

Department of Biological Sciences (BIO) – strategic plan 2022-2026

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Introduction

Department of Biological Sciences (BIO) shall perform research at a high international level and educate excellent candidates within a broad range of biological disciplines. A large part of the work is centered around the marine environment, biological effects of climate change and molecular life science, which are all fields of priority at the University of Bergen (UiB) and the Faculty of Mathematics and Natural Sciences (MN)

This Strategic Plan operates for the period of 2022 to 2026. The plan shall be an active part of management and a guide for our strategic work and constitutes, along with the accompanying Action Plan, an operative document for the development of the Department. The plan targets primarily the Department leadership, staff, and students, but is also intended to communicate with the rest of the University and society.

Sustainable finances

BIO's academic goals are ambitious, as described below. At the same time, we currently experience a financial deficit which will restrict our activities and our ability to complete our plan in the years to come. These financial restrictions will continue to be a reality throughout the time span of this plan and limit our possibilities to support and invest in new initiatives during this period.

Over the next few years, stopping the growth of the financial deficit and thereafter incrementally reducing the accumulated deficit to regain budget balance, will have the highest priority. This means that we must reduce costs as well as increase income from externally financed projects. Cost reductions must be considered all over but are of particular importance with respect to the budgets for permanent staff, rent, scientific equipment/infrastructure – both running costs and upgrades, PhD. and assistant professor positions as well as general running costs. Increased income can be achieved by e.g., increased and more consistent use of bench fees when applying for externally funded projects.

Details on BIO's plan to regain a sustainable economy is described in the Action Plan for 2022-2026. We expect the described measures may be revised.

What are biological sciences?

In our research as well as our teaching, BIO acknowledges that the world is faced with major challenges, and that the biological sciences can contribute substantially to potential solutions. BIO has leading research environments within molecular life sciences, toxicology, microbiology, marine ecology, fisheries biology, fish health, aquaculture, and terrestrial ecology. A large part of our research and teaching focuses on the fundamental questions in the biological sciences. At the same time, we are strongly engaged in UiB's efforts in teaching and research related to major societal challenges and society's need for sustainable development.

Our activities span the open oceans to the highest mountains and the deepest fjords, from the most complex molecules to the largest biomes, from microscopical viruses to mammals and from fundamental evolutionary questions to solving specific problems for industry or society. Our geographic location in Bergen, centrally placed on the west coast with its proximity to sharp, climatic gradients from ocean to fjord and from coast to mountains, provides a number of advantages which we intend to exploit. We are centrally located in a region where fast developing industries within aquaculture and marine technology, as well as other markets, need our knowledge. We are surrounded by stakeholders withing research, business, and public management to whom we are, and shall continue to be, an attractive collaborator.

As society's need for knowledge and our scientific fields are constantly changing, we are constantly curious and developing. We are independent as well as engaged and strive for transparency and fairness in a socially and intellectually safe environment for staff and students. We seek quality in all our efforts and are convinced that our fields of competence, the Department and our staff and students will play a major role in the development of the University of Bergen and the future knowledge of society.

The fundamental questions: the foundation of biological sciences

Basic research is a driver of all knowledge-based activities and therefore important to society. BIO shall investigate and teach the fundamental questions in biological sciences and advance effective measures to strengthen basic research and develop research environments of high quality at an international level.

Solving the fundamental questions of biological sciences demands coordinated efforts, high ambitions, new groundbreaking hypotheses, longevity, and sufficient time for research. Furthermore, new, and integrated approaches, across research fields, taxa scales and methods will also be needed. BIO shall focus on developing, implementing, and combining new analytical and quantitative methods and technologies. Digitalization of biological data at all levels, «big data», is an important trend in future research in biological sciences. This requires entirely new approaches to the acquisition, storage, organization, and not least, analysis of data. Our candidates shall be well reflected, critical and curious, and be trained to think creatively and outside of established models of explanation, and across disciplines.

