is single-cell ICP-MS, allowing to quantify elemental contents in individual cells, thus not only generating an average or median value (based on a large population of cells), but also the spread in target element content. This approach can tackle all types of cells, of bacterial, plant or animal origin.

A&MS

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Blue Growth research lab

https://bluegrowthlab.ugent.be

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// Research domain & discipline

Engineering and technology: Biotechnology
Medical and health sciences: Medical and health sciences
Natural sciences: Biological and chemical sciences

Abstract

Seas and oceans play a pivotal role in our society. The Blue Growth research lab applies transdisciplinary research to advance our understanding on how we interact with the ocean and how this affects ocean functioning as well as our own health at an individual and societal level. The main research topics are:

- molecules from the sea: The ocean is a vast reservoir of molecules. The Blue Growth research lab explores their function in marine ecosystems and their potential for human health;
- sustainable use of the sea: The Blue Economy capitalises on marine resources and marine space. The lab studies how economic activities interact with marine ecosystem services by building models and frameworks for the sustainable exploitation of the marine environment for human needs;
- humans and the sea: The lab studies how human impacts such as pollution affect the environmental health and the carrying capacity of marine ecosystems.

Blue Growth research lab

Ostend Science Park
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8400 Oostende

Coastal Engineering, Bridges and Roads unit

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

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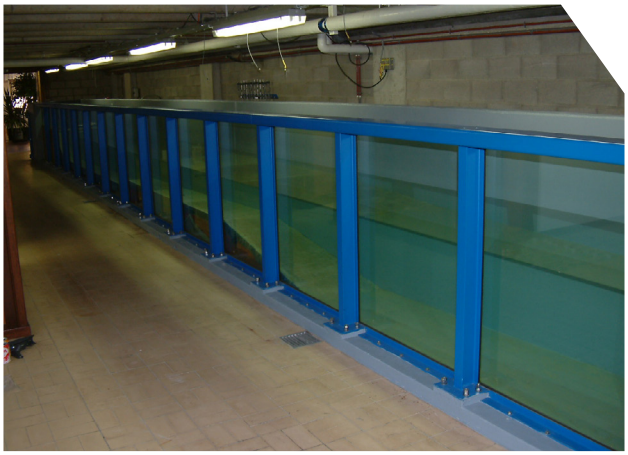
// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil engineering



Abstract

The Coastal Engineering, Bridges and Roads unit 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 defence (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);
- the interactions between water motions (waves and tides), including the associated sediment transport and the coastal structures (which may cause local erosion of the seafloor);
- 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 carrying out field measurements on coastal defence systems and 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 and transformation of wind-generated waves (MILDwave, FLOW3D, OpenFOAM) and tidal currents (COHERENS). The group coordinated the design and operational start-up of the wave tank, the Coastal & Ocean Basin (COB), in Ostend Science park.

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

Coastal Engineering, Bridges and Roads

Technologiepark 60
9052 Gent

Research group **Environmental Organic Chemistry and Technology**

www.ugent.be/bw/gct/en/research/envoc

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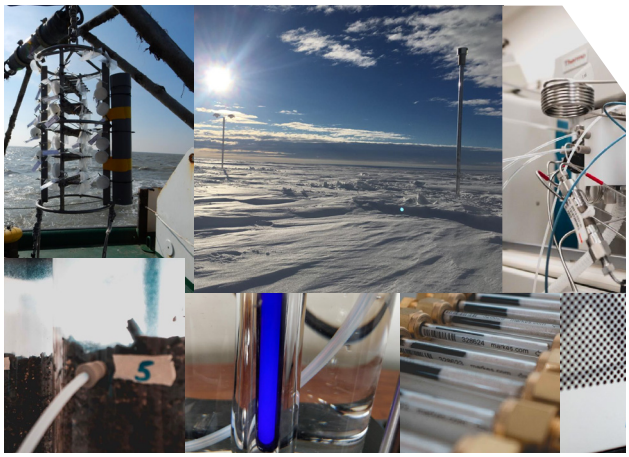
// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Green Chemistry and Technology

// Research domain & discipline

Engineering and technology: Other engineering and technology
Natural sciences: Biological and chemical sciences



Abstract

The research group Environmental Organic Chemistry and Technology (EnVOC) focuses on trace organic compounds in ecoystems, i.e. (bioactive) organic compounds that occur at (sub-)trace levels in our environment. The research activities involve three sub-disciplines:

- environmental trace analysis;
- environmental chemistry (fate, behaviour, partitioning, reactivity);
- environmental treatment technology.

Merging all this, integrated research approaches are used in the lab activities covering multi-disciplinary research topics. Specific research projects deal with the so-called contaminants of emerging concern (e.g. pharmaceutical residues) in the aquatic environment, and on airborne volatile and semi-volatile organics in both gas phase and on particulate matter. For its research, the EnVOC group is equipped with highly advanced - mass spectrometry based - chemical-analytical equipment, as well as with experimental set-ups to provide solutions for challenges with respect to treatment of air and water. EnVOC is member of the Marine@UGent consortium.

EnVOC

Coupure Links 653
9000 Gent

Laboratory of **Environmental Toxicology and Aquatic Ecology**

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Animal Sciences and Aquatic Ecology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The laboratory for Environmental Toxicology and Aquatic Ecology (GhEnToxLab) aims to advance the understanding of environmental and ecotoxicological problems and processes across all levels of biological organisation (from genomes and cells to populations and ecosystems). Through training and education of environmental scientists at both Master, PhD and postdoc level along this general research line and through open communication of research results to industry and policy-makers, the group ultimately aims to improve the ecological relevance of environmental risk assessment of chemicals and other natural and anthropogenic stressors and to support science-based environmental quality management and policy. The marine research within this group is supported by Prof. Colin Janssen.

GhEnToxLab

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Building F, 2nd floor
9000 Gent

Research group **Evolutionary Developmental Biology**

www.ugent.be/we/biology/en/research/evodevo

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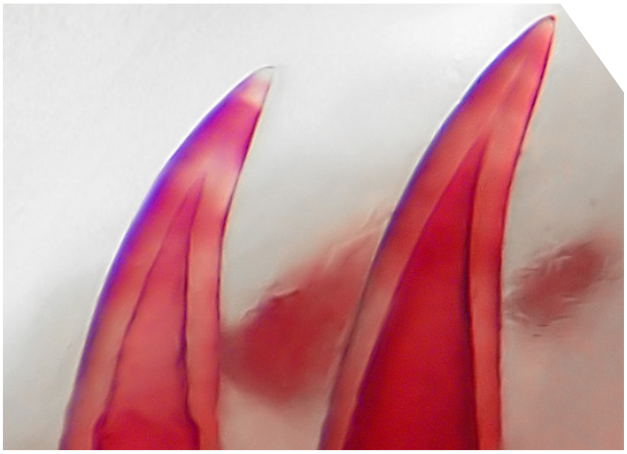
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The research group Evolutionary Developmental Biology focuses on the evolution and development (Evo-Devo) of the vertebrate skeleton. Special techniques are used for extreme detailed histological analysis of skeletal tissues. Current studies include molecular, histochemical and cytochemical approaches that can elucidate principles of vertebrate skeletal development. The basic research of the Evo-Devo lab focuses on the evolution of vertebrate teeth, with zebrafish and medaka as experimental models, and on the evolution of the vertebral column.

Basic knowledge about the skeleton promotes our applied studies: biomedical research and aquaculture research. Biomedical research analyses zebrafish as a model for human skeletal diseases, such as osteoporosis and osteogenesis imperfecta (brittle bone disease), in collaboration with the Ghent University Hospital (UZ), the University of Pavia (Italy) and other medical faculties across Europe. Aquaculture research investigates skeletal malformations of farmed fish, particularly Atlantic salmon and other salmonid species. At Ghent University the Evo-Devo lab is the centre for research on farmed Atlantic salmon. These studies are done with partners in Norway, Canada, Chile and Australia.

Evo-Devo

K.L. Ledeganckstraat 35
9000 Gent

Research group **Evolutionary Morphology of Vertebrates**

www.ugent.be/we/biology/evo-morph

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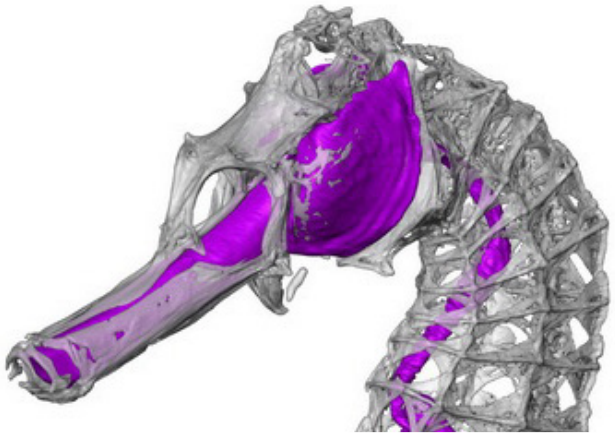
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The research group Evolutionary Morphology of Vertebrates conducts research that has a main focus on adaptive morphological evolution for improved performance in a specific function, as well as phenotypic responses to changing performance regimes due to varying selective pressures. Several disciplines and methodologies are required to provide holistic information on the morphological diversity of vertebrates and evolutionary patterns underlying it: dissections, clearing-and-staining, histological sectioning and graphical 3D-reconstructions, geometric morphometrics, taxonomy, phylogeny (morphological and molecular), biomechanics and performance testing. The expertise on studying vertebrate phenotypes is also used for more applied research topics, such as larval fish quality assessment in aquaculture and phenotyping of cranio-facial deformations in model organisms.

The marine research focuses on bio-inspired research, including studies of seahorse and brittlestar skeletons and its potential use in industrial designs.

The research group is part of the BLUEGent Consortium and the Marine@UGent consortium. Furthermore, the group collaborates intensively with the Centre for X-ray Tomography (UGent, UGCT).

Evolutionary Morphology of Vertebrates

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9000 Gent

Laboratory of **Foodborne Parasitic Zoonoses**

www.ugent.be/di/vpi/en/research/fpz

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// Institutional hierarchy

Faculty of Veterinary Medicine
Department of Translational Physiology, Infectiology and Public Health

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture, and veterinary sciences
Medical and health sciences: Medical and health sciences

Abstract

The laboratory of Foodborne Parasitic Zoonoses (LFBP) studies helminth zoonoses with an emphasis on the following (groups of) parasites: *Taenia solium*, *Taenia saginata*, *Sarcocystis* spp. and Anisakidae. The group uses a holistic approach, including the host, parasite and environment and tackling the diseases from a multidisciplinary, One Health perspective, within Belgium, the European Union, but equally so in endemic areas in the South.

The marine research applications concern the study of the occurrence in Belgium of marine roundworms (nematodes), *Anisakis* and *Pseudoterranova* species, which have marine mammals and fish eating birds as final hosts, crustceans as first intermediate host and cephalopods and saltwater fish as second intermediate hosts or paratenic host. Furthermore the laboratory studies their impact on the fish industry, and looks into more rapid diagnostics and methods to remove larvae from the fish fillets. Additionally the laboratory studies bacterial and allergic concerns related to these parasites.

LFBP

Salisburylaan 133
(Entrance 24)
9820 Merelbeke

Research group **Food Microbiology and Food Preservation**

www.ugent.be/bw/foodscience/en/research#rFoodMicro

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Food Technology, Safety and Health

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Natural sciences: Biological sciences

Abstract

The research group Food Microbiology and Food Preservation (LFMFP) 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 group focuses on studying microbial behaviour in food products during harvesting/slaughtering, production, storage, distribution and preparation. Two essential areas of research are: food preservation and spoilage and microbial safety. 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. Food packaging is a very important preservation technique studied intensively at LFMFP. Microbial food safety is a key research theme of the laboratory, with an emphasis on microbial food pathogens and microbial toxins in for example fish and fishery products. The effect of microbial toxins on humans is studied in vitro through several platforms. Quality assurance systems are investigated to ensure microbial food safety and quantitative data are collected and elaborated in 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;
- biological toxins in fish and fishery products.

In the future, the laboratory will focus on the further development of certain aspects regarding microbial food safety (detection of food pathogens and toxins), 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 a service laboratory (with up-to-date infrastructure) into the LFMFP. The laboratory is active within several consortia, such as Food2Know, Pack4Food and the UGent Aquaculture R&D consortium.

LFMFP

Coupure Links 653
9000 Gent

Geomatics - Cartography and GIS - 3D Data Acquisition

geoweb.ugent.be

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// Institutional hierarchy

Faculty of Sciences
Department of Geography

// Research domain & discipline

Engineering and technology: Geomatics and other engineering and technology

Abstract

The Geomatics division 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 Geomatics branch participates in national and European research projects and collaborates intensively with Flanders Hydraulics Research, Flanders Marine Institute (VLIZ), Antwerp Maritime Academy, ENSTA (Brest) and HafenCity Hamburg (HCU).

Geomatics

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Building S8
9000 Gent

Geotechnics laboratory

www.ugent.be/ea/civil-engineering/en/research/geotechnics

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// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil engineering

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Abstract

The Geotechnics laboratory has the following current research interests:

- soil mechanics;
- offshore foundations;
- shallow and deep foundations;
- foundations in difficult soil conditions;
- hydraulic barriers for environmental applications;
- soil remediation technologies.

Applications within the marine field consist of offshore foundations, cables and pipelines. The current research investigates the in-situ behaviour of offshore monopile foundations for offshore wind turbines through geotechnical labotory testing, numerical modelling and monitoring data back-analysis. Research into the thermal properties of soil which affect the temperature field around offshore cables is also conducted in collaboration with industry partners. In addition, design guidelines for anchors for mussel farms have been developed by the researchers.

Geotechnics

Technologiepark 60
9052 Gent

Hydraulics laboratory

www.ugent.be/ea/civil-engineering/en/research/hydraulics

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// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil engineering

Abstract

The Hydraulics laboratory 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 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;
- hydrodynamics and mass transfer between a flow and a lateral embayment;
- hydraulic design of structures (locks, weirs, fish passes, bed and bank protection, etc.).

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

Hydraulics

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Laboratory for **Immunology and Animal Biotechnology**

www.ugent.be/bw/asae/en/research/immunoanimalbiot

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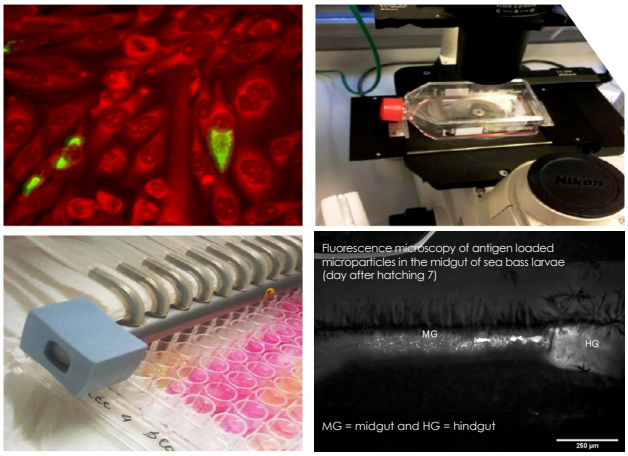
// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Animal Sciences and Aquatic Ecology

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Engineering and technology: Biotechnology
Medical and health sciences: Medical and health sciences



Abstract

The laboratory for Immunology and Animal Biotechnology conducts research which is clustered among three disciplines:

- *Chlamydia* spp. in animals and humans;
- *E. coli* pathogens for animals and humans;
- aquaculture.

Aquaculture is currently the fastest growing food producing sector in the world, due to the increasing demand for seafood. The larval phase of the aquaculture production cycle is however still affected by low and unpredictable survival, high susceptibility to diseases (caused e.g. by *Vibrio* spp.) and slow growth, all constituting bottlenecks for the sustainable expansion of aquaculture. The laboratory is studying the innate immune system of fish larvae and larvae of shrimp and mussels in order to design immunostimulants and recombinant-, DNA and mRNA vaccines for inducing innate immune memory and decreasing larval dead.

Immunology and Animal Biotechnology

Coupure Links 653
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9000 Gent

Laboratory of **Industrial Water and Ecotechnology**

www.ugent.be/bw/gct/en/research/greentech/research/liwet

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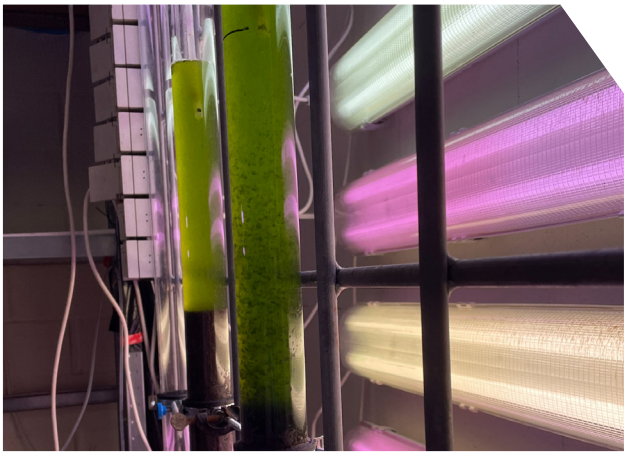
// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Green Chemistry and Technology

// Research domain & discipline

Engineering and technology: Biotechnology and other engineering and technology
Natural sciences: Biological and chemical sciences



Abstract

The laboratory of Industrial Water and Ecotechnology (LIWET) focuses on both water technology and ecotechnology. The laboratory is testing new water treatment technologies on lab-scale, followed by upscaling in pilot demo-sites to make sure these technologies can be implemented on industrial scale. With regard to water technology, the group is mainly focusing on advanced oxidation process and physical-chemical water treatment. In the field of ecotechnology, the group is focusing on microplastics removal in constructed wetlands, water treatment with natural systems and algal technology.

Within the marine context, the group is studying the characteristics and removal of microplastics in constructed wetlands, the biological growth of microalgae through microalgae cultivation and kinetic modelling, development of decentralised/mobile water treatment systems and removal of organic micropollutants with different techniques such as advanced oxidation.

LIWET

Campus Kortrijk
Sint-Martens-Latemlaan 2B
8500 Kortrijk

Magnel-Vandepitte laboratory

www.ugent.be/ea/structural-engineering/nl/onderzoek/magnel-vandepitte

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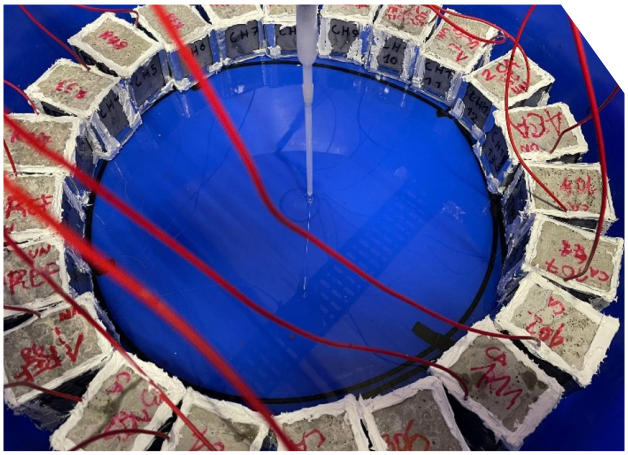
// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Structural Engineering and Building Materials

// Research domain & discipline

Engineering and technology: Civil engineering



Abstract

The Magnel-Vandepitte laboratory 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.).

