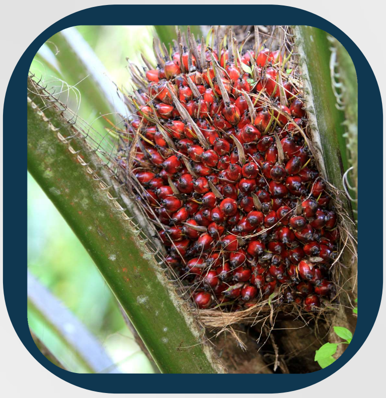

GHENT UNIVERSITY

BIODIVERSITY & EVOLUTION

OVERVIEW

WHAT

In this major, you gain tools to study Earth's life **diversity**, its **distribution** in space and time, and **evolution**. It covers multidisciplinary approaches, including **taxonomy**, **phylogenetics**, **genomics**, **fossils**, and **conservation**.

WHY

A thorough understanding of the eco-evolutionary processes that generate and shape the biodiversity of life on Earth is essential for understanding how life forms will respond to human-induced global change, and how we can best protect biodiversity.

HOW

Core courses

- **Taxonomy and systematics:** What guides modern taxonomy and what state-of-the-art tools are used?
- **Spatial processes and patterns in biodiversity:** What processes shape biodiversity's spatial organization?
- **Paleobiology:** What do fossils reveal about life's evolution and the past interaction of the biosphere and geosphere?
- **Phylogenetics:** How can we reconstruct and interpret genealogical relationships between genes, organisms, and evolution?
- **Evolutionary genomics:** How can advanced molecular-genomic and statistical tools reveal how genome evolution drives adaptation and speciation?
- **Evolutionary morphology:** What concepts, patterns and processes define and guide the morphological evolution of living organisms?
- **Biodiversity conservation:** How can fundamental and applied knowledge guide effective biodiversity conservation, and what international agreements govern it?

In-Depth courses

Choose a biodiversity and evolution course focused on specific organisms (prokaryotes, fungi, plants, birds, primates) or deepen your knowledge of Multivariate Analysis of Biological Data.

BIODIVERSITY & EVOLUTION

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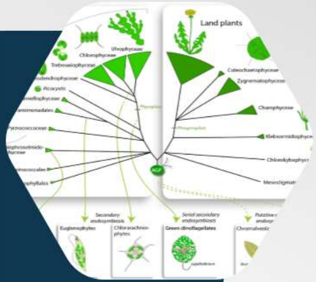
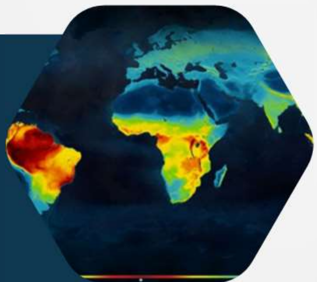
Integrative taxonomy - how do we inventory and describe biodiversity in the 21st century?



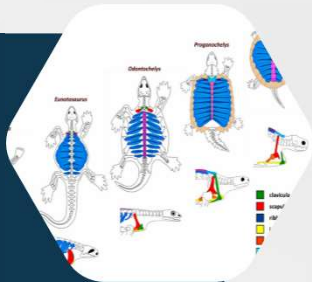
Several research groups in the UGent Department of Biology are internationally recognized for their expertise in the taxonomy and systematics of various life forms, ranging from microalgae and seaweeds, to Fungi, flowering plants and invertebrates. The 'Taxonomy and systematics', 'Phylogeny', and selected in-depth courses, rely on this expertise to train the students in the tools and skills needed for contemporary, integrative taxonomic research, which draws on independent lines of evidence (morphology, molecular-genomic, reproduction, etc.) to accurately delineate and describe species.

How is biodiversity distributed in space and time?



Multiple factors and processes shape patterns of biodiversity in space and time. We study how contemporary and past environmental and climatological variation, stochastic processes, organismal attributes (e.g. dispersal biology) and biotic interactions structure the biodiversity of communities on multiple spatial and temporal scales. Understanding the ecological and evolutionary processes that shape distributions is essential to predict future biodiversity responses to climate change and human pressures, and to guide adequate protection and conservation strategies.

How did the diversity of life forms evolve?



Evolution is a complex process, driven by the interplay between various genetic (e.g. population and quantitative genetics, evolvability, phenotypic plasticity, epigenetics), developmental and ecological (e.g. demographic change, selection) processes. In the courses 'Phylogenetics', 'Evolutionary genomics' and 'Evolutionary morphology' the students are familiarized with state-of-the-art tools and skills to study evolutionary relationships between organisms, and how genomic features and processes drive evolutionary change. An in depth understanding of the interactions between genomes, phenotypes and environment allows predicting how organisms adapt to environmental change, such as climate warming, ocean acidification or pollution.

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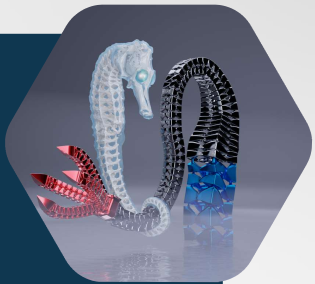
BIODIVERSITY & EVOLUTION

RESEARCH IN THE PICTURE

How vertebrate evolutionary morphology can inspire innovative robotic tools

By investigating the evolutionary morphology of vertebrates, we aim to understand how essential survival functions like feeding and locomotion evolved. Our approach combines detailed morphological studies, ranging from histology to 3D reconstructions using µCT scanning, with biomechanical analyses to link structural traits to functional performance. These findings are applied to develop nature-inspired robotic tools, such as the seahorse tail, which address modern biomedical challenges. This research bridges biology and engineering, offering innovative solutions for current and future technological and medical advancements.



Understanding deep-sea biodiversity patterns

We explore taxonomic and functional biodiversity patterns in deep-sea sediments, focusing on meiofauna — the most abundant microscopic animals in this environment. Using both traditional morphological identification and DNA metabarcoding, we study how these communities change over space and time to determine potential drivers of these changes. This helps us to predict and assess the impacts of human activities, such as deep-seabed mining, on these fragile ecosystems, and to guide conservation efforts.

Biodiversity and evolution of polar lake and soil microbiomes

Polar microbiota were long believed to comprise cold-adapted species recruited from a globally dispersing pool, unlike polar plants and animals. However, UGent research shows that limited dispersal between the Arctic and Antarctic, along with isolation-driven diversification, have played key roles in shaping polar microbiomes. By uncovering these evolutionary processes, we gain insight into the uniqueness of polar microbial biodiversity and its susceptibility to climate change and biotic homogenization, emphasizing the need to protect these fragile ecosystems.

Harnessing seaweed biodiversity for the Blue Economy

Seaweeds offer untapped potential for sustainable food, feed, and the chemical industry, positioning seaweed aquaculture as a top EU priority. Our research integrates genetic diversity with physiological factors like attachment, growth, and reproduction to support seaweed cultivation in the North Sea. Pilot-scale Sugar kelp trials are underway in offshore windfarms. This will inform the development of seaweed varieties, similar to terrestrial crop breeding, paving the way for large-scale seaweed farming in Europe.

Diversity and evolutionary history of milkcaps

Milkcaps (*Lactarius* and *Lactifluus*) are dominant ectomycorrhizal players in all forest ecosystems world-wide. We use a fruitbody based approach (collecting, describing field characters, ecology, microscopy, molecular data) as well as environmental DNA to assess their diversity and understand the distribution. We combine molecular and morphological data to delimitate species and understand the evolution of this group.