Ocean and coast – our marine history and proximity

Norway's possibilities within marine research, bioproduction and marine industry development are unique due to our extensive coastline, and to our historical role as a seafaring and exploring nation. In the global setting, we also have a particular responsibility for generating knowledge and understanding of the status of the marine environment and of central processes important to the productivity and biodiversity of our waters.

BIO's position is unique, harboring several excellent internationally renowned scientific environments within marine research and aquaculture, who provide solid research and relevant training of the researchers, advisors, and managers of our natural world nature managers of the future. BIO contributes to innovation and mutual stimulation by close collaboration with applied marine research institutions, industry, the market, and public management bodies. Our research efforts include the full spectra from marine bioproduction (fisheries, aquaculture, and fish health), nature- and resource management, molecular biotechnology, and bioprospecting, to the effects of pollution, climate on environmental change. Research and education at BIO contribute significantly to the development of marine businesses and to the sustainable management of sea and coastal ecosystems.

The environment and global change – sustainability and societal challenges

At present, the climate and nature crisis constitute an acute threat to biological diversity and the earth's ecosystems, thus jeopardizing the raw materials which sustain man's living conditions and quality of life. BIO has a long tradition at the forefront of international research on the effects of global climate and environmental changes on organisms and on the function of ecosystems. BIO's scientific communities have contributed new knowledge, based on novel data and methods, within all the five major drivers of global change – climate change, area usage, pollution, (over)harvesting from nature, and invasive species. We are uniquely positioned, with several research communities who are developing new theories, new methods, and new holistic and cross disciplinary perspectives to understand the complex interactions between climate, environment, and biodiversity in the past, present, and future.

BIO constitutes a solid platform for the scientific development in the field. We are world leading within central themes. We will head into the future development of the department in an analytical

fashion to ensure the process is knowledge-based, and thus strengthen our position, our role, and our contribution to society in the future.

We shall achieve this by striving for quality, to be relevant and adaptive in everything we do. At the same time, we shall sustain a long-term perspective in our research and education and be conscious of our role as a broadly orientated department within the field of biological sciences. In this way we will maintain and build credibility and a positive reputation.

Moving ahead

It is our goal to sustain the Department's academic breadth in the future. We see this as important for our efforts in teaching as well as in research. Currently BIO contributes significantly to address the major questions, to sustainability and to the management of our ecosystems, and will continue to do so in the future. On the other hand, society's need for knowledge is shifting. Also, methods and technology are developing fast within our fields of expertise. Today BIO is a solid platform for further development, and we shall always look ahead, analyze our position and gain knowledge of how to best fill our role. We shall be flexible and willing to turn around to stay relevant in our research and teaching, while continue to be conscious of our function as a broad-spectrum department within the biological sciences. We shall continue to be world leading in relevant fields and shall focus on quality in everything we do to uphold our high level of credibility.

For the duration of this plan, we shall be focusing on maintaining and strengthening our position, while strive for development when strategically sound and called for in response to society's need for knowledge. BIO shall maintain and build strong academic communities and produce research of excellent quality withing the breadth of the biological sciences. We shall offer excellent, research-based education and teaching within our fields, and produce excellent candidates with competence relevant to society and to the challenges of the future. At the same time, we shall keep focus, and work continuously, on reducing costs and increasing incomes to achieve financial balance.

Research

BIO shall provide excellent research within the field of biological sciences, and contribute to the basic understanding of molecular, biological, and ecological processes, as well as providing society with relevant research, innovation, and research-based education.

BIO shall maintain and build strong academic communities with the breadth of our fields, answering major strategic priorities at national level, as well as those defined by the University's long-term program. BIO's academic profile lies at the center of UiB's priorities within basic research, marine research ("Hav og miljø") and climate ("Klima og energiomstilling").