Magnel-Vandepitte

Technologiepark 60
9052 Gent

Marine Biology research group

www.marinebiology.ugent.be

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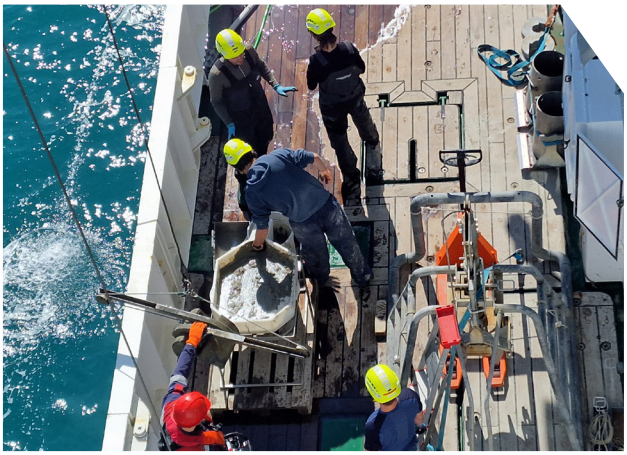
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The Marine Biology research group (MARBIOL) performs ecological and systematic research on marine ecosystems. Since its foundation in the 1970s, there has been a geographical expansion of the study areas (North Sea to tropical and polar regions, including deep-sea ecosystems) and a shift from morphological, taxonomic and ecological studies based on field observations towards process-oriented and functional studies with an experimental, bio(geo)chemical and molecular approach. The policy-oriented questions regarding sustainable fisheries, marine spatial planning and nature conservation constitute important elements in the valorisation of the fundamental research conducted by the group. The research focuses on three research pillars:

- Biodiversity and ecosystem functioning: Marine biodiversity loss and invasive species are a concern for ecosystem functioning, jeopardising the provision of ecosystem goods and services and therefore affecting human well-being. By performing laboratory and field experiments and observational studies, a better understanding of the marine ecosystem is aimed for, giving the baseline and best practice to underpin sound ecosystem management. In this context, the group studies food web structure and flow of energy, species interactions, dispersal ecology, population dynamics, acclimation and adaptation, taxonomy, patterns of diversity and community structure, diversity-ecosystem functioning relationships, resistance and resilience of populations, communities and ecosystem functioning, carbon and nutrient cycling, and carbon sequestration in marine sediments;
- Anthropogenic impact and climate change: MARBIOL focuses on advancing the field of climate change ecology and anthropogenic impact assessment in general, as marine communities are under increasing pressure. The group has a specific interest in how ecosystems, and specifically benthic systems, communities and species, cope with those changes at the level of individuals and populations and how these form ecological patterns across spatial scales. The research includes the study of the effects of microplastics, the impact of deep-sea mining, the effect of offshore wind farms and anthropogenic underwater noise, the impact of fisheries and aquaculture, impacts of specific aspects of global change such as ocean acidification and warming, sea ice decline and glacier retreat on functioning of marine ecosystems, species interactions and energy flow in marine food webs;
- Marine resource and environmental management: The group aims to improve insights into the complexities of marine resources (and related activities) and environmental management in order to provide guidance for sustainable value creation. Understanding the interplay between all stakeholders (policy, science, industry and society) and underlying impacts of marine resource exploitation is key to a sustainable use of the sea. In this context, research focus is on deep-sea mining, marine renewable energy, environmental monitoring, fisheries, aquaculture, sand extraction and the role of biodiversity for coastal restoration.

MARBIOL

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9000 Gent

Marine Optics and Remote Sensing research group

www.ugent.be/we/biology/en/research-corefacilities/marsens

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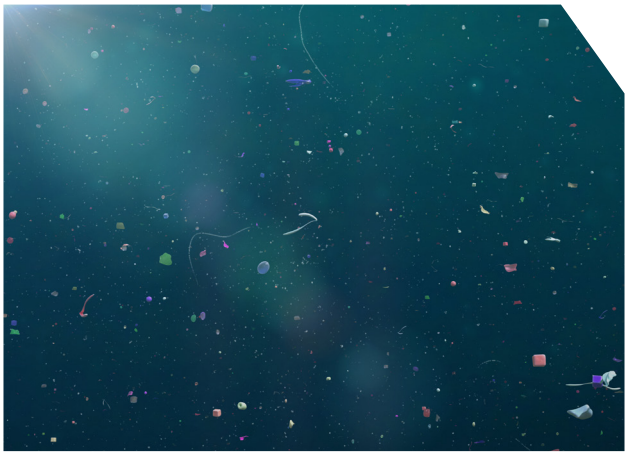
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Engineering and technology: Other engineering and technology
Natural sciences: Biological and chemical sciences



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Abstract

The Marine Optics and Remote Sensing (MarSens) research group focuses on development and applications of in situ and remote sensing observations of marine particles – the living and the non-living, the organic and the inorganic – from the surface of the sea to the deep ocean. Marine particles are an important component of marine ecosystems and play a crucial role in marine biogeochemical cycles. The MarSens group studies the spatiotemporal distribution, diversity, and ecological/biogeochemical roles of particles in coastal and open ocean environments.

The group's research interests comprise:

- theoretical modelling of optical properties of marine particles;
- biogeochemical characterisation of particles;
- development of optical algorithms for remote sensing of particles;
- development of optical sensors and methods for in situ (autonomous) observation of marine particles;
- broad-ranging applications in marine biogeochemistry, plankton ecology and water quality.

The research activities of MarSens include theoretical and laboratory work, sensor development, work at sea and analyses of multiplatform datasets (in situ and remote sensing) to address a wide range of research questions in marine ecology and biogeochemistry, including an improved understanding of the ocean's biological carbon pump.

MarSens

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Maritime Institute

www.law.ugent.be/maritimeinstitute

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// Institutional hierarchy

Faculty of Law and Criminology
Department of European, Public and International Law

// Research domain & discipline

Social sciences: Economics and business, law and legal studies, and political sciences and policy

Abstract

The Maritime Institute was established in 1984 with the following objectives:

- to conduct legal and multidisciplinary research with focus on oceans and related activities (shipping, ports, fisheries, marine spatial planning, etc.);
- to support education in the field of the law of the sea, marine environmental law, port and maritime sciences;
- to organise workshops, conferences and symposia;
- to provide consultancy to non-academic actors, such as governments, non-governmental organisations and the private sector.

In terms of research, the Maritime Institute is specialised in law of the sea (shipping, maritime security, pollution, coastal/port/flag state jurisdiction, exploitation of natural resources, coastal zone management, offshore renewable energy, marine protected areas, etc.), international and European environmental and biodiversity law, port economics and policy, maritime economics, marine spatial planning and interdisciplinary research. Throughout the years, members of the Maritime Institute have been involved in strategic legal research and the drafting of legislation supported by the Federal and Flemish government, as well as international policy relevant research projects. In terms of education, the Maritime Institute organises the annual post-academic Port Management course series and the advanced inter-university master program in Maritime Science.

Maritime Institute

Universiteitstraat 4
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Maritime Technology division

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// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil and mechanical engineering, and other engineering and technology

Abstract

In 1904, the research unit Naval Architecture 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:

- ameliorate the academic education regarding the design, construction, propulsion, functioning and maintenance of marine structures such as ships, but also aquaculture and offshore constructions;
- fundamental and applied scientific research in the maritime field, especially regarding the hydrodynamics of vessels and other floating structures (floating photovoltaics, floating offshore wind, aquaculture);
- 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 floating structures (mainly but not only ships) in the water. While the emphasis of the research lies on ship behaviour in shallow and confined water (access channels, rivers, canals, harbours), dynamics of other floating structures such as aquaculture plants and photovoltaic systems are also covered.

Research 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 vessel dynamics, arrival and departure arrangements for deep-drafted 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 tanks in Antwerp and Ostend.

Maritime Technology

Technologiepark 60
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Center for **Microbial Ecology and Technology**

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Biotechnology

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Engineering and technology: Biotechnology
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. Furthermore, the group is involved in several European and national marine research projects.

CMET

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Laboratory of **Microbiology**

www.ugent.be/we/biochemicro/en/research/microbiology/overview.htm

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// Institutional hierarchy

Faculty of Sciences
Department of Biochemistry and Microbiology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The laboratory of Microbiology (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 and bacteria;
- study of the biodiversity, specificity and function of endosymbiotic bacteria in macroalgae;
- identification and classification of new marine bacteria, including genome analysis;
- characterisation of enzymes of marine bacteria.

The group is active within national and international projects and collaborates intensively with laboratories within UGent, 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).

LM-UGent

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9000 Gent

Department of **Morphology**

https://bluegent.ugent.be/department-morphology-0

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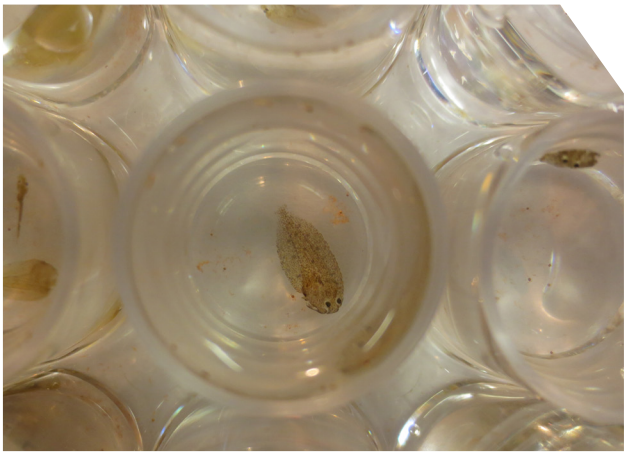
// Institutional hierarchy

Faculty of Veterinary Medicine
Department of Morphology

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture, and veterinary sciences



Abstract

The department of Morphology 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 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;
- aquatic veterinary medicine.

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

- gastrointestinal development of fish larvae;
- 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 (UGent) and the department of Pathology, Bacteriology and Poultry Diseases (UGent). The department of Morphology is also part of the UGent Aquaculture R&D consortium 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 and focuses on unambiguous protocols regarding conservations techniques for mammalian skeletons in natural historical collections in close collaboration with the Operantional Directorate Natural Environment (RBINS). The museum is furthermore involved in the recovery and conservation of stranded marine mammals along the Belgian coast.

Fact sheet not validated by research group

Morphology

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9820 Merelbeke

Palaeontology and Palaeo-environments research group

www.ugent.be/we/geologie/en/research/organization/palaeontology-and-palaeo-environments

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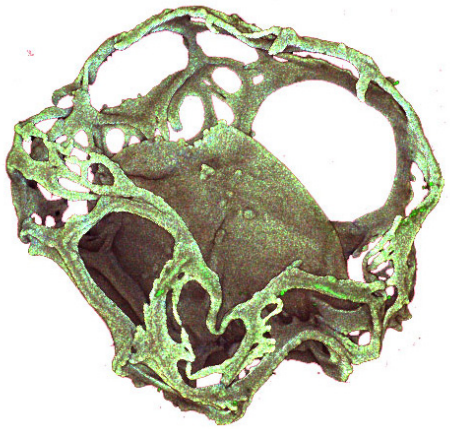
// Institutional hierarchy

Faculty of Sciences
Department of Geology

// Research domain & discipline

Natural sciences: Earth sciences



Abstract

The Palaeontology and Palaeo-environments research group was founded in 1960. The group mainly focuses on reconstructing environmental conditions and the evolution of life from ancient Palaeozoic times to the current Anthropocene. The research gives insights in when, how and at which pace environments and climate changed in the past, and how this happened in tandem with the evolution of life on Earth.

The core specialisation of the research group is in palynology (the study of microfossils with an organic wall). These range from the remains of ancient tiny marine planktonic organisms to the spores and pollen of modern trees. The group studies the spatial and temporal distribution of these fossils, along with their geochemical composition, and also studies other and larger fossils (e.g. arthropods). The group uses stratigraphical methods, sedimentology, geological field observations and complex numerical climate models. Combined, these data inform us how ancient ice caps grew and disappeared again, how oceans and marine life evolved, how the biosphere, oceans and atmosphere interacted, how and when humans settled in our region and what processes govern the evolution of life. Research of how life on Earth responded to major environmental changes in the past can help predicting how it may respond in the future.

The current specific research projects involve:

- 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 Quaternary palaeoenvironmental reconstructions;
- palaeoecology and biostratigraphy of mid-Palaeozoic chitinozoans and acritarchs;
- fossil teratology as a palaeoenvironmental proxy;
- Ordovician and Silurian palaeoenvironmental and palaeoclimate reconstructions;
- geochemical characterisation of Palaeozoic and Cenozoic palynomorphs;
- palaeobiology of exceptionally perserved Palaeozoic biota;
- stable isotopic analyses (O/C) of fossil plankton;
- environmetal triggers of large-scale macro-evolutionary events, including major radiations and mass-exinctions in the Palaeozoic and Mesozoic.

Palaeontology and Palaeo-environments

Krijgslaan 281
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9000 Gent

Particle and Interfacial Technology group

www.ugent.be/bw/gct/en/research/paint

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Green Chemistry and Technology

// Research domain & discipline

Engineering and technology: Other engineering and technology
Natural sciences: Chemical sciences

Abstract

The Particle and Interfacial Technology (PaInT) 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 reverse osmosis (RO), forward osmosis (FO), electrodialysis (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.

Fact sheet not validated by research group

PaInT

Coupure Links 653
9000 Gent

Phycology research group

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// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Phycology research group was founded at the end of the 1990s under its former name 'laboratory of Morphology, Ecology and Plant Systematics'. The research undertaken by the laboratory has gradually evolved from descriptive floristics and taxonomic studies towards biogeography, diversification, developmental biology and genomics 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, Porphyra, Palmaria*) 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 evolutionary success 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 green and brown algae, in collaboration with the laboratory of Microbiology (UGent);
- 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 development of a seaweed aquaculture sector in Europe. Furthermore, the Phycology research group participates in both Belgian and international research projects and collaborates with several research groups worldwide.

Phycology

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Laboratory of **Plant Ecology**

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Plants and Crops

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The laboratory of Plant Ecology researches many aspects of the dynamic interactions between plants and their environment with a special emphasis on water and carbon fluxes in xylem and phloem. Its projects include work on crops and trees in both man-made and natural ecosystems. Its research activities range from plant ecophysiology to the structure and function of plants and the role of plants in the global water and carbon cycle. Its researchers study the dynamic plant- environment interplay with detailed measurements of the microclimate and on the plant itself using an array of plant sensors. They also apply radioactive and stable isotope tracers and medical imaging techniques (micro-CT, MRI and plant-PET) to visualise and better understand xylem and phloem functioning. At the laboratory, mechanistic plant models, in 2D and 3D, are developed as avenues for improving our understanding on how plants grow and respond to changes in the environments they inhabit, and also novel plant-based control and stress detection systems are developed.

The marine aspect of the research is related to mangroves and includes foliar water uptake capacity in mangrove species, and associated anatomical and hydraulic features.

Plant Ecology

Coupure Links 653
9000 Gent

Center for **Plant Systems Biology**

www.psb.ugent.be

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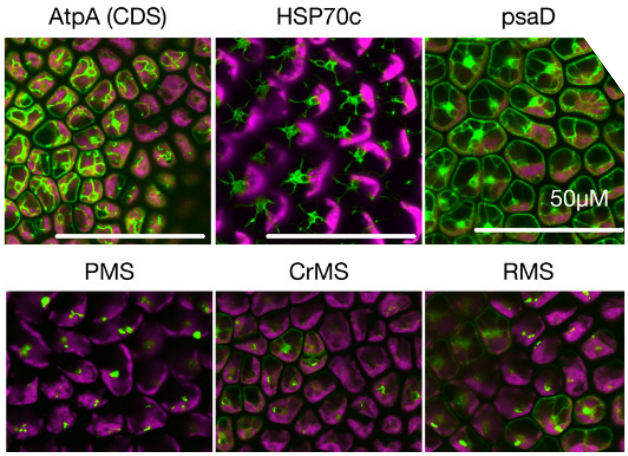
// Institutional hierarchy

Vlaams Instituut voor Biotechnologie

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Engineering and technology: Biotechnology
Natural sciences: Biological sciences



Abstract

The cornerstone of the center for Plant Systems Biology (VIB-PSB) is curiosity-driven research on basic cellular mechanisms. Much of this research is performed on *Arabidopsis* as well as other plants including maize, poplar, tomato, wheat, *Marchantia*, duckweed, canola, soybean and plants producing high value specialised metabolites. VIB-PSB has identified five scientific focus areas:

- plant metabolism (morphological and biochemical features of plants for carbon fixation, environment adaptation and human consumption and utilisation), growth and development;
- interaction of plants with the environment (interaction of different abiotic stress factors, e.g. droughts and heat, water deficiciency, closing the lab-field gap, intercropping);
- bioinformatics and integrative biology (assembly and annotation of novel plant genome sequences, evolutionary genomics, the analysis and integration of -omics data, gene network modelling and comparative genomics);
- translation from models to crops and from lab to field (closing the lab-to-field learning cycle, wheat on phosphoproteomics, single cell analysis, multiplex mRNA in situ hybridisation, genome editing and network biology, soybean to add to the traditional pipeline));
- breakthrough technologies (genome editing, efficient transformation pipelines to improve plant growth, yield, and climate resilience).

The marine research is mainly conducted in the Bioinformatics and Systems Biology group which focuses on functional, structural and comparative genomics. The marine topics concern the genetic study of algae (e.g. diatoms) for which collaboration is established with the laboratory of Protistology and Aquatic Ecology (UGent). Furthermore, the research also targets species which are important for aquaculture such as *Artemia*, in close collaboration with the laboratory of Aquaculture and Artemia Reference Center (UGent). The Plant Genome Editing group and the Phycology Research Group (UGent) collaborate and develop techniques to generate gain- and loss-of-function mutants for the green seaweed *Ulva*.

VIB-PSB

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Laboratoy of **Protistology and Aquatic Ecology**

www.ugent.be/we/biology/en/research/protistology/pae-home

// Contact

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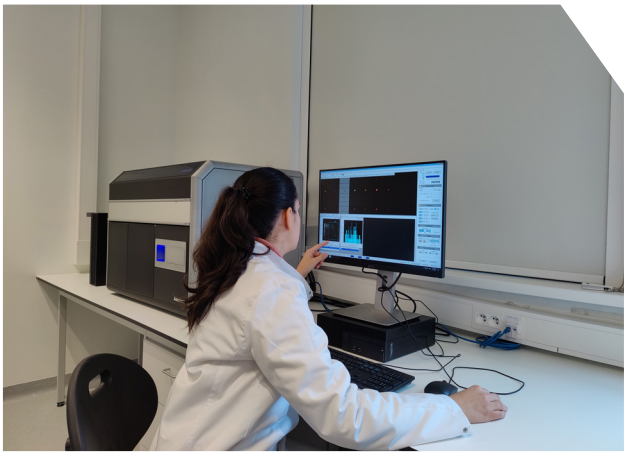
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Biological sciences



Abstract

The laboratory of Protistology and Aquatic Ecology (PAE) studies marine, freshwater and terrestrial ecosystems, with an emphasis on coastal systems and polar-alpine and temperate regions. There is a strong focus on the biodiversity, ecological roles and evolutionary history of unicellular eukaryotes as well as on past and present impacts of global change on the composition and function of microbiomes in these systems. The lab hosts the BCCM/DCG, a public Biological Resource Center (BRC), specialised in diatoms and other microalgae and part of the Belgian coordinated collections of microorganisms.

The lab has a long-standing history of research on diatoms, which are the focus of a long-term integrative research line, including cell biology of new model diatom species, population genomics and macroecological and biogeographical studies. In an applied context, the group focuses among others on harmful algal bloom monitoring and control, and algal biotechnology. Research topics include:

- species diversity, speciation and micro-evolution of protists;
- aquatic and soil microbiome biogeography and function;
- chemical ecology of microbial interactions;
- life cycle regulation and genotype-phenotype relationships in microalgae;
- (palaeo)environmental change in lake, estuarine and coastal ecosystems.

PAE

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Renard Centre of Marine Geology

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// Institutional hierarchy

Faculty of Sciences
Department of Geology

// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The Renard Centre of Marine Geology (RCMG), founded in 1986, performs research in the field of marine and lacustrine geology. The group acquired international recognition by studying clay tectonics of the North Sea (1991) and by the discovery of cold-water coral mounds ('Belgica mounds') in the Porcupine Seabight (Ireland) in 1997, which were drilled into during the IODP Expedition 307 in 2005. RCMG carries out research in numerous seas (Black Sea, Atlantic margin, Antarctic margin, Mediterranean Sea, etc.), participates in several international research projects and collaborates with renowned foreign marine research groups such as Ifremer, NOC Southampton, Center for Marine Environmental Sciences (Marum) Bremen and Royal Netherlands Institute for Sea Research (NIOZ).

The current marine research topics of RCMG are:

- geological processes of passive continental margins (palaeoceanography with an emphasis on sedimentation or erosive processes, slope stability studies, etc.);
- methane hydrates (occurrences and stabilisation conditions), cold seeps and mud volcanos (processes of seepage, methane fluxes and budgets);
- cold-water coral mounds: the study of environmental forcing on deep-water coral habitats and mounds, with respect to deep-water circulation;
- 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, marine geohazards (submarine landslides) and palaeoseismology (palaeotsunamis) and marine geoarchaeology.

RCMG

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9000 Gent

Soete laboratory

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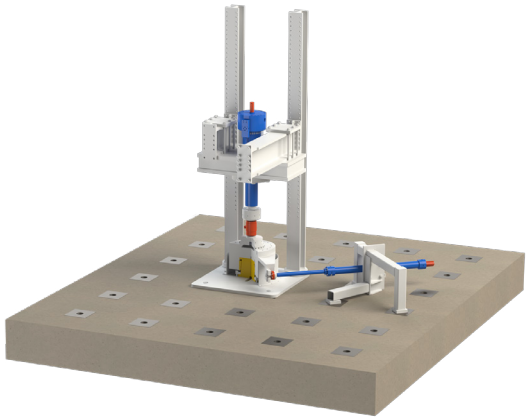
// Institutional hierarchy

Faculty of Engineering and Architecture
Department of Electromechanical, Systems and Metal Engineering

// Research domain & discipline

Engineering and technology: Mechanical engineering



Abstract

The Soete laboratory pushes the boundaries in the fields of tribological investigation, fracture mechanics and fatigue of mechanical components and constructions. The laboratory performs fundamental and applied research, as well as industrial services in component design, material characterisation, structural analysis and lifetime assessment. Both experimental and computational expertise is available to provide a broad spectrum analysis. The laboratory conducts research and services in the following fields:

- tribology: advanced lubrication, erosive/abrasive wear, friction and wear of advanced materials (ceramics, polymers and composites, self-lubricating materials);
- fracture mechanics: crack initiation, failure analysis with a special focus on the assessment of welded structures or multi-material joints;
- fatigue and lifetime assessment: lifetime of components, structures and mechanical constructions;
- development of customised test infrastructure with innovative monitoring tools and analysis.

The marine research focuses on full-size testing of different bearing types in their relevant environment, 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 cables or polymer composite used in marine applications. Ongoing projects focus on creating knowledge and solutions for damage phenomena and/or lifetime of offshore renewable energy structures (with several projects focusing on offshore wind) and on the shipping industry.

Soete laboratory belongs to the UGent - Metals valorisation consortium, 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.

Soete laboratory

Technologiepark 46
9052 Zwijnaarde

Sustainable Systems Engineering research group

www.ugent.be/bw/gct/en/research/sten

// Contact

jo.dewulf@ugent.be

// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Green Chemistry and Technology

// Research domain & discipline

Engineering and technology: Other engineering and technology

Abstract

The research of the Sustainable Systems Engineering research group (STEN) focuses on both methodological developments and different technological applications. From a methodological perspective, environmental sustainability assessments are in the core of its expertise. As an engineering group, STEN's methodological expertise covers process engineering methods and material flow analysis.

This methodological expertise of the group is applied to a broad range of materials, products, and technologies. In particular, the assessment of raw materials and resources is covered. In addition, a broad expertise on the bio-economy has been developed, including on the one hand bio-based processes and products and on the other hand agricultural and food systems. The research group engages in the transition to a circular economy by investigating an optimal end-of-life management, including recycling technologies and the analysis of recycling opportunities. STEN also has technological expertise in the chemical, pharmaceutical and energy sectors and conducts research on nature and natural resources management, focusing on soil quality and ecosystem services.

In the marine domain, the group has been doing research into sustainable resource management and life cycle assessment within the deep sea mining context. In this regard STEN developed a sustainability assessment toolbox that follows system-thinking in order to reduce the overall impact of deep sea mining. It develops sustainability assessment methods for human activities in the marine environment, relying on impacts on ecosystem services and through life cycle assessment methodologies (SUMES project). Further on, it investigates circular economy strategies for infrastructure employed in the marine environment, such as wind farms (CTO project).

STEN

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Building B, 5th floor
9000 Gent

Terrestrial Ecology unit

www.ecology.ugent.be/terec

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luc.lens@ugent.be

// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Terrestrial Ecology unit (TEREC) studies patterns and processes underlying the functioning of terrestrial ecosystems. The unit therefore runs competitive research programs on population and community dynamics, biotic interactions and life-history strategies in a wide suite of plants and animals. Research activities comprise field observations, field- and lab experiments and computer simulations, and results are interpreted both within a fundamental (evolutionary-ecological) and applied (conservation-oriented) framework. To reach scientific excellence and sustain technological innovation, our researchers are active in various national and international research networks, such as SPEEDY, MAD, EVENET and CONGENOMICS.

The marine research mainly focuses on coastal research projects. The coastal region of Flanders comprises unique ecosystems that are typically highly dynamic by nature (beaches, salt marshes, dunes) and under severe anthropogenic pressure or use (harbours). The unit studies to which degree these dynamics alter the functioning of the (terrestrial) coastal ecosystems by focusing on vegetation dynamics, the ecological and evolutionary dynamics of threatened arthropods, plant-arthropod interactions, and gull life histories.

TEREC

K.L. Ledeganckstraat 35
9000 Gent

Thermochemical Conversion of Biomass research group

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

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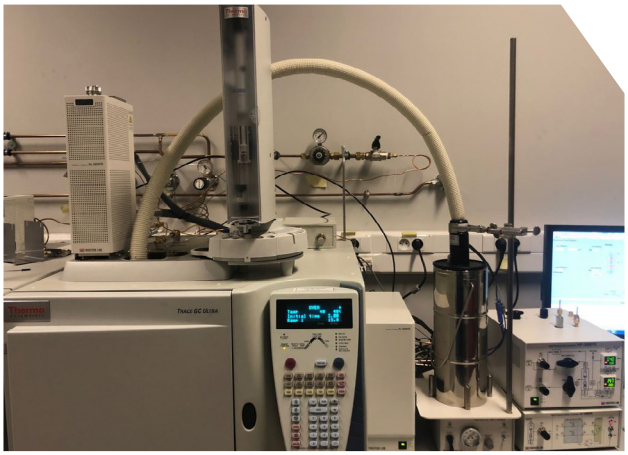
// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Green Chemistry and Technology

// Research domain & discipline

Natural sciences: Biological and chemical sciences



Abstract

The Thermochemical Conversion of Biomass (TCCB) research group studies the development and optimisation of thermochemical conversion technologies to renewable fuels, chemicals and energy from biomass (including marine biomass like micro and macroalgae). Regarding the thermochemical conversion technologies, research is devoted to fast pyrolysis and catalytic fast pyrolysis for the production of liquid biofuels and chemical intermediates, to slow pyrolysis for the production of biochar and to torrefaction as a biomass pretreatment unit operation. Other technologies of interest include hydrothermal conversion technologies, torrefaction, gasification and post-conversion treatment of bio-oil, which includes upgrading and fractionation.

In the marine field, the group studies the following topics:

- pyrolysis (heating of an organic material in the absence of oxygen) of algae;
- production of solid hydrochar from waste seaweed by hydrothermal carbonisation.

TCCB

Copure Link 653
9000 Gent

Laboratory of **Veterinary Pathology**

www.ugent.be/di/di05

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// Institutional hierarchy

Faculty of Veterinary Medicine

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture, and veterinary sciences

Abstract

The department of Pathobiology, Pharmacology and Zoological Medicine studies host-microbial interactions, antimicrobial resistance and several (non-)infectious diseases in various animal species.

The laboratory of Veterinary Pathology has expertise in research regarding beneficial effects of pre- and probionts and their modes of action in marine larviculture and pathogenesis of bacterial infections in fish with a focus of the skin, gill and gut as portal of entry. Previous research has also included an evaluation of the impact of pulse fishing on a selection of marine fish and invertebrate species in the North Sea and microbial endocrinology. The lab of Veterinary Pathology is also experienced in necropsy and histopathology of (marine) fish and marine mammals.

Veterinary Pathology

Salisburylaan 133
9820 Merelbeke

Hasselt University

Biomedical research institute

www.uhasselt.be/en/instituten-en/biomed-en

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// Institutional hierarchy

Faculty of Medicine and Life Sciences
Department of Neuroscience

// Research domain & discipline

Engineering and technology: Biotechnology
Medical and health sciences: Medical and health sciences

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Abstract

The Biomedical research institute (BIOMED) is a multidisciplinary institute that uses high-end technology to deliver novel insights in three main disease areas:

- immunology;
- neuroscience;
- cardiovascular disease.

The group aims to translate scientific discoveries into applications that contribute to a healthier society. The marine research focuses on the potential use of seaweed-derived compounds for combating Alzheimer's disease, and preventing neurodegenerative and cardiometabolic diseases. Further, the group examines the effects of brown seaweed food supplementation on allergies, inflammation and health, and explores the neuroprotective and therapeutic properties of edible seaweed constituents.

BIOMED

Agoralaan, Building C
3590 Diepenbeek

X-lab

www.uhasselt.be/en/research/research-groups/detail/8972-x-lab

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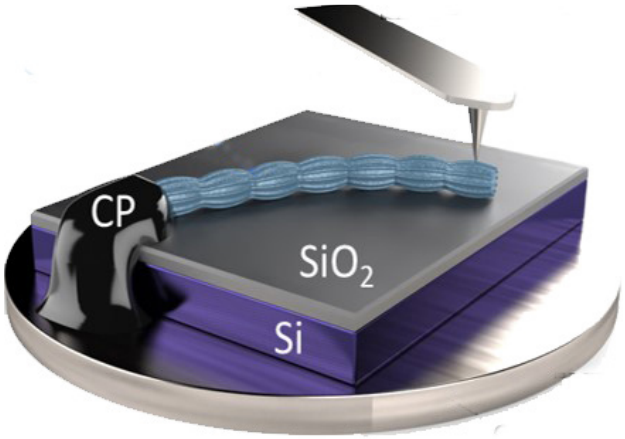
// Institutional hierarchy

Faculty of Sciences
Discipline group Physics

// Research domain & discipline

Engineering and technology: Biotechnology and electrical and electronic engineering
Natural sciences: Biological sciences



Abstract

X-lab conducts exploratory and interdisciplinary research in the field of bio-electronics, energy conversion mechanisms, experimental physics, etc. The group studies among others the electrically conductive structures in cable bacteria, which thrive in marine and freshwater sediments.

X-lab

Agoralaan, Building D
3590 Diepenbeek

Research group **Zoology: Biodiversity and Toxicology**

www.uhasselt.be/en/research/research-groups/detail/52-zoology-biodiversity-and-toxicology

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tom.artois@uhasselt.be

// Institutional hierarchy

Research Institute: Centre for Environmental Sciences

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The research group Zoology: Biodiversity and Toxicology (CMKDK) 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 toxicologal 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.

CMKDK

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3590 Diepenbeek

Fact sheet not validated by research group

KU Leuven

Marine@KULeuven

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filip.volckaert@kuleuven.be

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 the informal interfaculty consortium Marine@KULeuven.

The mission of Marine@KULeuven is to bring together scientists from different disciplines with a common interest in marine science in order to bring research, education and service to society to a higher level by capitalizing on complementary expertise and insight. Marine@KULeuven groups a broad range of topics, among others in the research domains of geo- and ecosystems, physics, climate, biodiversity, ecosystem services, materials, sustainable production processes, energy, history, governance and environmental policy.

Marine@KULeuven is composed of 9 research teams from three Groups (Science, Engineering and Technology; Biomedical Sciences; Human Sciences). 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, membrane technology, blue growth, policy, and so on.

Marine@KULeuven aims to promote and facilitate the collaboration between these research groups as well as with Flanders Marine Institute (VLIZ) and The Blue Cluster. Cooperation and integration is an important step in assuring that marine research at KU Leuven can contribute to the great ocean/sea related challenges.

Marine@KULeuven

Kasteelpark Arenberg 40
3001 Leuven

Partners

Science, Engineering and Technology Group

- Department of Civil Engineering (incl. Hydraulics and Geotechnics sections *)
- Laboratory of Biodiversity and Evolutionary Genomics *
- Laboratory of Aquatic Biology
- Food and Lipids lab *
- Section ESAT - Electrical Energy Systems and Applications *
- Biogeology & Paleoclimatology research group
- Process Engineering for Sustainable Systems section *

Rega Institute

- Bioinformatics and (Eco-)systems Biology lab

Biomedical Sciences Group

- Laboratory of Toxicology and Pharmacology *

* Group is a marine research group

Division of **Applied Mechanics and Energy Conversion**

www.mech.kuleuven.be/en/tme

// Contact

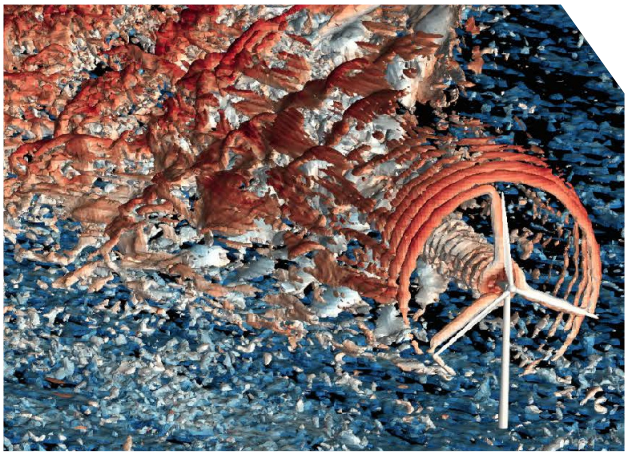
johan.meyers@kuleuven.be

// Institutional hierarchy

Faculty of Engineering Science
Department of Mechanical Engineering

// Research domain & 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: modelling, numerical simulation and optimisation of thermal, fluid and kinetic transport phenomena;
- Energy and Environment: multi-energy system operation and planning, towards a clean, secure and efficient energy provision;
- Simulation of Thermal Systems: thermal systems in buildings, Waste-to-Energy;
- Turbulent Flow Simulation and Optimisation: wind energy, indoor ventilation, pollutant dispersion.

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.

TME

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B.2421
3001 Heverlee

Laboratory of **Biodiversity and Evolutionary Genomics**

http://bio.kuleuven.be/eeb/lbeg

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filip.volckaert@kuleuven.be

// Institutional hierarchy

Faculty of Science | Science, Engineering & Technology Group
Departement of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The laboratory of Biodiversity and Evolutionary Genomics (LBEG), 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 current marine topics studied by the laboratory are:

- seascape genomics: mechanisms behind oceanic environmental variation and the emergence and maintenance of locally adapted populations;
- parasite infections and global change: study of the molecular evolution and transmission dynamics of *Schistosoma* and modelling of the distribution of its intermediate snail hosts;
- dynamics of freshwater fishes in changing environments: study of how barriers influence the riverscape of fish and what the impact is of environmental mercury on the genome of three-spined sticklebacks;
- genomics for users, seafood tracing and aquaculture genetics: performing for end-users high-throughpunt metabarcoding, metagenomics, transcriptome sequencing, marker development, genome data mining and genome data analysis.

LBEG

Charles Deberiotstraat 32
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3000 Leuven

Research group of **Developmental Neurobiology (Seuntjens lab)**

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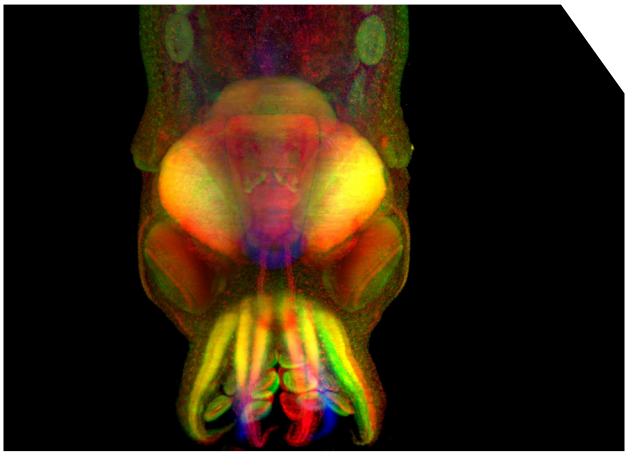
// Institutional hierarchy

Faculty of Science
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

Our human brain contains billions of neurons and glial cells grouped together into functional circuits. These cellular components of the brain are formed during development at distinct places, and at different time points. Neurogenesis, neural migration and initial wiring are controlled by molecular pathways in which neuron-environment or neuron-target recognition play a central role. In terms of factors mediating these recognition processes it is clear that a large number of structurally diverse surface receptors play a key role. Part of the research studied at research group of Developmental Neurobiology (Seuntjens lab) revolves around the study of Protocadherins (PCDH), which are large transmembrane proteins with tentative functions in cell-cell recognition, neural development and cancer metastasis in vertebrates.

PCDH have also been found to be expanded in coleoid cephalopods such as octopus, squid and cuttlefish. These are mollusks, but have large nervous systems containing half a billion neurons, which is in the same range as mammals. The lab studies how the nervous system of these animals develops, what cell type diversity is generated, how this brain generates particular behaviours, and to what extent genomic innovations like PCDH gene expansions are involved.

Seuntjens lab

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B. 2464
3000 Leuven

Section **ESAT - Electrical Energy Systems and Applications**

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// Institutional hierarchy

Faculty of Engineering Science
Department of Electrical Engineering

// Research domain & discipline

Engineering and technology: Electrical and electronic engineering

Abstract

The research of the section ESAT - Electrical Energy Systems and Applications (ESAT-ELECTA) covers a broad spectrum of electrical energy systems and the robust control of industrial 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. ELECTA is co-founder of the knowledge center EnergyVille together with VITO, imec and Hasselt University. At this knowledge center technologies are developed to support a transition to an energy efficient, decarbonised and durable urban environment. This research stretches from solar panels and energy storage, all the way to energy strategies and markets.

The marine research component of this group concerns the techno-economic aspects of the energy production by offshore wind turbines. Additionally, research is conducted on offshore transmission networks, the planning of hybrid offshore assets, a north-sea energy plan for transition to sustainable wind energy, electrical networks to connect remote offshore wind farms and testing of critical components in wind turbines.

ESAT-ELECTA

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Food and Lipids lab

https://kulak.kuleuven.be/nl/onderzoek/Onderzoeksdomeinen/food_lipids

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Microbial and Molecular Systems
Centre for Food and Microbial Technology

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Biological sciences

Abstract

The Food and Lipids lab 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. spreadibility) 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 (i) to autotrophic microalgae as new sources of nutritionally-interesting lipids and (ii) to the use of seaweed in food products and changes during its processing. For the microalgae, 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. For seaweed, the focus is on the use of the full biomass in foodstuffs and the role of lipids, pigments and antioxidants on the product quality.

Food and Lipids lab

Etienne Sabbelaan 53
8500 Kortrijk

Laboratory of **Food Technology**

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// Institutional hierarchy

Faculty of Bioscience Engineering
Department of Microbial and Molecular Systems
Centre for Food and Microbial Technology

// Research domain & discipline

Engineering and technology: Biotechnology

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Abstract

The research mission of the laboratory of Food Technology is to understand and quantify process-structure-function relations of food systems during processing, preservation and storage by optimal exploitation of the endogenous potential of fruit- ,vegetable-, algae-, legume-derived systems, both for developed and for developing countries. The group particularly focuses on fruit-, vegetable-, legume- and algae-based foods and ingredients. For example, microalgal biomass for functional foods and food ingredients.