The basics – the foundation of understanding in biological sciences

Basic research is of great importance to BIO and we contribute knowledge which shapes our understanding of molecular and biological processes and it is the motor of all knowledge-based activities. Our basic research is founded on a long-standing tradition, and long-term perspectives and stable financing is needed to maintain opportunities for growth and necessary maneuverability in basic research. BIO shall increase its contribution and optimize tools aimed at strengthening our basic research and develop strong and durable research communities of a high international standard.

BIO shall have strong scientific communities working on fundamental questions in the biological sciences, e.g.:

- How did different life-forms arise and adapt to the environment through evolution?
- How does the complex molecular organization that defines life and the variety of life-forms, arise, and adapt?
- What is the relationship between the structure and function of biomolecules? What are the basic mechanisms that give rise to, and drive, life processes and patterns?
- How does biodiversity arise, and how is it maintained?
- How does the interplay between molecules, genes, individuals, populations, and species contribute to maintain functions and processes within ecosystems?
- What mechanisms define how environmental stressors affect organisms, populations, and ecosystems?
- What are the biotic and abiotic drivers underlying biological patterns and developmental trends?
- What is the evolutionary foundation of trophic interactions, and what is the significance of such interactions with respect to population densities and distribution of species?

The ocean and the coast – proximity to the marine environment

The United Nations (UN) has through its Sustainable Development Goals, highlighted life in the oceans and we have just entered the UN's Decade of Ocean Science (2021-30). Norway's waters – from the open ocean to the fjords, our coastal areas, and the produce we harvest from their ecosystems, constitute the foundation of our national prosperity. To use and manage these in a sustainable manner and to be able to hand them over in an intact state to future generations, requires knowledge. UiB is responsible for research and education related to Sustainable Development Goal 14, *Life below water*. BIO shall strengthen its efforts in the field of marine research to increase its contribution to acquiring this knowledge.

BIO has a long-standing tradition and strong scientific communities in the field of marine research and teaching, with expert knowledge of the fjords, the coastal line, the open ocean, and polar ecosystems, as well as of aquatic bioproduction. As the focus on marine life and marine production is increasing – nationally as well as internationally, accompanied by an increase in available funds, this field continues to hold a central position in BIO's scientific profile. BIO will contribute to the field by:

- Providing further knowledge of the species diversity, ecosystems, and resource foundation of the ocean.
- Providing further knowledge on sustainable harvesting from, and production in (aquaculture), the ocean, at several trophic levels.
- Providing further knowledge of human impact and interplay with the ocean to facilitate a sustainable management of marine resources for future generations.
- Strengthen the activity at and increase the use of our Marine biological station at Espegrend.
- Actively seek participation in international marine research projects and networks and be an attractive partner in these.

Global change and the environment – sustainability and societal challenges

We live in an age where the consequences of man-made changes to the climate and environment are rapidly manifesting. We face major challenges as nature itself changes, and our generation is the

first to experience fundamental changes to nature as well as to the climate and other major global processes.

Biological research is essential in understanding the situation, the underlying processes and drivers of these changes, as well as in identifying possible solutions to meet these challenges in the future. BIO has contributed basic knowledge of biodiversity and ecosystems, from the deep oceans to the alpine mountains and from tropical to polar environments. The unique timelines of data we have collected from our proximal surroundings, constitute an important knowledge base which will help document future changes, to understand processes and causal relationships in the present, and identify solutions for a sustainable future. The University of Bergen has been granted responsibility for research and teaching in relation to UN's Sustainable Development Goal no. 14, *Life below water*.

It is becoming increasingly apparent that biology plays a key role in understanding biological effects of the climate crises as well as in our efforts to solve the crises. BIO contributes critical knowledge from terrestrial as well as marine ecosystems. Furthermore, our research lays the foundation for knowledge based and effective nature-based solutions.

BIO focuses on biological processes as a foundation for understanding effects and consequences of man-made environmental and climate change. Thus, our research within gene regulation, physiology, trophic interactions, reproduction, behavior, population dynamics, environmental toxicology, biodiversity, and ecosystem processes are fundamental to our ability to remain relevant in addressing sustainability and global societal challenges.