Fact sheet not validated by research group

Food Technology

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3001 Heverlee

Division of **Geology**

https://ees.kuleuven.be/nl/geologie/index.html

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// Institutional hierarchy

Faculty of Science
Department of Earth and Environmental Sciences

// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The division of Geology is active in several research themes:

- archaeometry: use of mineral resources in Antiquity and the organisation and technology of ancient craft production;
- ore geology and geofluids: study of (i) sediment-hosted deposits, such as stratiform Cu-Co deposits in the Central African Copperbelt and stratabound Zn-Pb deposits worldwide, (ii) REE-Zr-Nb-Ta-P mineralisation associated with carbonatites and alkaline igneous rocks in Africa (Burundi, DRC, Rwanda, Angola) and (iii) Ta-Nb-Sn-Li pegmatite and Sn-W-Au quartz vein deposits, in Central Africa (Burundi, DRC and Rwanda), Europe (Portugal) and USA (Maine and South Dakota);
- geodynamics: geodynamic processes in low-grade metamorphic, low-permeability, mid-crustal environments (i.e. slate belts);
- biogeology and palaeoclimatology: links between environmental and biotic changes during the last 70 million years of Earth's history;
- reservoir geology: analysis and modelling in the field of sediment characterisation (provenance, generation, transport, and diagenesis) and reservoir characterisation (reservoir architecture and fluid flow);
- applied Mineralogy: mineralogical characterisation and use of industrial minerals with X-Ray Powder Diffraction as the most important analysis technique;
- petrology: multidisciplinary research group working on differentiation processes in active volcanoes and terrestrial planets.

Within the context of marine research, the group has expertise in marine microfossils and marine carbonates.

Geology

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3001 Heverlee

History department

www.arts.kuleuven.be/geschiedenis/eng

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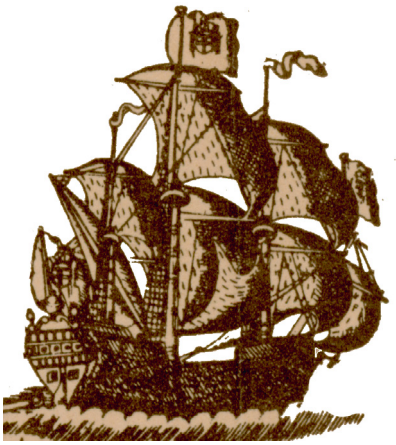
// Institutional hierarchy

Faculty of Arts

// Research domain & discipline

Humanities: History and archaeology



Abstract

Research within the History department is conducted in five research groups:

- Ancient history: history, culture, literature and philosophy of Graeco-Roman Antiquity and its impact on Western European cultural history;
- Medieval history: social, political, economic and religious history of medieval Europe (500-1500);
- Early modern history: worldwide Habsburg monarchies and how cultural, political and religious renewal came about; global history with a focus on Chinese, Asian, and Spanish American history;
- Cultural history since 1750: history of knowledge and science, historiography and historical culture, cultural infrastructure and cultural transfers;
- Modernity and society 1800-2000: focus on agency and agenda-setting as well as the bottom-up processes which brought about new organised forms of trans- and international interaction in the last 200 years.

The marine research includes: transpacific trade and exchange, the transoceanic transfer of (medicinal, botanical, geographical, navigational, shipbuilding) knowledge, diseases, maritime maps and rutters, the reconstruction of early modern transpacific sea routes, influences of maritime environmental and climate issues on early modern seafaring, piracy, shipboard diets and maritime medicine, maritime archaeology and the investigation of Manila galleon wrecks, and an assessment of two 20th century ship wrecks in the North Sea. The geographic focus of Schottenhammer's team lies in Asia, the Asia-Pacific and Indian Ocean region as well as the Spanish American coast. Prof. Schottenhammer herself also covers the periods of Asian early medieval and medieval maritime research, including shipwreck archaeology.

History department

Blijde Inkomststraat 21
B. 3307
3000 Leuven

Hydraulics and Geotechnics section - Arenberg campus

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jaak.monbaliu@kuleuven.be

// Institutional hierarchy

Faculty of Engineering Technology
Departement of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil engineering
Natural sciences: Earth sciences

Abstract

The Hydraulics and Geotechnics section - Arenberg campus conducts research that focuses on process understanding, numerical modelling and statistical analysis of aspects of the water cycle in the urban environment, in river systems, and in the coastal zone, including shelf seas and estuaries. The academic staff is responsible for teaching a number of courses related to the fields of hydraulics, hydrodynamics, hydraulic structures; urban, river and coastal engineering; and sediment mechanics and (eco-)morphodynamics. The research activities are mainly in the following domains of application:

- urban and river hydrology and hydraulics, covering all aspects of the water cycle in the urban environment as well as in river systems. Research topics are classified in 'rainfall', 'river hydrology and hydraulics' and 'urban hydrology and hydraulics';
- coastal and estuarine hydrodynamics with a main focus on waves and current modelling studies for design, operational or more fundamental aspects of coastal zone processes and also offshore applications;
- sediment mechanics with a focus on cohesive sediments (mixture of clay, silt, sand and organic matter);
- eco-hydromorphodynamics with a main focus on interactions between water, sediments and biota.

The section provides scientific consultancy services to third parties in the different research fields.

Note that there is also a Hydraulics and Geotechnics section - Bruges campus (KU Leuven, department of Civil Engineering). The focus there is on coastal and geotechnical engineering and more in particular on natural coastal protection, wave-structure-interaction and soil-structure-interaction under static, cyclic and seismic multidirectional loading.

Hydraulics and Geotechnics - Arenberg

Kasteelpark Arenberg 40
B. 2448
3001 Heverlee

Hydraulics and Geotechnics section - Bruges campus

https://iiw.kuleuven.be/onderzoek/kustwaterbouw-grondmechanica/coastal-geotechnical/coastal-geotechnical

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// Institutional hierarchy

Faculty of Engineering Technology
Departement of Civil Engineering

// Research domain & discipline

Engineering and technology: Civil engineering

Abstract

The Hydraulics and Geotechnics section - Bruges campus focuses on the interaction between water, soil and structures, with application in hard and soft sea defenses, offshore energy and (deep) foundations. The research domains studied encompass different research projects and PhD studies. Some examples of recent marine projects are:

- SUSANA: sustainable use of sand in Nature Based Solutions for Coastal Protection;
- Hydrogeological feedback mechanisms during juvenile dune development;
- Sand exchange during engineered dune development for coastal resilience;
- Dune-in-front-of-dike: towards a better understanding of the behaviour of man-made dunes at the Belgian Coast;
- Morphodynamics of the Belgian coast: getting more insight in the coastal dynamics of the Belgian Coastal Zone by intensive data analysis and modelling;
- Polder2C's: Investigating the strength of flood defences, designing new and better emergency response actions and educating the next generation flood defences;
- PHAIRYWIND: optimisation of vessel operations near offshore wind turbines;
- Coastal Ocean Basin: in a consortium with Ghent University and Flanders Hydraulcs Research, the research group assisted in the construction of a wave basin in Ostend;
- SAGE-SAND: on the ageing of soils near pile foundations of offshore wind turbines;
- Soil-structure interaction framework for monopiles in sand under cyclic loading.

Hydraulics and Geotechnics - Brugge

Spoorwegstraat 12
8200 Brugge

Laboratory for **Molecular Biodiscovery**

https://gbiomed.kuleuven.be/english/research/50000715/52455311

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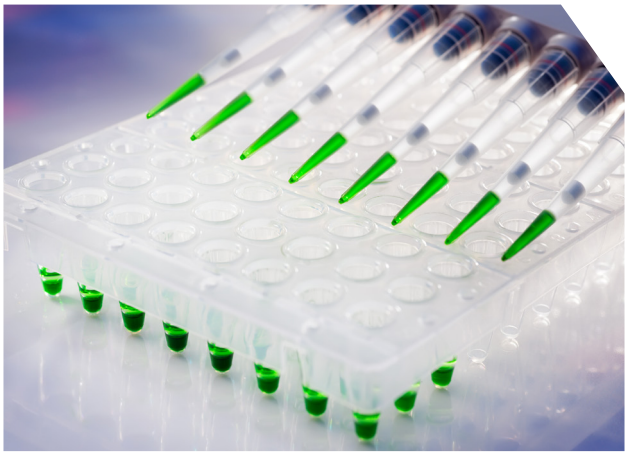
// Institutional hierarchy

Faculty of Pharmaceutical Sciences | Biomedical Sciences Group
Department of Pharmaceutical and Pharmacological Sciences

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Biological sciences



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Abstract

The laboratory for Molecular Biodiscovery is a zebrafish-based platform for small-molecule drug discovery for CNS disorders and the evaluation of drug-induced organ toxicities. The group has experience in high-throughput behavioural and seizure assays, whole mount in situ hybridisation, EEG whole brain recording, transgenic zebrafish lines, antisense knockdowns, fluorescence microscopy and cryotome sectioning.

The marine component includes the zebrafish-based discovery of antiseizure compounds from the North Sea and Red Sea.

Molecular Biodiscovery

Herestraat 49
B. 824
3000 Leuven

Process Engineering for Sustainable Systems section

https://cit.kuleuven.be/process

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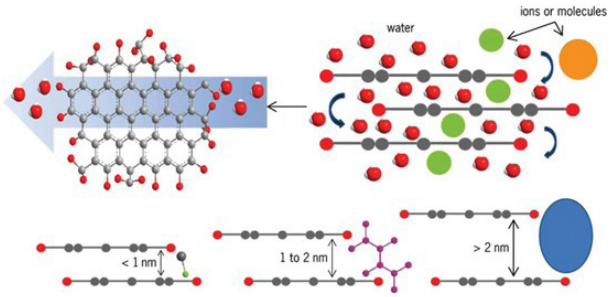
bart.vanderbruggen@kuleuven.be

// Institutional hierarchy

Faculty of Engineering | Science, Engineering and Technology Group
Department of Chemical Engineering

// Research domain & discipline

Engineering and technology: Other engineering and technology
Natural sciences: Chemical sciences



Abstract

The Process Engineering for Sustainable Systems (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 membrame technology which focuses on the development and application of separation processes in aqueous and non-aqueous solutions. This inter alia concerns seawater desalination and resource recycling from seawater related sources.

ProcESS

Celestijnenlaan 200F
B. 2424
3001 Heverlee

Laboratory of **Toxicology and Pharmacology**

https://gbiomed.kuleuven.be/english/research/50000715/50000721/toxicology-and-pharmacology

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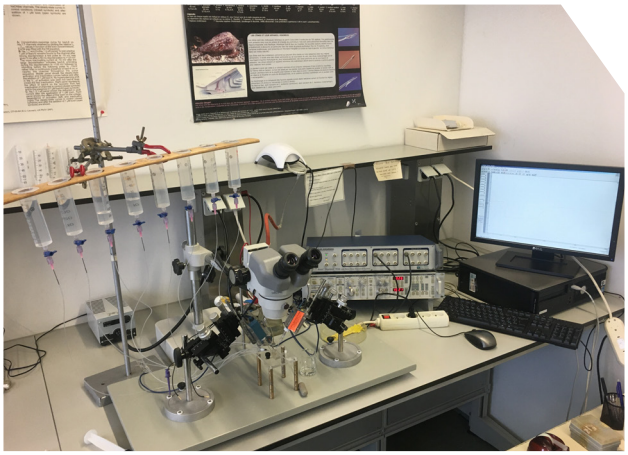
// Institutional hierarchy

Faculty of Pharmaceutical Sciences | Biomedical Sciences Group
Department of Pharmaceutical and Pharmacological Sciences

// Research domain & discipline

Engineering and technology: Biotechnology
Medical and health sciences: Medical and health sciences



Abstract

The laboratory of Toxicology and Pharmacology consists of two main research fields:

- Forensic Toxicology;
- Drug Discovery and Pharmacology.

The research objectives of Forensic Toxicology are focused on optimisation of analytical detection methods/tools and volatile decomposition detection. The main practice of this subdivision is its service in juridical dossiers as expertise and investigation center at the request of the Ministry of Justice. The research objectives of Drug Discovery and Pharmacology are mainly focused on investigation of venom from venomous animals such as spiders, sea anemones, cone snails, scorpions, cnidaria, etc. Because these venom peptides regularly work on ion channels of the human body, they are interesting lead compounds for the development of for example analgetics, anti-cancer drugs, drugs for neurological disorders such as multiple sclerosis, Parkinson's disease, Alzheimer's disease, etc.

Toxicology and Pharmacology

Herestraat 49
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3000 Leuven

2 Flemish scientific institutes

Institute for Agricultural, Fisheries and Food Research (ILVO)

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// Institutional hierarchy

Government of Flanders
Policy Area Agriculture and Fisheries

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Natural sciences: Biological and chemical sciences

Abstract

The Institute for Agricultural, Fisheries and Food Research (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 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.

ILVO-Marine

Jacobsenstraat 1
8400 Oostende

Meise Botanic Garden

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// Institutional hierarchy

Government of Flanders
Policy Area Economy, Science and Innovation

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

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

Research conducted at Meise Botanic Garden is organised into five themes:

- biodiversity;
- evolution;
- ecosystems;
- plants for society;
- biodiversity conservation.

Within these teams, plant systematics and related fields such as floristics, phytogeography, phylogeny, comparative morphology, pollen and spores and vegetation studies are the main research areas of the institute. The Garden concentrates on temperate Europe (especially Belgium), the palaeotropics (especially Central Africa) and the polar regions (mainly Antarctica). All plant groups in the traditional sense are studied: vascular plants, bryophytes, algae, and fungi (including lichens).

The marine research of the Garden focuses on diatoms, macroalgae and fungi. Although mainly freshwater algae are studied, marine, coastal and brackish water (African inland saline) species are also part of the research scope (in this context, the term 'coastal' refers to the shorelines of the (great) lakes). An international reputation was built with the study of algae from arid and semi-arid regions in northern and Sub-Saharan Africa. Furthermore, diatom research includes diversity and biogeographical studies of polar regions (mostly Antarctica and sub-Antarctic islands), and diversity of epizoic diatoms on sea turtles. Marine macroalgal research focuses on taxonomy, evolution and biogeography of green, red and brown seaweeds.

Meise Botanic Garden

Nieuwelaan 38
1860 Meise

Flanders Heritage Agency

www.onroerenderfgoed.be

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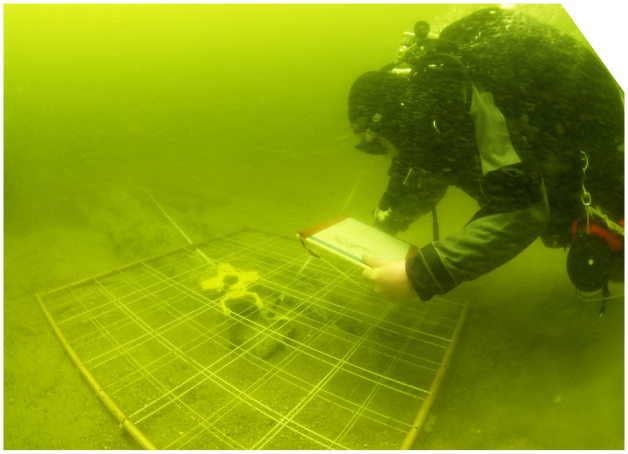
// Institutional hierarchy

Government of Flanders
Policy Area Environment

// Research domain & discipline

Humanities: History and archaeology
Natural sciences: Biological and earth sciences



Abstract

The Flanders Heritage Agency deals with built, archaeological and landscape heritage but also with heraldic heritage and the historical fleet. 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 who perform policy-oriented research on topics related to maritime and/or underwater heritage. In the present structure marine researchers are spread over different units of the agency and have different responsabilities. 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;
- medieval cogs of Doel;
- maritime conservation: this topic gradually became more important since the start of the project 'De Kogge' (2009-2014);
- 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: (i) development of a reliable research methodology (using geophysical and remote sensing techniques); (ii) developing proposals for a transparent and sustainable management policy and for the further development and implementation of a legal framework for underwater heritage and (iii) 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);
- legal aspects related to Underwater Cultural Heritage in the North Sea;
- archaeological Heritage present in rivers.

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 Belgian laws (2014, 2021) on protecting underwater cultural heritage, and the conservation and exhibtion traject of the Cog of Doel. In October 2025 Flanders Heritage Agency organises IKUWA 8 in Ostend in close collaboration with many partners.

There is also a close collaboration with both national and international institutes and participation in various international research projects. Flanders Heritage Agency is a member of ICUCH (the International Scientific Committee on Underwater Cultural Heritage) and of the Scientific and Technical Advisory Board of the UNESCO Convention of 2001 for the protection of Underwater Culural Heritage (UCH).

Flanders Heritage Agency

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Flanders Hydraulics

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// Institutional hierarchy

Government of Flanders
Policy Area Mobility and Public Works

// Research domain & discipline

Engineering and technology: Civil engineering and other engineering and technology
Natural sciences: Earth sciences

Abstract

Flanders Hydraulics 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 Flemish government.

Flanders Hydraulics Research is active within five research fields:
- coastal protection;
- harbours and waterways;
- water management;
- hydraulic structures;
- hydraulics and sediment.

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);
- developing efficient measures to control exceptional water levels in rivers.

More specifically, the group 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.

Flanders Hydraulics

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2140 Borgerhout

Flanders Marine Institute (VLIZ)

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// Institutional hierarchy

Government of Flanders
Policy Area Economy, Science and Innovation

// Research domain & discipline

Engineering and technology: Electrical and electronic engineering and information and computer sciences
Natural sciences: Biological and earth sciences
Social sciences: Communication and media, and political sciences and policy

Abstract

Flanders Marine Institute (VLIZ), founded in 1999, is an autonomous institute with the legal status of a non-profit organisation. 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 six 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;
- deploy and manage large marine research infrastructure, including research vessels, a marine station and the Flemish Marine Data Centre.

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 Government of Flanders (UNESCO/IOC Project Office for IODE, EMB secretariat, EMODnet secreatariat, JPI Oceans secretariat Brussels);
- (co-)organising the Flemish contribution to marine research infrastructures of the ESFRI list, such as LifeWatch, ICOS and EMBRC.

VLIZ

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8400 Oostende

Research Institute for Nature and Forest (INBO)

www.inbo.be

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// Institutional hierarchy

Government of Flanders
Policy Area Environment

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Research Institute for Nature and Forest (INBO) was founded in 2006 and focuses on the sustainable management and the use of nature. INBO primarily works for the Government of Flanders, but as a Flemish research and knowledge institute, INBO also performs research and provides knowledge to policy makers and other interested stakeholders. The institute provides information for international reports and to local authorities and supports organisations with regard to nature management, forestry, agriculture, hunting and fisheries.

The marine research focuses on the impact of human activities on coastal breeding birds and sea bird populations; migration bottlenecks; habitat use and recovery of (diadromous) fish in estuaries; landscape dynamics in coastal dunes; flora and fauna in coastal nature reserves; management evaluation, ecological objectives, recovery, state and trend evaluation in estuaries.

The Species Diversity research team focuses on the study of seabirds at sea, breeding seabirds and coastal birds. It monitors population trends and studies anthropogenic impact, food ecology, habitat use and migration patterns. The monitoring activities contribute to the Marine Strategy Framework Directive, the Birds and Habitats Directives and the environmental status of the North East Atlantic (OSPAR QSR). Within this context, INBO concluded important cooperation agreements with several national and international research institutes.

The research team Estuaria is mainly working in the framework of the long-term vision for the Scheldt estuary, the updated Sigmaplan, the Water Framework directive and the Birds and Habitats directives. The integrated monitoring system of the macrobenthos, water birds, vegetation and habitats or ecotopes provides information for the evaluation of the state and trends of the environment and the licensing policy in order to set objectives and metrics for European directives, the ecological recovery strategy for the Scheldt estuary and the design, planning and evaluation of the associated measures. The research contributes to the research and monitoring (O&M) effort of the Flemish-Dutch Scheldt Commission (VNSC) and is performed in collaboration with numerous partners.

The research team Aquatic Management performs ichthyologic research in estuaries: research on habitat use and recovery; migration and migration bottlenecks; effects of pumping stations and hydropower; the preparation of species recovery and species management plans (e.g. eel management plan).

The Landscape Ecology and Nature Management research team focuses on the landscape dynamics in the coastal dunes (including hydrology and geomorphology), the inventory and mapping of vegetation and focus species along the Flemish coast, and providing scientific support for conservation management and restoration.

The research group Monitoring and Restoration of Aquatic Fauna conducts policy-related scientific research on the monitoring of fish in estuaries. Within the framework of various national and international directives fish assemblagesare surveyed to map the state of aquatic wildlife. Migration pattern and spawning activities are studied for diadromic species (especially twaite shad). In the frame work of the long-term vision for the Sea Scheldt estuary and the updated Sigmaplan, the evolution of fish assemblages are monitored in flood control areas with a controlled reduced tide and in newly created floodplains and wetlands i.e. compensation measures to assure ecological recovery of the estuary.

The Open Science Lab for Biodiversity (oscibio, https://oscibio.inbo.be/) offers technical support to research projects it participates in (such as LifeWatch, RIPARIAS, GloBAM and the Belgian Biodiversity Platform). This support is mainly focused on data management, the publication of open data and the development of research software. Its approach is open by default, international, and community-oriented, with the goal of making biodiversity research more efficient and reproducible.

INBO

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Flemish Institute for Technological Research (VITO)

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// Institutional hierarchy

Government of Flanders
Policy Area Economy, Science and Innovation

// Research domain & discipline

Engineering and technology: Geomatics
Natural sciences: Earth sciences

Abstract

The Flemish Institute for Technological Research (VITO) is an independent research and development institute that focuses on innovative technologies and scientific knowledge to facilitate the transition to a more sustainable society and economy. 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 and beyond.

VITO's research is divided into five themes including:

- sustainable chemistry;
- sustainable land use;
- sustainable health;
- sustainable materials;
- sustainable energy.

Remote sensing and land use modelling are the core technologies applied to sustainable land use. Within the Remote Sensing unit, the focus is placed on the development and demonstration of image processing algorithms and related models, using (manned and unmanned) airplanes, water platforms as well as satellite observations.

VITO

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2400 Mol

3 Universities and graduate schools of the Wallonia-Brussels Federation

Université Libre de Bruxelles

Biogeochemistry and Earth System Modelling group

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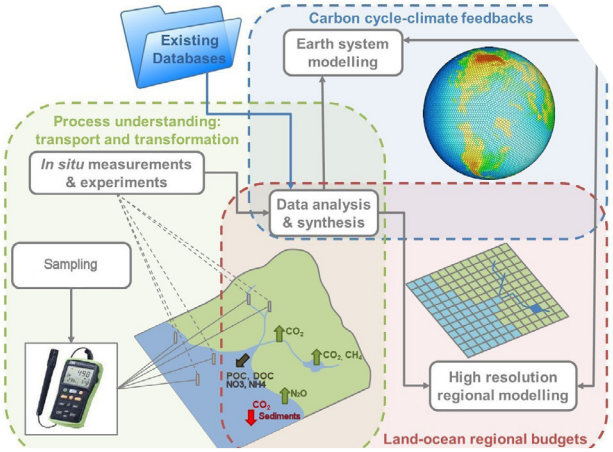
// Institutional hierarchy

Faculty of Sciences
Department of Geosciences, Environment and Society

// Research domain & discipline

Natural sciences: Earth sciences



Abstract

The Biogeochemistry and Earth System Modelling (BGéoSys) group 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 associated greenhouse gas (CO_2, CH_4, N_2O) fluxes, including their role in shaping the present and past climates on Earth. The group is active member of the Global Carbon Project, leading syntheses for inland and coastal waters.

More specifically, the research concentrates on the following topics:

- the role of ice sheets in global biogeochemical cycles;
- arctic biogeochemistry;
- greenhouse gases fluxes from inland waters, estuaries, blue carbon ecosystems and the coastal ocean;
- biogeochemical cycling in fjords and estuaries;
- quantification of the global shelf CO_2 sink from observations and models;
- carbon and nitrogen cycling along the land-to-ocean aqautic continuum and integration in Earth system models;
- modelling of the Earth system and anthropogenic greenhouse gas budgets;
- geomicrobial processes at the 'water - rock - microorganism'-interface (i.e. fungi and bacteria);
- biogeochemical and geomicrobial dynamics in the sedimentary systems;
- palaeoenvironments and palaeoclimate: archiving and tracing of processes in geological records.

BGéoSys

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1050 Brussel

BioMatter lab

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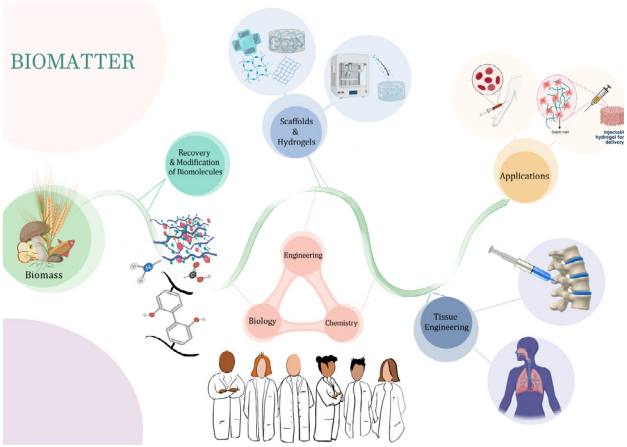
// Institutional hierarchy

Faculty of Engineering
École Polytechnique de Bruxelles

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Chemical sciences



Abstract

The BioMatter lab conducts research on the following topics:

- valorisation of by-products such as polymers, bioactive molecules, and structures to obtain raw materials, improving the functional properties of biopolymers (e.g. alginate, hyaluronic acid, and collagen) through modification and consequently developing high-value processes and products for biomedical and tissue engineering applications;
- relationships between structure and material properties of polysaccharides with a focus on the development of natural polymers e.g. polysaccharides into hierarchical structures such as scaffolds and hydrogels for tissue engineering applications such as skin wound healing;
- additive manufacturing of biomaterials with a focus on improving the functional properties of biopolymers such as keratin and developing new bioinks for bioprinting from biotransformation of biomass with tailored degradation kinetic properties.

The laboratory studies marine oligosaccharides and marine fish collagen as a potential bioagent for biomaterials engineering. Further, the group is using cutting-edge biofabrication techniques to demonstrate the potential of 3D bacterial constructs, for instance with respect to green bioremediation for the removal of hazardous environmental pollutants or to develop innovative food products.

BioMatter lab

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Laboratory of **Ecology of Aquatic System**

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// Institutional hierarchy

Brussels School of Bioengineering
Faculty of Sciences

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The laboratory of Ecology of Aquatic System (ESA) focuses on the study and modelling of the microbial diversity, 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 biodiversity, eutrophication and advanced modelling. Its main research themes concern:

- coastal eutrophication;
- marine biogeochemical cycles and climatic gases;
- bacterial ecology of surface waters (including microbiological quality);
- prospection of aquatic environments for bioactive molecules;
- microbiological aspects of drinking water production and distribution.

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

ESA

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1050 Brussel

Unit of **Evolutionary Biology and Ecology**

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// Institutional hierarchy

Faculty of Sciences
Department of Biology of Organisms

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Engineering and technology: Information and computer sciences
Natural sciences: Biological sciences

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Abstract

Research activities within the unit of Evolutionary Biology and Ecology (EBE) focus on five complementary thematics in evolutionary biology:

- natural substances produced by organisms that share the same environment from their secondary metabolism play a major role in interactions (intra- or interspecific). EBE focuses on pheromones involved in conspecific recognition among insects but also on the role of chemicals in insect-plants interactions (chemical defense, chemical mimicry);
- problems of biodiversity conservation are studied in the local area and in tropical forest ecosystems. At a local scale (Brussels and suburbs), EBE is interested in the distribution and behaviour of endangered species, which require to study potential competitors in expansion (invasive species). Bats, birds and ladybirds belong to the focus groups. In tropical forest, focus groups are termites and ants but also trees, on wich an evaluation is conducted of the biodiversity and its variations depending on natural environment conditions and human activities impact;
- evaluation and own development of available statistical tools to characterise the organisation of genetic diversity and identify the processes involved (genetic drift, dispersal, mutation, selection). Study of the genetic structure of societies and populations of social insects (ants, termites), and their social consequences in terms of reproductive strategies. Phylogeographic studies are conducted, at the interface between populations and species, to gain insights into the geographic distribution of genetic variation and on the mechanisms of speciation;
- gaining of a deeper understanding of the principles that lead evolution of animal societies and the ecological consequences of social life: organisation of societies, reproductive strategies and conflicts within groups. These researches focus on social insects (ants, termites), using several approaches as behaviour, ecology and genetics;
- studies of alpha taxonomy (identification and description of genus and species) are made in part for their own interest (inventory of living organisms), but also as a basis for studies on biodiversity estimation. Building of phylogenies, thanks to genetic tools, allows to elaborate evolution outlines for other features: social organisation, behaviour, reproduction.

Within these research activities, marine research topics studied are:

- biology and conservation of marine turtles;
- delimitation of marine species using molecular markers and morphology;
- genome assembly and analyses of marine species, with implications for fisheries in the case of species of economic importance;
- search for novel enzymes and other natural products (such as antibiotics) in the genomes of marine species (e.g., sponge-associated bacteria);
- phenotypic and physiological plasticity of marine species (such as coral holobionts);
- comparative analyses of genome sizes in marine organisms, trophic chains in the sea. The taxa studied include corals, crustaceans, sponges as well as vertebrates (turtles, elasmobranchs).

EBE

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Glaciology unit

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// Institutional hierarchy

Faculty of Sciences
Department of Geosciences, Environment and Society

// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The Glaciology unit 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 was 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.

Glaciology unit

Campus du Solbosch
Avenue F.D. Roosevelt 50
Building D, 4th floor, CP 160/03
1050 Brussel

Laboratory **G-Time**

https://gtime.ulb.be

// Contact

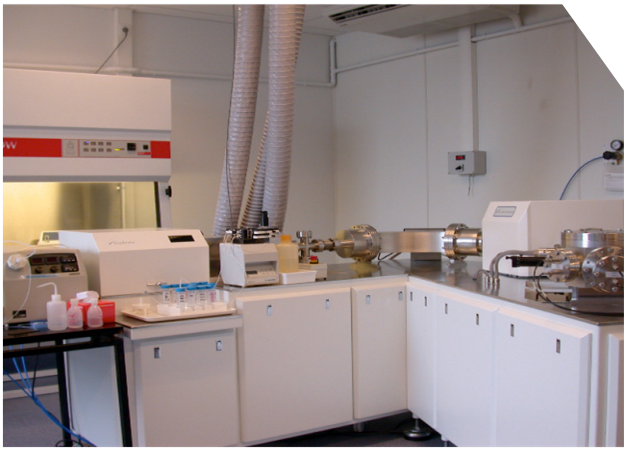
nmattiel@ulb.ac.be

// Institutional hierarchy

Faculty of Sciences
Department of Geosciences, Environment and Society

// Research domain & discipline

Natural sciences: Chemical and earth sciences



Abstract

The laboratory G-Time (Geochemistry & Geophysics) was founded in 2001 and was formerly known as the research unit IPE 'Isotopes: Petrology and Environment'. This group conducts research about the research themes Geochemistry, Volcanology and Brucares (Brussel's University Platform for Geochemical Analyses in Environment, Health and Society). The Geochemistry team applies isotope geochemistry (radiogenic isotopes and non-traditional stable isotopes) and petrology to Earth mantle dynamics, early earth and planetary processes, and environmental studies. Within the Volcanology field, chemical and physical properties of the products of past volcanic eruptions are studies and novel monitoring approaches at active-dormant volcanoes are used to better understand future hazards and forecast eruptions.

Marine research topics that are currently studied at G-Time are: hydrothermal systems and rock - fluid interactions as well as the dynamics of volcano hydrothermal systems.

G-Time

Campus du Solbosch
Avenue A. Depage 30
Building D, 5th floor
1050 Brussel

Laboratories of **Image, Signal Processing and Acoustics**

https://lisa.polytech.ulb.be

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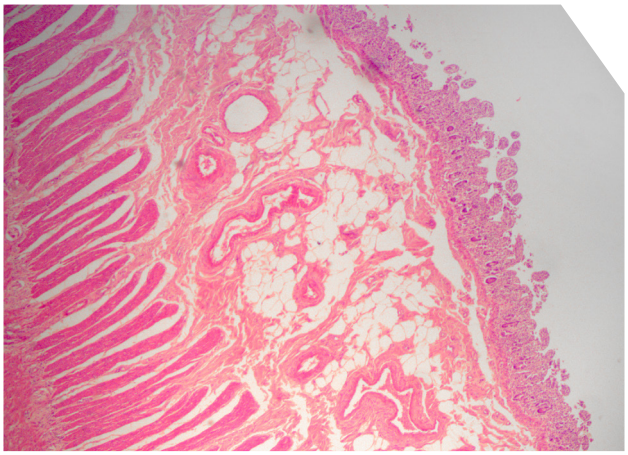
polina.lemenkova@ulb.be

// Institutional hierarchy

Faculty of Applied Sciences

// Research domain & discipline

Engineering and technology: Information and computer sciences



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Abstract

The laboratories of Image, Signal Processing and Acoustics (LISA) have developed expertise both in image analysis/ pattern recognition and computer graphics. In the field of image analysis and pattern recognition, this unit develops new methods for object segmentation, recognition or tracking in 2D and 3D problems, multi-modal image registration, as well as statistical learning methods applied to image and data classification. Developed algorithms are related to biomedical, industrial and HMI (Human Machine Interface) applications.

The marine research of LISA focuses on seismic and geochemical analysis in sea basins:

- seismic moment tensor solutions for geophysical mapping of the Philippine Sea Basin;
- geochemical tests to study the effects of cement ratio on potassium and TBT leaching and the pH of the marine sediments from the Kattegat Strait.

LISA

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Fact sheet not validated by research group

Marine Biology laboratory

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// Institutional hierarchy

Faculty of Sciences
Department of Biology of Organisms

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Marine Biology (BIOMAR) lab carries out research focusing on marine conservation at all latitudes, blending (numerical)ecology, bio/phylogeography and physiology of a broad range of marine organisms (with a special attention devoted to benthic invertebrates, including echinoderms). BIOMAR started its research and training activities in 1969, when Prof. Michel Jangoux was first recruited. Since 1989, BIOMAR is closely associated to other marine biology research laboratories, forming the 'Centre Interuniversitaire de Biologie Marine' (CIBIM). Since 2023, BIOMAR co-manages a research station in Belaza (Southwest of Madagascar) with UMons, ULiège and UToliara.

The following subjects are studied: aquaculture, biodiversity, biogeography, biomineralisation, development, ecotoxicology, ecophysiology (including energetics), general biology, marine imagery, numerical ecology, nutrition, systematics, reproduction and symbioses.

BIOMAR

Campus du Solbosch
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1050 Brussel

Laboratory of **Microbiology**

https://cvchercheurs.ulb.ac.be/Site/unite/ULB133UK.php

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// Institutional hierarchy

Faculty of Sciences
Department of Molecular Biology

// Research domain & discipline

Natural sciences: Biological sciences

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Abstract

The laboratory of Microbiology studies the following topics:

- physiology of mesophilic and thermophilic microorganisms;
- relationships between structure and function in proteins and enzymes;
- biosynthesis and function of the modified nucleosides of transfer RNA.

Within the marine field, the group studies the M42 aminopeptidase enzyme in the thermophilic bacterium *Thermotoga maritima*, originally isolated from a deep-sea hydrothermal vent. The group focuses on its oligomeric state transition, the structural and functional role of a conserved aspartate residue in the catalytic site, and how metal cofactors drive the dimer-dodecamer transition of the enzyme. The research utilises X-ray crystallography and protein analysis techniques to investigate the molecular characteristics and mechanisms of this enzyme.

Microbiology

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6041 Gosselies

Fact sheet not validated by research group

Systems Ecology and Resource Management research unit

https://serm.ulb.be

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// Institutional hierarchy

Interfaculty Institute for Socio-Ecological Transformations
Faculty of Sciences
Department of Biology of Organisms

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Systems Ecology and Resource Management research unit was founded in 2007. The group seeks to understand and to predict how and why spatial and temporal dynamics in vegetation and landscapes 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 research unit is the general coordinator of the Erasmus Mundus Joint Master in Tropical Biodiversity and Ecosystems. The group has published over 200 peer-reviewed papers in renowned journals including as 'Science', 'Nature Plants', 'Current Biology' and 'Frontiers in Marine Science'.

In the marine domain, the group focuses on mangrove forests, with links to neighbouring ecosystems such as coral reefs. The research unit 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 (conservation, restoration, governance). Within this framework, the group is also interested in changes in biodiversity and in climate, and on ecological and ethological plant - animal and man - ecosystem interactions, particularly in an attempt to early warn for ecological degradation and unsustainable exploitation practices. The research is done on different spatial scales from the case-study level in different American, African and Asian countries to the macroecological level (global) and also explores the science-policy interface.

SERM

Campus du Solbosch
Avenue F.D. Roosevelt 50
CP 264/1
1050 Brussel

University of Liège

Chemical Oceanograpy unit

www.co2.uliege.be/cms/c_5622303/en/co2

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// Institutional hierarchy

Faculty of Sciences
Freshwater and Oceanic Science Unit of Research (FOCUS)

// Research domain & discipline

Natural sciences: Chemical and earth sciences

Abstract

The Chemical Oceanography unit originates from the Oceanology laboratory and became an independent research unit within the department of Astrophysics, Geophysics and Oceanography in 1996. Later, the unit became part of the Freshwater and Oceanic Science Unit of Research (FOCUS). This research entity federates ten laboraties of the University of Liège working on oceanography and limnology and integrates multidisciplinary scientific expertise about aquatic systems. 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 CO_2, CH_4, N_2O and dimethyl sulfide (DMS). Key events since the establishment of the group include a publication in the renowned journal 'Science' about CO_2 emission from European estuaries (Frankignoulle *et al*., 1998 - Science), a publication on the first synthesis of CO_2 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 CO_2 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 CO_2 fluxes in continental shelves and the global synthesis of CO_2 and CH_4 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 research group collaborates with some renowned national and international universities and institutes such as the Vrije Universiteit Brussel, KU Leuven University, Université Libre de Bruxelles (Belgium), 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 carbon dioxide).

Chemical Oceanography

Allée du six Août 17
Building B5
4000 Liège 1

Early Life Traces and Evolution - Astrobiology research group

www.earlylife.uliege.be/cms/c_4341629/en/earlylife

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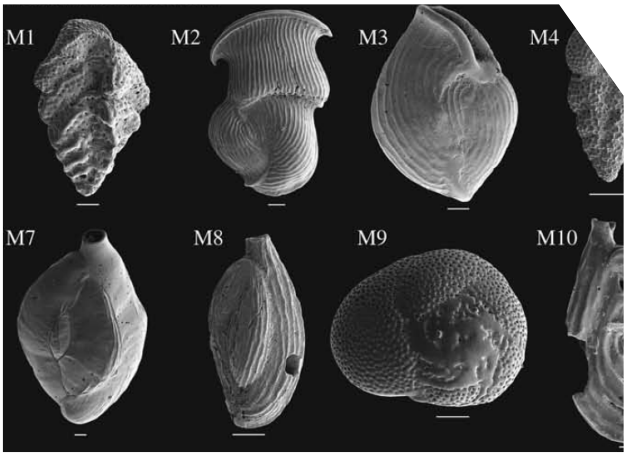
ej.javaux@ulg.ac.be

// Institutional hierarchy

Faculty of Sciences
Department of Astrobiology

// Research domain & discipline

Natural sciences: Earth sciences



Abstract

The Early Life Traces and Evolution - Astrobiology research group 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).