Exploitation by humans is one of the major causes for the loss of biodiversity and wilderness areas. The climate and nature crises do not occur separately but are interlinked by direct and indirect drivers in society. Facing cross-sectional problems demands interdisciplinary and intersectoral solutions in the development of knowledge-based methods as well as nature-based solutions, to Green Transition and to pursue the Sustainable Development Goals.

Teaching and education which shape society

BIO shall offer the best research-based education and teaching within our scientific fields to educate excellent candidates with a competence which is relevant to society and to the challenges of the future.

Society's capacity to adapt, to generate values, to manage our resources and to generate employment depend heavily on the education of skilled candidates holding solid basic and applied knowledge in biological sciences. We educate candidates at a bachelor, masters, PhD, and postdoctoral level who combine specialist biological competences with a solid basis of natural science knowledge. We have a strong and unique environment (bioCEED) who work with the development of teaching and teaching methods, as well as with research on teaching in a discipline-oriented manner.

Holding a solid scientific competence, our students are well equipped to fill important roles within research, education, health, industry, public management, and society in general. With a foundation of modern research, active teaching methods and an open door to the surrounding world, our students shall develop the ability to apply scientific knowledge and methods to understand nature and to find solutions to societal challenges. We provide the students with the possibility to acquire discipline-based knowledge, practice academic and generic skills and develop sound ethical

standards with respect to research and to their profession. BIO's education equips our candidates with a critical, constructive, and reflective attitude and the knowledge needed to advance scientific methods and perspectives as a foundation for solutions to local, national, and global environmental challenges and political decisions.

Research training is one of our core activities and is primarily conducted in the individual scientific communities, combined with specialized courses, research schools, collaboration with external scientific partners, and through participation in international conferences, seminars, workshops, and research stays. Our PhD candidates and postdoctoral fellows are a very important component of our research and teaching activities and shall acquire a solid competence in transferable skills such as teaching, communication, and innovation.

It is BIO's overarching goal to secure the relevance and quality of our education at all levels. Our teachers take an active, reflective, and research-based approach to teaching. This implies collegial responsibility for the education and a continuous process of quality development through close collaboration with our Centre for excellence in teaching – bioCEED. The content of our bachelor and master programs, as well as the learning outcomes for our courses, our teaching activities and different assessment forms, shall complement each other. The students shall be activated through effective feedback, skills development and teaching methods focusing on student participation. Furthermore, the students shall be trained to take responsibility for their own learning and development, to become independent and reflected contributors to the development of society.

BIO's academic profile, shall

- teach a broad range of fields within the biological sciences, in terms of the bachelor and master programs we offer, in terms of our programs of professional study and our students' focal areas.
- highlight topics spanning from molecular biology to ecosystems, in the ocean as well as on land, with a distinct focus on sustainability.
- profile our unique geographic location, placed on the border between marine and alpine environments, which provide rich opportunities for relevant practical teaching in the field, as well as good systems for practical work experience.
- provide teaching which is clearly linked to the department's research profile and the strategic priorities given by the Faculty of Natural Sciences and to UiB.
- sustain a solid recruitment of students and ensure the students' completion of their studies within the stipulated time

Our education shall:

- actively engage the students, be research-based and offer participation in a research community
- be coordinated – both within and between degree programs
- continue to focus on generic skills, and maintain a knowledge-based approach to teaching to help the students develop solid research skills
- be focused on practical training and societal relevance and teach the students the skill set of biological sciences
- take a scientific approach
- be relevant to society and offer opportunities for continuing education
- be governed within a management structure in which roles and responsibilities are clearly defined, communicated, and executed which include the head of department, the heads of the different schools of study and program boards, working closely with the department's student affairs staff.

- undergo continuous development and evaluation in collaboration with the program boards, at a department and Faculty level, the department's educational board ("utdanningsrådet") and the Faculty's educational board ("studieutvalget").
- focus on the teaching and working environment and maintain a collegial culture of learning.