The group 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, metamorphosis);
- characterisation of biosignatures for palaeobiology and astrobiology.

Fact sheet not validated by research group

Early Life Traces and Evolution - Astrobiology

Alléé de 6 Août 14
Building B18
4000 Liège 1

Laboratory of **Economy and Rural Development**

www.gembloux.ulg.ac.be/economie-et-developpement-rural

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philippe.lebailly@ulg.ac.be

// Institutional hierarchy

Gembloux Agro-Bio Tech

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Social sciences: Economics and business

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Abstract

The laboratory of Economy and Rural Development develops teaching (bachelor's degrees, master's degrees, complementary master's degrees) and research activities. The research activities are organised around the following themes:

- agricultural and agri-food economics (farm management, agricultural accounting, analysis of agricultural sectors, market studies, diversification, product processing and promotion);
- rural development (thematic studies on today's rural environment, strategy development for the Walloon Rural Development Plan);
- development economics (rural entrepreneurship, rural development, agrarian dynamics, sector studies, etc.).

The marine research focuses on socio-ecological and economic developmental challenges within the aquaculture and small scale fisheries sector with the aim of building the knowledge base toward socially, economically and environmentally sustainable development.

Economy and Rural Development

Avenue de la faculté 13
Building B18
5030 Gembloux

Fact sheet not validated by research group

Laboratory of **Food Analysis**

www.fmv.uliege.be/cms/c_4760151/en/fmv-department-food-science

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nkorsak@uliege.be

// Institutional hierarchy

Faculty of Veterinary Medicine
Department Food Science

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Medical and health sciences: Medical and health sciences
Natural sciences: Biological sciences

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Abstract

The research conducted at the laboratory of Food Analysis deals with:

- food processing and product characteristics;
- food safety and contaminants;
- consumption patterns and nutrient contributions;
- bacterial diversity and metagenomics.

The marine focus lies in the fact that the research specifically targets smoked fish/shrimps and smoked-dried fish.

Fact sheet not validated by research group

Food Analysis

Avenue de Cureghem 6
Building B43
4000 Liège 1

Functional and Evolutionary Morphology laboratory

www.morfonct.uliege.be/cms/c_4463025/en/morfonct

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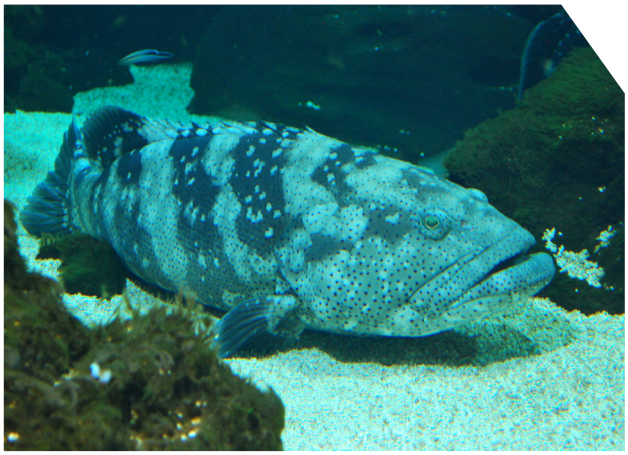
e.parmentier@ulg.ac.be

// Institutional hierarchy

Faculty of Sciences
Department of Biology
Ecology and Evolution

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The Functional and Evolutionary Morphology laboratory has a long tradition in the study of animal musculo-skeletal systems by combining comparative and experimental methods of analysis, studies in the laboratory and in the field, to describe and understand at best the relationships between the animal performance, its behaviour and its environment. The current research projects concern mainly studies dealing with the fundamental components of the acoustic communication (sound production and hearing) in fishes and their evolution in different taxa. The studies describe and explain the mechanisms implied in sound production and reception in various taxa of adult teleosts. It integrates data in (functional) morphology, histology, physiology, behaviour, ontogeny, biogeography as well as physics and acoustics. Moreover, the comparison of taxa living in different environments attempts to clarify the influence of environmental factors on the sound production. The laboratory is also conducting studies related to biomimicry (i.e. the design and production of materials, structures, and systems that are modelled on biological entities and processes) with the description of cuticle in arthropods and skeletal structures in teleost fishes.

Functional and Evolutionary Morphology

Allée de la Chimie 3
Building B6
4000 Liège 1

Genetics and Physiology of Microalgae laboratory

http://labos.ulg.ac.be/genetique-physiologie-microalgues

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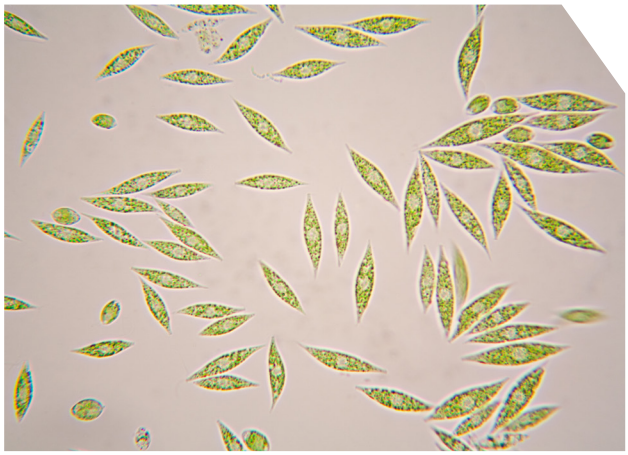
c.remacle@ulg.ac.be

// Institutional hierarchy

Faculty of Sciences
Department of Life Sciences

// Research domain & discipline

Natural sciences: Biological sciences



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Abstract

The research of the Genetics and Physiology of Microalgae laboratory focuses on the characterisation of bioenergetic pathways (respiration, photosynthesis, fermentation) in unicellular microalgae of diverse evolutionary origin, such as the green alga *Chlamydomonas reinhardtii* (Chlorophytes), the red alga *Galdieria sulphuraria*, the marine diatom *Thalassiosira pseudonana* (Bacillariophytes), the secondary green alga *Euglena gracilis* (Euglenophytes) or the marine dinoflagellate *Symbiodinium* (Dinophytes). These photosynthetic microeukaryotes are of ecological, evolutionary or biotechnological interest.

The main research topics include:

- composition, assembly and structure of respiratory complexes;
- assimilation of exogenous carbon sources (heterotrophy and mixotrophy);
- regulation mechanisms of the photosynthetic electron transfer chain;
- interactions between bioenergetic processes (respiration, photosynthesis and fermentation);
- development of genetic tools (transformation and mutant screening strategy).

Genetics and Physiology of Microalgae

Chemin de la Vallée 4
Building B22
4000 Liège

GeoHydrodynamics and Environmental research group

www.gher.uliege.be

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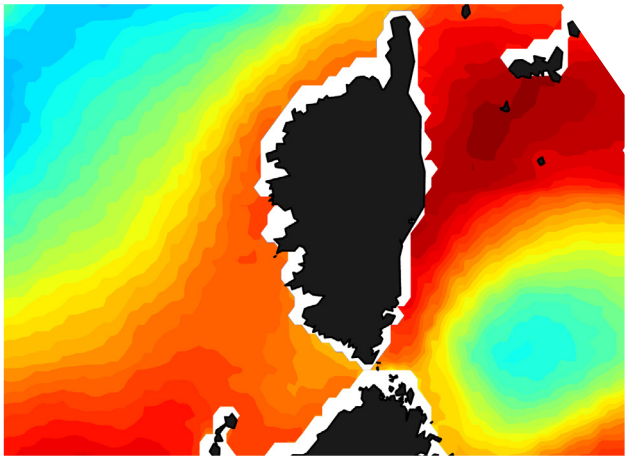
jm.beckers@ulg.ac.be

// Institutional hierarchy

Faculty of Sciences
Freshwater and Oceanic Sciences Unit of Research (FOCUS)

// Research domain & discipline

Natural sciences: Earth sciences



Abstract

The GeoHydrodynamics and Environmental research group (GHER) was formerly known as 'unité d'Océanographie Physique'. The group focuses on marine and environmental studies and modelling.

In the 1970s, 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 participated 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 database 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.

GHER

Allée du 6 Août 19
Building B5
4000 Liège

Fact sheet not validated by research group

Hydraulics in Environmental and Civil Engineering research group

www.hece.ulg.ac.be

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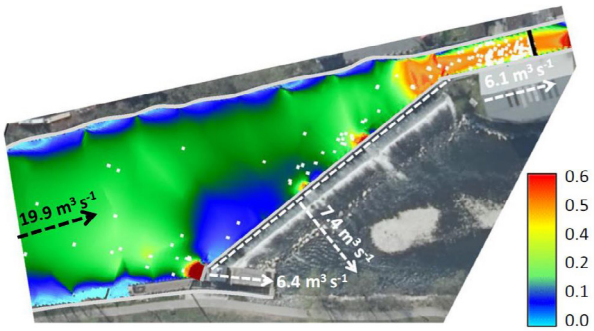
s.erpicum@uliege.be

// Institutional hierarchy

School of Engineering
Urban and Environmental Engineering

// Research domain & discipline

Engineering and technology: Civil engineering



The Hydraulics in Environmental and Civil Engineering research group (HECE) was created in 1937. The activities of the group concern experimental modelling as well as the development of innovative composite or hybrid modelling approaches applied to hydraulics in environmental and civil engineering. They are related to topics as varied as the design of hydraulic structures (spillways, dams, locks), sediment transport, flood risk management and prevention or hydropower and its impacts on the aquatic fauna for instance.

The marine component is related to the influence of hydraulic structures (including the design of fish passages) on the migrations of diadromous species, such as the Atlantic salmon (*Salmo salar*).

HECE

Allée de la Découverte 13
Building B52/3
4000 Liège

Laboratory of **Immunology - Vaccinology**

www.dmipfmv.ulg.ac.be/vetimmuno

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// Institutional hierarchy

Faculty of Veterinary Medicine
Department of Infectious and Parasitic Diseases

// Research domain & discipline

Medical and health sciences: Medical and health sciences

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Abstract

The laboratory of Immunology-Vaccinology was created in 1979. The two main topics of the lab are the development of new vaccines and the study of host pathogen interactions with a special interest for immune-evasion mechanisms developed by pathogens. Various host-pathogen models are studied, focusing mainly on animal viruses but also on few parasites.

The marine component of the group relates to the study of restocked diadromous eel and the biological and genomic features of its pathogens, despite the fact that research is mainly taking place in freshwater ecosystems. This also includes the study of different pre-release quarantine conditions for eel, in the framework of restocking programs, important for mitigation of sanitary risks, including avoiding the further spread of eel pathogens.

Immunology - Vaccinology

Avenue de Cureghem 10
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4000 Liège

Management of Aquatic Resources and Aquaculture unit

www.ugeraa.uliege.be/cms/c_8846181/en/ugeraa

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// Institutional hierarchy

Faculty of Sciences
Freshwater and Oceanic Science Unit of Research (FOCUS)

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Natural sciences: Biological sciences

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Abstract

The Management of Aquatic Resources and Aquaculture unit (UGERAA) is part of the Freshwater and Oceanic Science Unit of Research (FOCUS). It was created in 2020 as an association between the laboratory of Fish Demography and Hydroecology (LDPH) and the Centre for Training and Research in Aquaculture (CEFRA). The UGERAA works closely with the Behavioural Biology unit in the University of Liege and the non-profit organisation CERER-Pisciculture. Its research team uses the fish as biological model to conduct fundamental and applied research in:

- management of aquatic resources: behavioural ecology, population dynamics, hydroecology, conservation and sustainable development of fisheries resources;
- aquaculture: reproductive biology and control, sex determination, genetic selection and improvement in growth, fish welfare and development of farming systems in line with environmental sustainability. Research is mainly carried out on freshwater fish species in Europe as well as in Africa within the framework of the development cooperation with countries in the southern hemisphere.

UGERAA

Quai Van Beneden 22
Building I1
4020 Liège

Mass Spectrometry laboratory

www.mslab.uliege.be/cms/c_6417994/en/mass-spectrometry-laboratory

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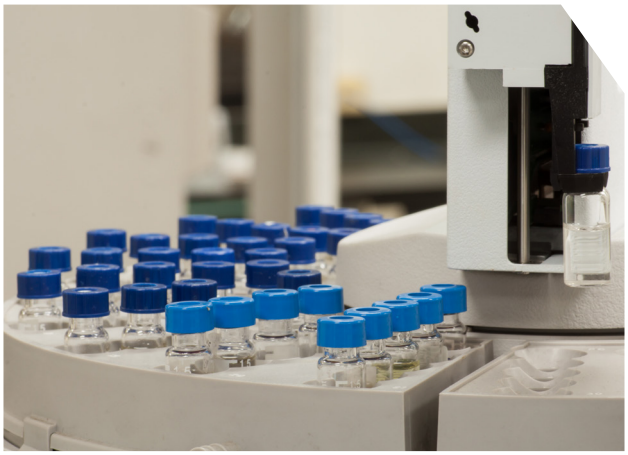
// Institutional hierarchy

Faculty of Sciences
Department of Chemistry
Research Unit Molecular Systems

// Research domain & discipline

Natural sciences: Chemical sciences



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Abstract

The Mass Spectrometry laboratory (MSLab) is dealing with the impact of chemicals on biodiversity. The laboratory is an accredited (EN17025) analytical chemistry laboratory largely involved internationally in organochlorinated and endocrine disruptors analysis. Two years ago a research program started in view to apply new prespectives of proteomics in the fied of exposure to xenobiotics monitoring.

MSLab

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4000 Liège

Fact sheet not validated by research group

Modelling for Aquatic Systems research group

http://labos.ulg.ac.be/mast

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// Institutional hierarchy

Faculty of Sciences
Freswhater and Oceanic Science Unit of Research (FOCUS)

// Research domain & discipline

Natural sciences: Biological, chemical and earth sciences

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Abstract

The Modelling for Aquatic Systems research group (MAST) develops models to understand the interactions between the ocean physics, biogeochemical cycles and ecosystem functioning. These models are used to forecast and project the ocean state and potential impacts of global environmental changes on marine system functioning.

Research of the group includes the following topics:

- development of stochastic modelling approaches and data assimilation to improve marine environmental forecasting;
- extending models to better represent the interactions with the other earth system's components (Earth System modelling approach);
- understanding and predicting marine deoxygenation and its consequences on marine ecosystems and the biogeochemical cycles of carbon, nitrogen and phosporus;
- development of methodologies to connect the predictions of hydrodynamical-biogeochemical models with the assessment of the goods and services provided by marine ecosystems.

Fact sheet not validated by research group

MAST

Allée du six Août 19
Building B5a
4000 Liège

Research group **Naval architecture, Maritime engineering, Inland and Sea shipping and Transport System Analysis**

www.ulg.ac.be/anast

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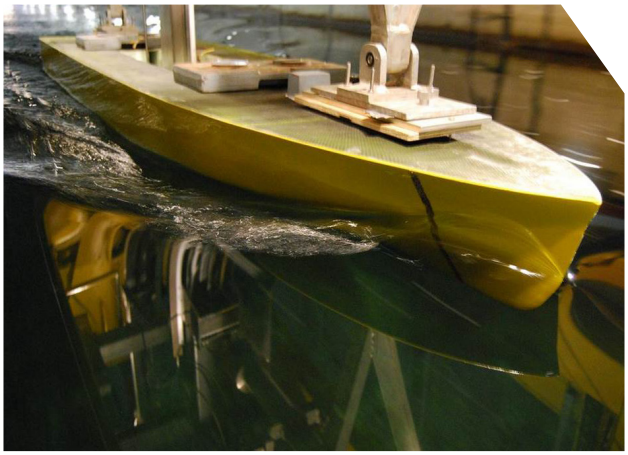
ph.rigo@uliege.be

// Institutional hierarchy

Faculty of Applied Sciences
Urban and Environmental Engineering Research Unit

// Research domain & discipline

Engineering and technology: Civil and mechanical engineering, and other engineering and technology



Abstract

The research group Naval Architecture, Maritime Engineering, Inland and Sea Shipping and Transport System Analysis (ANAST) studies multiple aspects of shipping. The research activities of this group concentrate on shipbuilding, naval and offshore engineering (wind energy); 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.

ANAST

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Laboratory of **Oceanology**

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// Institutional hierarchy

Faculty of Sciences
Freswhater and Oceanic Science Unit of Research (FOCUS)

// Research domain & discipline

Natural sciences: Biological and earth sciences

© Karl Van Ginderdeuren

Abstract

The laboratory of Oceanology 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, sulfur 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;
- macrophytodetritus dynamic and ecology.

The research takes place at many locations, from the Arctic to Antarctic, including Mediterranean Sea and benefits from the oceanographic station STARESO (ULiège).

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 participated in the vERSO and RECTO project (Brain-Be, BELSPO) (Antarctic Sciences) and FNRS project. Our team was 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 Eramus Mundus MER (as main partners) and in the Master Erasmus Mundus IMBRSea (as associated partner).

Oceanology

Allée de six Août 11
Building B6c
4000 Liège 1

Sedimentary Petrology laboratory

www.geolsed.uliege.be/cms/c_10601671/fr/geolsed

// Contact

fboulvain@uliege.be

// Institutional hierarchy

Faculty of Sciences
Department of Geology

// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The Sedimentary Petrology laboratory mainly studies Palaeozoic and Mesozoic carbonate-containing sediments. The research topics studied include reef and littoral sedimentation processes, basin dynamics, cyclostratigraphy, microbiological interference with sedimentation and climates of the past.

Research topics related to the marine field are:

- sedimentation processes and use of proxies in order to reconstruct the palaeoenvironments;
- astronomical calibration of geologic times, climate of the past;
- Palaeozoic and Mesozoic coral reefs, mounds and atolls.

Sedimentary Petrology

Allée du six Août 12
4000 Liège

TERRA Teaching and Research Centre

www.terra.uliege.be/cms/c_4054766/en/terra

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// Institutional hierarchy

Gembloux Agro-Bio Tech

// Research domain & discipline

Engineering and technology: Biotechnology
Natural sciences: Biological and earth sciences

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Abstract

TERRA Teaching and Research Centre is an interdisciplinary research centre that studies and develops biological engineering in the fields of agri-food, agriculture, biotechnology, environment and forestry. One of the main objectives of TERRA is to develop transversality and exchanges between researchers from different disciplines. The nine research themes that TERRA researchers propose to develop in the next five years are:

- monitoring, impact and adaptation of climate change;
- new approaches to crop protection;
- innovative methods in agricultural production;
- multiscale soil systems;
- development of urban agro-and ecosystems;
- dynamics and changes in forest socio-ecosystems of Central Africa;
- feeding the future;
- innovative processes in biotechnology;
- genetic improvement of agro-biological resources.

Four Research and Teaching Support Units are associated with TERRA:

- Environment is Life: focus on the evolution of interactions between water, soil, plant, ecosystems and atmosphere in relation to environmental factors, under the effect of biotic and abiotic stress (climate change);
- Food is Life: focus on the fractionation and transformation of agro-resources, including fermentation, with a view to developing innovative products and processes;
- Agriculture is Life: offering innovative agricultural production and processing techniques from an agronomic, economic, social and environmental point of view;
- Forest is Life: focus on forest ecosystems and, more generally, landscape structures with a low degree of anthropisation, in both temperate or tropical regions.

The group studies different coastal/marine topics, including:

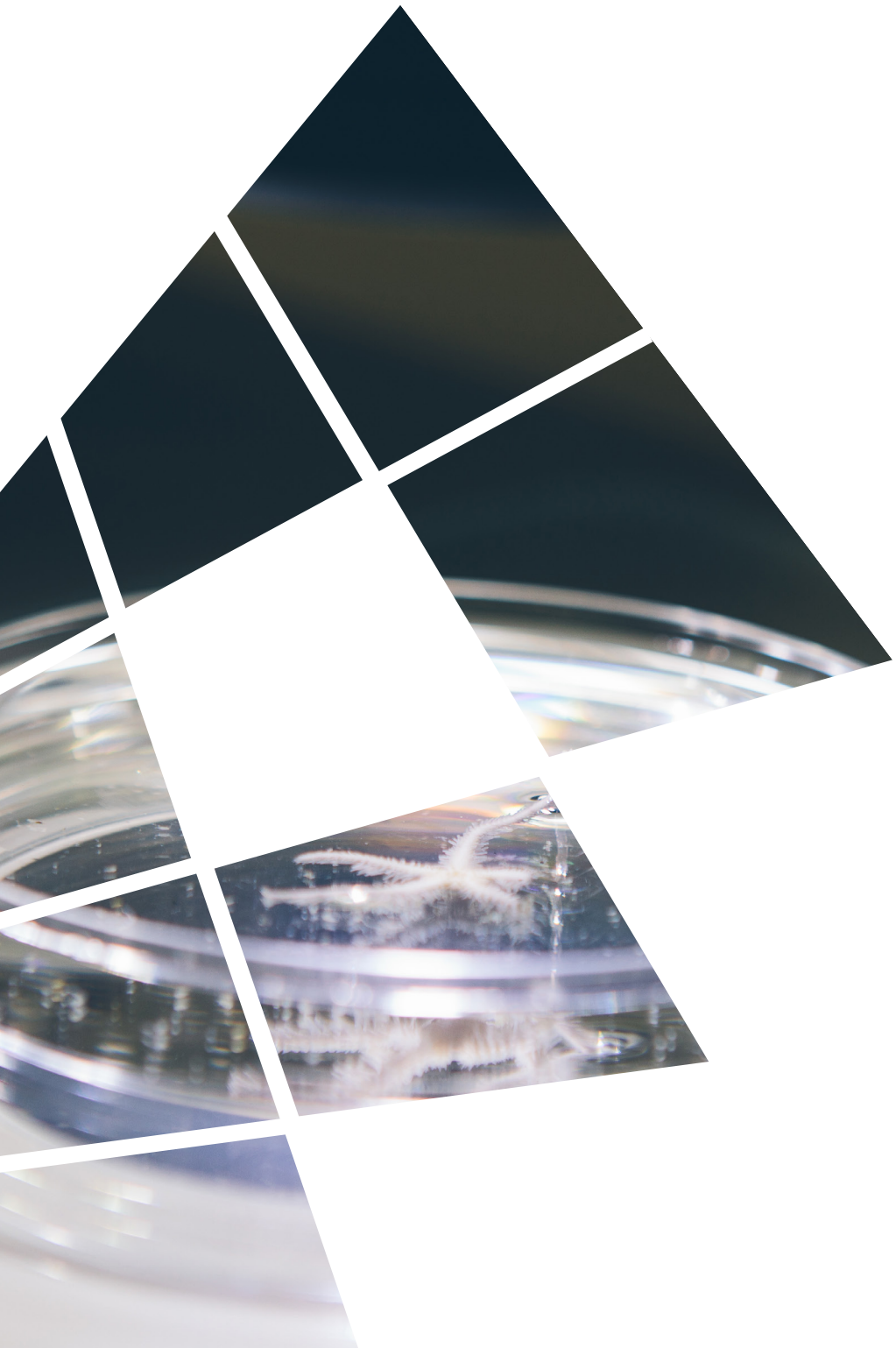
- body mass variation in seabird during spring migration;
- microbial interactions in seaweeds;
- soil dynamics in coastal dunes;
- functional properties and health benefits of bioactive peptides derived from *Spirulina*.

Fact sheet not validated by research group

TERRA Teaching and Research Centre

Avenue de la Faculté d'Agronomie
5030 Gembloux

Université Catholique
de Louvain



Earth and Climate division of the Earth and Life Institute

https://uclouvain.be/en/research-institutes/eli/elic

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// Institutional hierarchy

Science and Technology Sector
Earth and Life Institute

// Research domain & discipline

Natural sciences: Earth sciences

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Abstract

The Earth and Climate division of the Earth and Life Institute (ELIc) 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:

- climate system dynamics;
- land use and globalisation;
- soil, sediment and nutrient fluxes;
- space and planets.

The marine-related research of the group concerns climate, sea-ice and ocean models. The group is developing and maintaining, in collaboration with the Nucleous for European Modelling of the Ocean (NEMO) consortium, the Sea Ice Modelling integrated initiative (SI3) / Louvain-la-Neuve Ice Model (LIM). ELIC has contributed to the coupling of NEMO-SI3/LIM to several climate models. These models are applied on various systems at global scale, in particular to study the mechanisms responsible for past and future climate change at high latitudes of both hemispheres and the role of polar oceans and sea ice in observed and projected climate change.

ELIc

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1348 Louvain-La-Neuve

Laboratory of **Food and Environmental Microbiology**

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annika.gillis@uclouvain.be

// Institutional hierarchy

Science and Technology Sector
Earth and Life Institute
Applied Microbiology pole

// Research domain & discipline

Agricultural and veterinary sciences: Fisheries and aquaculture sciences
Medical and health sciences: Medical and health sciences
Natural sciences: Biological sciences

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Abstract

The laboratory of Food and Environmental Microbiology studies fish processing (preservation practices, processing methods) and the effects on physicochemical characteristics and safety of smoked fish products.

Food and Environmental Microbiology

Croix du sud 2
Building Kellner, 1th floor
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1348 Louvain-la-Neuve

Team **Marine Biology**

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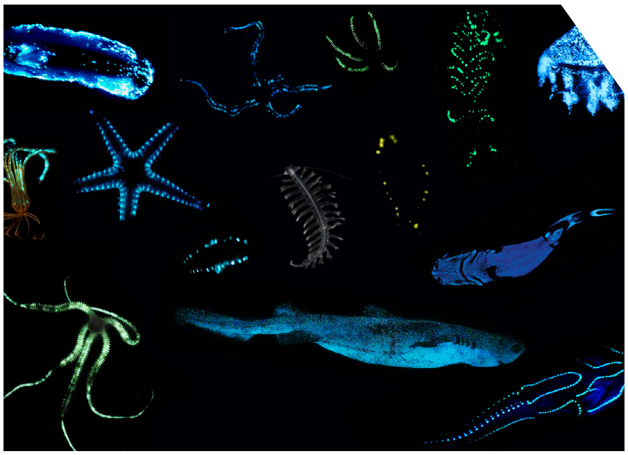
jerome.mallefet@uclouvain.be

// Institutional hierarchy

Science and Technology Sector
Earth and Life Institute
Research pole Ecology and Biodiversity

// Research domain & discipline

Natural sciences: Biological sciences



© Prof. J. Mallefet FNRS-UCLouvain

Abstract

The team Marine Biology (BMAR) 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 (Norway), Göteborg and Lund Universities (Sweden), Otago University , Niwa Wekllington (New Zealand), University of California - Santa Barbara Campus (USA), Ryukyus University (Japan) and the 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 on the following marine topics:

- biodiversity of bioluminescence;
- bioluminescence in sharks - trophic ecology of deep-sea sharks;
- the control mechanisms, functions and evolution of bioluminescence;
- origin of marine luminous compounds in echinoderms and others phyla;
- bioluminescence on the pelagic ringworm *Tomopteris*.

BMAR

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Plant Physiology research group

https://uclouvain.be/en/research-institutes/eli/elia/about.html

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// Institutional hierarchy

Science and Technology Sector
Earth and Life Institute
Research pole Agronomy

// Research domain & discipline

Natural sciences: Biological sciences

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Abstract

The Plant Physiology research group (GRPV) is part of the research pole Agronomy of the Earth and Life Institute (ELIA). ELIA rounds up multidisciplinary expertise over the biological, technological and socio-economical dimensions of agricultural productions, agrarian systems and open biotopes. The pole promotes the investigation of processes underlying the functioning and evolution of those systems, from organisms to populations.

GRPV explores the complex relationships between environmental factors and plant responses. In the marine field (salt marshes), the group investigates the effects of various factors, such as heavy metals (cadmium and zinc) and salinity (NaCl), on the physiological processes and responses of the halophyte plant species *Kosteletzkya pentacarpos*. The group aims to understand how these factors interact and influence the synthesis of certain compounds (ethylene, polyamines, cytokinin trans-zeatine riboside) in the plant, and how these interactions affect the plant's resistance or susceptibility to heavy metal toxicity and salinity stress.

Fact sheet not validated by research group

GRPV

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1348 Louvain-la-Neuve

SLIM

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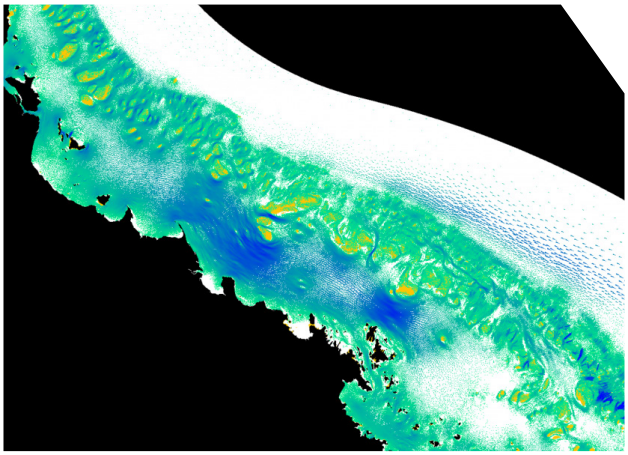
// Institutional hierarchy

Science and Technology Sector
Earth and Life Institute
Research pole Environmental Sciences

// Research domain & discipline

Engineering and technology: Information and computer sciences, and other engineering and technology
Natural sciences: Earth sciences



Abstract

SLIM (here considered as an overarching entity covering the marine research groups 'Research pole Environmental Sciences' and 'Applied Mechanics and Mathematics') at the Earth and Life Institute is interested in the development and application of multiscale coastal ocean models to simulate the dynamics of currents and waves, and the transport of oil, sediments, larvae and other biological materials. These models allow to achieve unprecedented accuracy to bring new insight into the physical and biological processes at play. SLIM is particularly interested in marine connectivity, environmental impact assessment and coastal vulnerability. They develop and apply the multi-scale coastal ocean model SLIM. SLIM is an unstructured-mesh hydrodynamic model that can seamlessly simulate flows from the river to the coastal ocean. It relies on the Discontinuous Galerkin finite element method to achieve high accuracy, even for very complex coastlines and bathymetry.

SLIM

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Building de Serres
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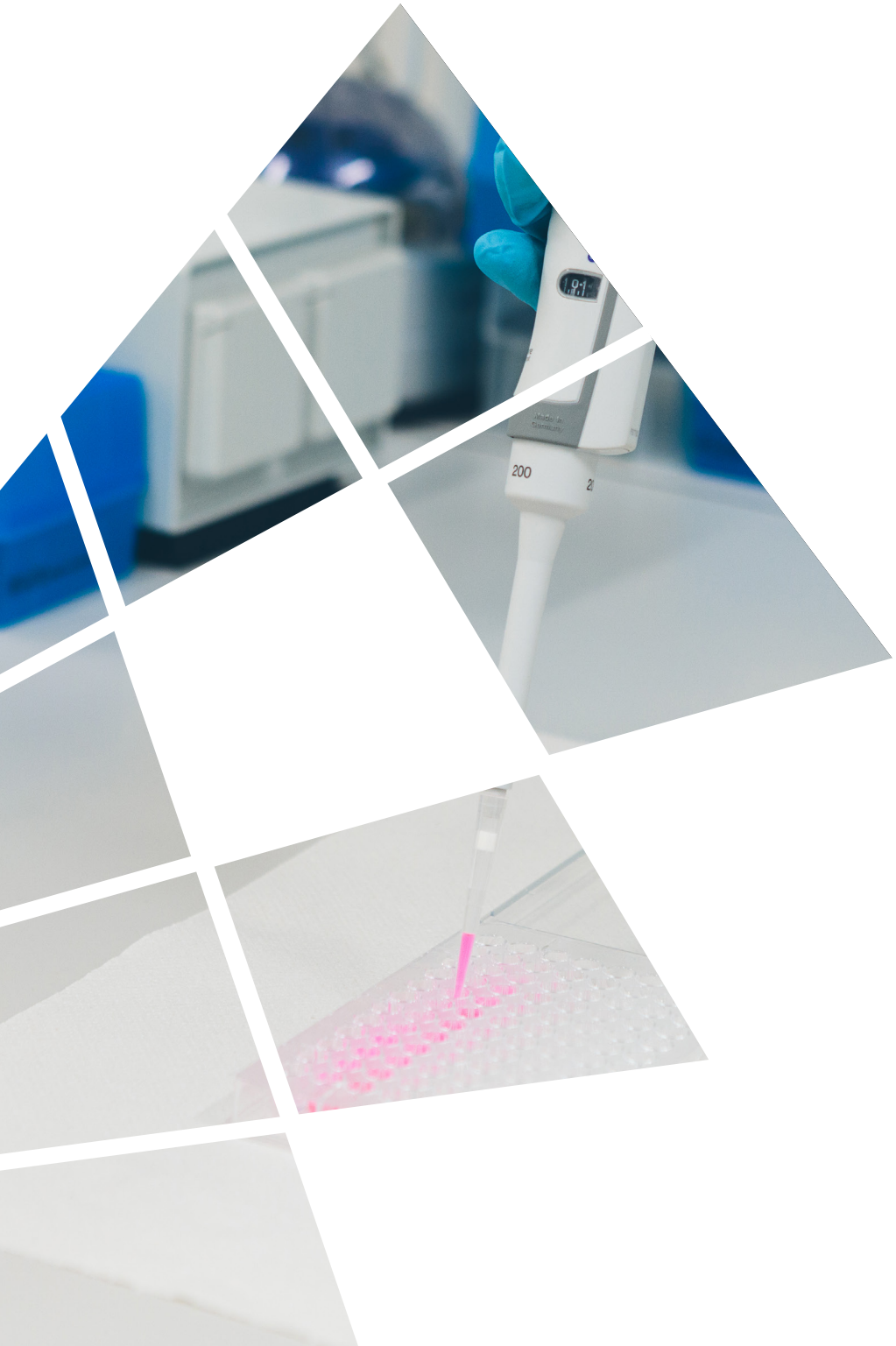
1348 Louvain-la-Neuve

University of Mons



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

www.bio-mar.com

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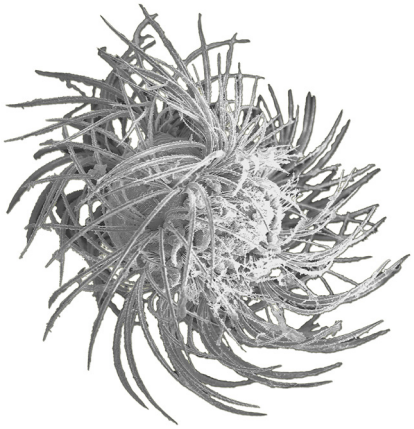
igor.eeckhaut@umons.ac.be

// Institutional hierarchy

Faculty of Science
Research Institute for Biosciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The research carried out within the laboratory of Biology of Marine Organisms and Biomimetics, which is part of the Interuniversity Center for Marine Biology (CIBIM), focuses on four main axes:

- socio-ecological aquaculture;
- symbiosis and diseases;
- biological materials and biomimetics;
- photobiology.

The 'socio-ecologic aquaculture' research addresses issues on aquaculture - 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 Unit (PRU) in Madagascar in collaboration with the Halieutic Institute and Marine Science of the University of Toliara. PRU became the Marine Station of Belaza co-directed by UMons, ULg and UTuléar. The laboratory is also involved in seaweeds (algoculture) and corals (coraliculture).

The 'symbiosis and diseases' axis performs research on parasitic, commensal or mutualist relations of marine organisms. The life cycle, etiology and phylogeny of symbiotic prokaryonts and various symbiotic eukaryonts (e.g. ctenarians, flatworms, polychaetes, myzostomids, 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 methodes are used and include electronic microscopy (TEM and SEM), DNA phylogeny and mass spectrometry.

The 'biomimetics' approach focuses on the different protein-based 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.

Finally, the 'marine photobiology' axis aims at a better understanding of how marine organisms are able to perceive light using opsin-based photoreceptation. In parallel, the functional interaction potentially occurring between extraocular photoreception and bioluminescence in limunious animals are investigated.

Biology of Marine Organisms and Biomimetics

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Numerical Ecology unit

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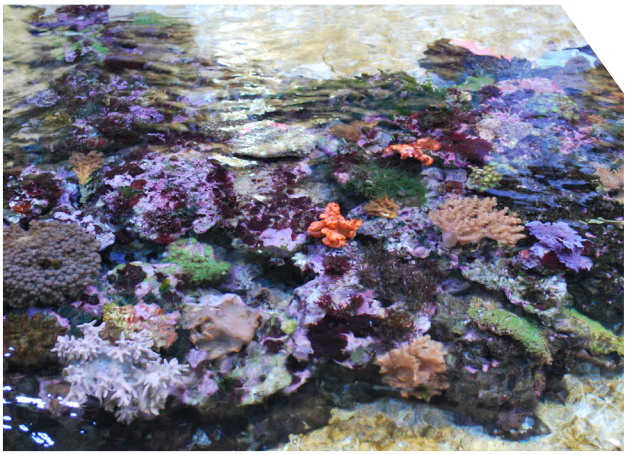
// Institutional hierarchy

INFORTECH Institute | COMPLEXYS Institute

// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The Numerical Ecology unit studies marine plankton using digital imaging techniques combined with automated and semi-automated machine learning classification. 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, which is called Zoo/PhytoImage, for the elaboration of spatio-temporal plankton series by automating the sample processing. This open-source software allows to analyse various kinds of digital images of plankton, and to measure, count and classify the different planktonic organisms digitally fixed on these images. It then calculates ecologically important variables, such as abundances, biomasses and size spectra by taxonomic group or for the whole sample. Also other extensions to R software are developed, such as SciViews for a homogenisation of its user interface, pastecs for the analysis of spatio-temporal series in ecology, aurelhy for the spatial interpolation of hydro-climatic variables, or the generation of graphs to be directly used for publication.

Numerical Ecology

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Organic Synthesis and Mass Spectrometry laboratory

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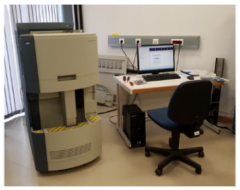
// Institutional hierarchy

Faculty of Science

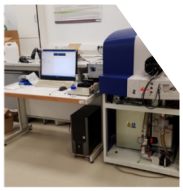
// Research domain & discipline

Natural sciences: Chemical sciences

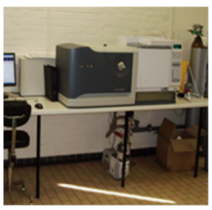
Waters Synapt G2-Si



Waters MALDI QToF Premier



Waters QToF API-US



Waters GCT Premier

Waters Quattro Premier

Waters QToF Premier

Abstract

Research activities in mass spectrometry were initiated in Mons in the mid-1960s when the first mass spectrometer was acquired by the laboratory of Organic Chemistry of the faculty of Sciences. Now, the Organic Synthesis and Mass Spectrometry laboratory (S²MOs) studies the following research themes:

- chemistry of natural molecules such as saponins, flavonoids, lipids and polysaccharides to (i) establish molecular diversity in living organisms such as plants, microalgae or marine animals to establish their biological role; (ii) modifying the structure of natural molecules to exacerbate their biological properties; (iii) using complex biological molecules to develop mass spectrometry techniques, particularly ion mobility spectrometry;
- chemistry of synthetic macromolecules such as biodegradable or conjugated polymers to essentially optimise MS methods for their structural characterisation or help our collaborators to validate their synthetic developments;
- chemistry of peptoids, which are synthetic biomimetic molecules of peptides to (i) establish the primary structure/secondary structure relationship and (ii) use the structural diversity linked to these molecules to create chiral selectors or systems able to store solar energy (Molecular Solar thermal Energy Storage - MOST);
- development of mass spectrometry methods for the analysis of original organic molecules, with a particular focus on ionisation/desorption, various ion activation techniques and ion mobility separation.

S²MOs

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7000 Mons

Proteomic and Microbiology unit

https://web.umons.ac.be/prmi

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// Institutional hierarchy

Faculty of Science
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences

Abstract

The Proteomic and Microbiology unit is a member of the Research Institute for Biosciences and performs genetic and metabolic analyses on different types of organisms. This a.o. includes molecular studies, proteomic characterisations, functional analyses, etc.

In the marine field, the group 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.

Fact sheet not validated by research group

Proteomic and Microbiology

Avenue du champ de Mars 6
Pentagone Building
7000 Mons

University of Namur

Research unit in **Environmental and Evolutionary Biology**

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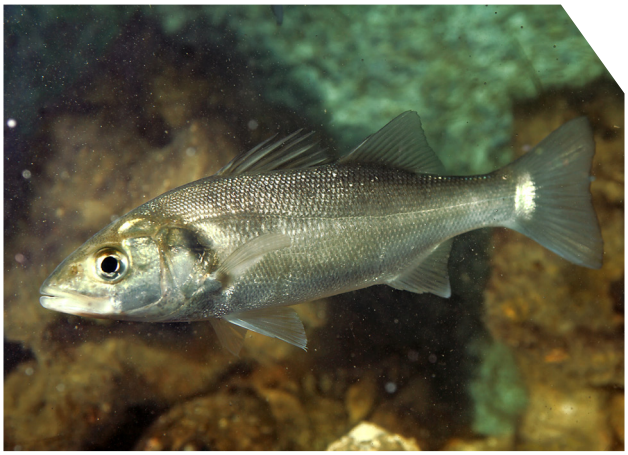
// Institutional hierarchy

Faculty of Sciences
Department of Biology

// Research domain & discipline

Natural sciences: Biological sciences



© Misjel Decleer

Abstract

The research unit in Environmental and Evolutionary Biology (URBE) 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.);
- molecular ecology and evolutionary genetics;
- 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.

URBE

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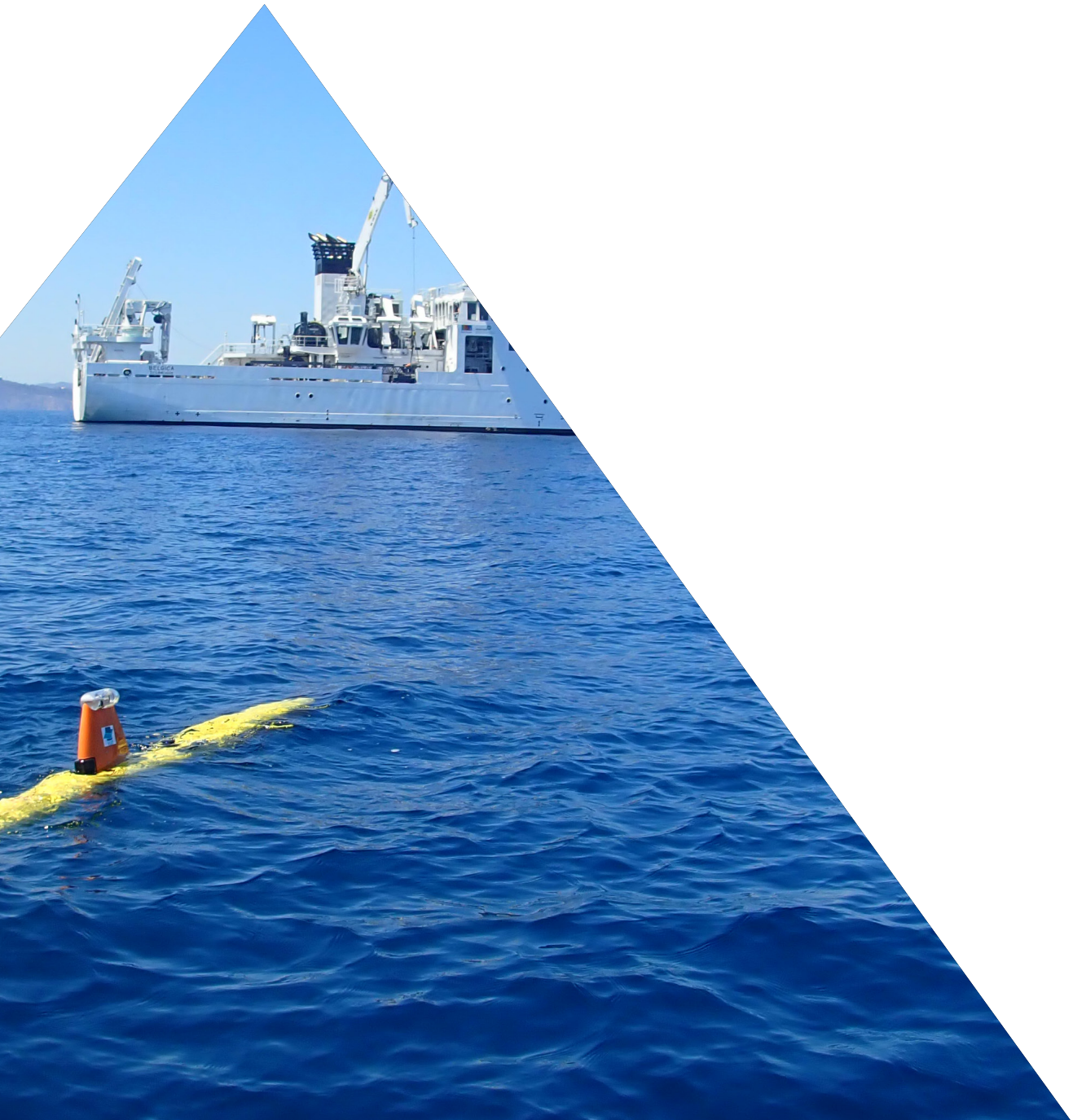
5000 Namur

4 Federal scientific institutes



Belgian Nuclear Research Centre

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// Research domain & discipline

Natural sciences: Biological sciences
Social sciences: Political sciences and policy

Abstract

Marine research within the Belgian Nuclear Research Center (SCK CEN) takes place in the Biosphere Impact Studies unit and focuses on marine radioecology, with significant contributions to modelling the effects of the Fukushima nuclear accident (but also e.g. assessment of the prospective Fukushima water discharges and dispersion and impact from releases from Sellafield). Marine radioecology has traditionally focussed on transfer and impact of radionuclides in marine biota. One of our staff (J. Vives i Batlle) is a member of the Belgian delegation of UNSCEAR team that has been performing the first international assessment of the impact of accidental discharges from the Fukushima accident to the marine environment. Vives i Battle participates in International Commission on Radiological Protection (ICRP) biota dosimetry activities and collaborates with International Atomic Energy Agency (IAEA) project MEREIA modelling the impact of radiation on populations of non-human biota in a Norwegian Fjord. SCK CEN also has a collaboration with the Centre for Environmental Radioactivity (CERAD) on modelling studies on the speciation of radionuclides and transfer to fish in Norwegian fjords. Main research interests therefore lie on measuring the transfer of radionuclides from the environment to living organisms and assessing the radiological effects, with several dozens of 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).

SCK CEN

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2400 Mol

Institute of Natural Sciences - Operational Directorate Earth and History of Life

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// Research domain & discipline

Natural sciences: Earth sciences

Abstract

The Operational Directorate Earth and History of Life is part of the 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 'Quartenary 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 topics 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 'Palaeobiosphere 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.

Fact sheet not validated by research group

RBINS - OD Earth and History of Life

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Institute of Natural Sciences - Operational Directorate Natural Environment

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// Research domain & discipline

Engineering and technology: Geomatics and information and computer sciences
Natural sciences: Biological, chemical and earth sciences

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Abstract

The Operational Directorate Natural Environment (OD Nature) is part of the 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 group 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:

- studying biotic and abiotic components of the natural environment and the interactions of the systems that are part of it;
- providing scientific expertise, including running a monitoring program for the North Sea, and capacity building in the field of biodiversity in developing countries;
- managing and improving databases and major scientific infrastructure, such as the RV Belgica;
- representing the federal state in international bodies and instruments.

Around 100 collaborators are spread over two locations in Brussels and 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), which is now a part of OD Nature. OD Nature's 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, environmental DNA and Antarctica. 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.

RBINS - OD Nature

Vautierstraat 29
1000 Brussel

Institute of Natural Sciences - Operational Directorate Taxonomy and Phylogeny

www.naturalsciences.be/nl/science/do/97

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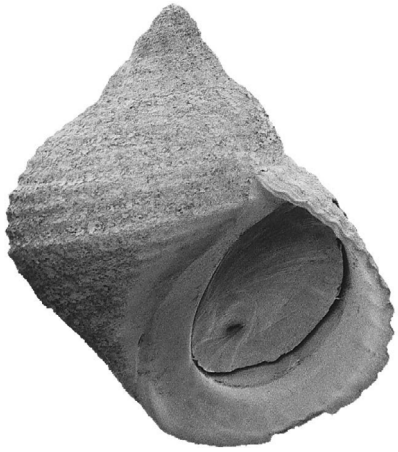
// Research domain & discipline

Natural sciences: Biological sciences



Abstract

The Operational Directorate Taxonomy and Phylogeny is part of the 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 and description of new taxa (primarily via morphology and DNA barcoding), the expansion of introduced and invasive species, the importance of chemical communication in insects, the effects of habitat disruption, the reconstruction of phylogenetic relations, the spread and biology of zoonoses, 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), flatworms (Platyhelminthes) and sponges (Porifera). The Directorate performs field work in various parts of the world. Especially the work in Antarctica (Southern Ocean) has a marine focus. The research group is for example involved in SCAR-MarBIN 'the Antarctic Marine Biodiversity Information Network'. The team also contributes to EASIN (European Alien Species Information Network) and has been/is involved in several European marine biological research projects.

The OD comprises two specialised research teams that are shared with RMCA (Royal Museum for Central Africa):

- JEMU: The Joint Experimental Molecular unit;
- BopCo: Barcoding facility for organisms and tissues of policy concer.

RBINS - OD Taxonomy and Phylogeny

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1000 Brussel

Royal Military Academy

www.rma.ac.be

// Contact

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// Research domain & discipline

Engineering and technology: Electrical and electronic engineering, geomatics, and information and computer sciences
Natural sciences: Earth 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.

RMA also conducts scientific research at university level for projects funded by the Belgian Defense or external funding agencies at regional, federal or European level. Although research topics are mainly aimed at solving military problems, RMA also participates to and coordinates research projects focused on civilian applications, mostly within the security/safety domain in a broad sense. Research is conducted in collaboration with other reserach institues, universities, industry and other Law Enforcement Agencies (LEAs). Academic departments, present at RMA, are (i) Communication, information, systems and sensors; (ii) Economy, management and leadership; (iii) Physics; (iv) Life; (v) Mechanics; (vi) Mathematics; (vii) Behavioural sciences; (viii) Chemistry; (ix) Conflict studies; (x) Weapon systems and ballistics. Finally, in a much broader sense, strategic issues such as energy independence and economical impact are also actively investigated.

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 measures, for instance to increase the performance of existing sonars and gradiometers and evaluating the impact of the environment on their performance. Other research projects relate to maritime situational awareness, involving different sensors, such as EO cameras and LiDAR, mounted in diferent (un)manned vehicles. It inter alia also concers research on air- and space-borne sensors such as scatterometers which are radar instruments, measuring the wind speed and direction above water surfaces.

RMA

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Royal Museum for Central Africa

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// Research domain & discipline

Natural sciences: Biological and earth sciences

Abstract

The origin of the Royal Museum for Central Africa (RMCA) dates back to the Brussels International Exposition of 1897. At King Leopold II's behest, the 'Colonial Section' of the exhibition was moved to the Africa Palace (formerly known as the 'Colonial Palace') in Tervuren. The exhibition halls were home to naturalised animals, geological samples, commodities, Congolese ethnographic and artistic objects and art objects created in Belgium. The name of the museum has changed several times in the course of its history: from 'Museum of the Congo', over the 'Museum of the Belgian Congo' (when the Congo Free State became the Belgian Congo) and the 'Royal Museum of the Belgian Congo' (established by Royal Decree in 1952), to the Royal 'Museum for Central Africa' (at the time of Congo's independence). Since the renovation, the museum is more commonly known as the 'Africa Museum'.

Africa is home to an enormous variety of species and ecosystems of global importance. To further knowledge of African biodiversity, research at this museum concerns the study the taxonomy and phylogeny of different groups of vertebrates and invertebrates using morphological and genetic approaches. Next, the structure and function of wood is studied, as well as the role of trees and fauna in various African ecosystems. The researchers assess the impact of human activities on these ecosystems and their research combines fieldwork and the study of collections, which contain 10 million specimens. There are two services, JEMU (Joint Experimental Molecular Unit) and BopCo (barcoding facility for organisms and tissues of policy concern), which focus on certain molecular biology techniques. Its objective is to improve and disseminate our knowledge of African biodiversity through publications, online databases and training courses.

The marine research involves the biodiversity of tropical African vertebrates with a main focus on fresh and brackish water fishes: systematics (taxonomy, phylogeny, biogeography), ecology, evolutionary history. Morphometrics, and osteological and molecular techniques are most commonly used. In this way, the Royal Museum for Central Africa tries to get a better insight into the diversity of fishes in Africa and, as such, also contributes to its conservation and sustainable fisheries and aquaculture.

RMCA

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3080 Tervuren

Royal Observatory of Belgium

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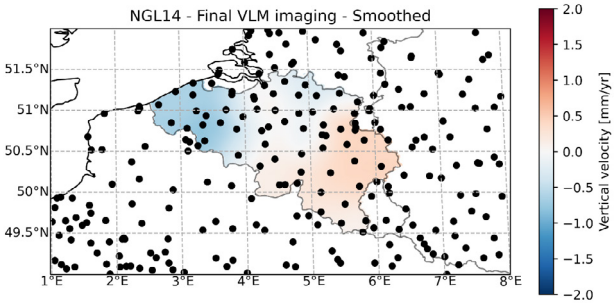
// Research domain & discipline

Natural sciences: Earth sciences



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Abstract

The Royal Observatory of Belgium (ROB) is a federal scientific research institute, which 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, gravimetry, seismology, space geodesy, space weather and solar physics. The ROB also collaborates with several international centres.

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

- seismological reseach on fault systems in the North Sea (Strait of Dover);
- application of oceanographic research on planets and their satellites;
- earth's and ocean tides;
- determination of long-term vertical land motion at local, regional and global scale, also impacting the marine environment.

ROB

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Sciensano

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// Research domain & discipline

Agricultural and veterinary sciences: Veterinary sciences
Medical and health sciences: Medical and health sciences

Abstract

Sciensano is a public scientific institution committed to connecting health, science and society. It puts its data, its scientific excellence and expertise and its network to work for the benefit of human and animal health. Sciensano's strength lies in its holistic and interdisciplinary approach to health ('One Health'), which it applies in its scientific activities, services and advice.

Marine research applications can be found at Sciensano at different topics. A few examples of possible applications are: food-borne illness caused by marine biotoxins found in seafood because of toxic algae belonging to the chemical contaminants; diseases (e.g. Avian influenza) affecting sea birds; analysis and risk characterisation of arsenic species in food supplements based on algae and marine animals; analysis and risk evaluation of marine toxins, such as: Amnesic or Paralytic Shellfish Poisoning toxins (ASP&PSP) and lipophilic group toxins; analysis of metals and trace elements in marine sediments and biota. The most recent approach includes the risk-benefit analysis of fish consumption.

Sciensano

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Von Karman Institute for Fluid Dynamics

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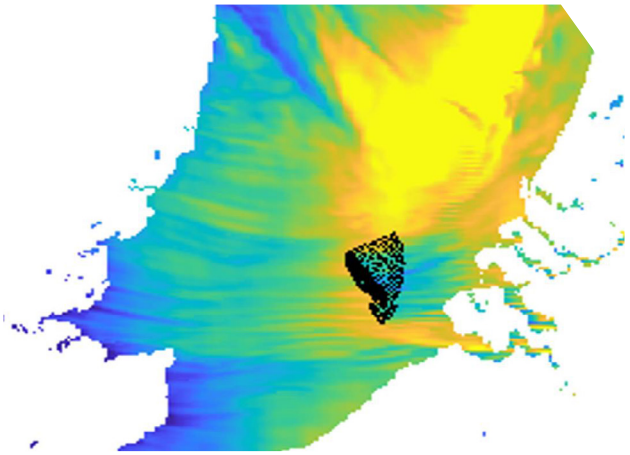
// Research domain & discipline

Engineering and technology: Mechanical engineering and other engineering and technology



Abstract

The unique expertise and scientific infrastructure of the von Karman Institute for Fluid Dynamics (VKI) is aimed at studying and solving complex fluid dynamics problems. The group combines simulations on dedicated software (including in-house developed flow codes and modules) and experimental validation on scale models in world-unique test facilities. Research fields include: aeroacoustics, aerodynamics and aeronautics, compressor aerodynamics and heat transfer, aerothermochemistry, aerothermodynamics, environmental and safety flows, turbine aerodynamics and heat transfer, industrial flows, instrumentation, liquid and solid propulsion, optimisation and rarefied plasma flows.

Several marine topice are studied by the group:

- atmospheric and environmental flow research for offshore wind: VKI develops innovative micro-scale models for numerical weather prediction for wind technology and wind resource assessment for wind turbines siting, allowing to predict the expected energy production during operations, as an input to grid balancing. The group also studies the correlation between extreme weather events and erosion/corrosion/wear of critical components of wind turbines, allowing to adapt the control strategies;
- decarbonisation of shipping: VKI develops transformative models for the powertrain of hydrogen power vessels, providing maritime end-users an instrument to evaluate trade-offs between different pathways towards decarbonisation: hydrogen vs. other fuels such as ammonia or methanol, gaseous versus liquid hydrogen, internal combustion engines versus fuel cells, etc. An emerging research topic is also the development of concepts for wind assisted propulsion for ships, including route optimisation of wind assisted ships in function of the weather and current predictions;
- exploring synergies between hydrogen applications and offshore wind, investigating the needs for testing offshore hydrogen applications, specifically for testing under harsh conditions;
- wind loading on ships, including experimental testing in the windtunnel of the wind loading towards the design optimisation of ships, or the wind loading on high draft ships (e.g. ultra large container ships, LNG tankers) in a complex harbor environment, aiming at improved and safe mooring configurations.

VKI has been involved in several research projects for coastal protection, including eolian sand deposition, dune erosion and dune drifting, impact of man made and nature based structures (beach cabines, dunes, berms and fences) on eolian sand drift and the development of sand mitigation measures. These aspects of coastal protection have been extensively studied both with numerical modelling and with experimental research (windtunnel) for a hybrid performance assessment of sand mitigation measures.

VKI

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COMPENDIUM
KUST & ZEE / COAST & SEA
VLIZ
pionier in zeekennis
Vlaanderen
verbeelding werkt
west-vlaanderen
de gedreven provincie