Knowledge development in a changing world

Science and technology towards 2030 – Strategy

UiO : Faculty of Mathematics and Natural Sciences
University of Oslo

Contents

Knowledge development in a changing world

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The Observatory, the first building built for research purposes at the University of Oslo.

Abstract

The Faculty of Mathematics and Natural Sciences is a steward of a long-standing tradition of knowledge built on collegial values and free, independent research. The Faculty conducts research and education at a high international level and has extensive collaboration with external partners, both nationally and internationally.

The cornerstone of the Faculty's activities comprises basic long-term research on mathematical and natural sciences and technology. The Faculty aims to be one of Europe's leading centres for research, education and innovation by being a contender in the top echelons of research-intensive universities in Europe.

The lead lies in research. The Faculty shall develop more academic groups which will feature among international leaders in their respective fields. The Faculty's education of researchers shall be improved, and the Faculty shall facilitate career development for young researchers. The Faculty shall participate in the development of important research infrastructures, both nationally and internationally.

Culture for learning. The education programmes at the Faculty shall maintain a high international standard at all levels and be closely connected to research, both academically and pedagogically. The Faculty shall recruit academically motivated students and provide opportunities for students with particularly high learning abilities. International cooperation shall be strengthened and priority shall be placed on the education of future teachers.

Knowledge in use. The Faculty shall facilitate innovation derived from research and provide students with high-quality tuition in innovation and entrepreneurship. The Faculty shall develop strategic cooperation with companies and units in public sector. The Faculty shall provide support for the general presentation of research in society and active participation in social debate.

Focusing on people. The Faculty shall be involved in all significant aspects associated with the development of excellent working and study environments. This also means placing increased focus on recruitment processes, equality and diversity, leadership, organisational development and the development of digital expertise for all employees and students.

The Faculty of Mathematics and Natural Sciences shall continue to develop its activities in respect of the basic development of knowledge in the various academic disciplines. Four thematic initiatives across units and in cooperation with partners shall receive special attention. These are:

- life sciences
- earth and space sciences
- energy and material sciences
- digitalisation and computational science

Convergence is when several different factors – subjects, methods or ideas – that have different points of departure approach each other and create a whole. Convergence will affect development in different ways during the forthcoming years and the Faculty has a special responsibility to promote interdisciplinarity in research and education.

Perspectives on bildung in the 21st century shall characterize our activities, and bildung will receive particular attention in the development of the Faculty's education programs.

The major challenges of our time have been formulated well in the UN's sustainability development goals. On selected areas the Faculty shall be an important contributor in the global effort on realising these goals.

Part I: The Faculty of Mathematics and Natural Sciences

A proud history

Since 1811, when the University of Oslo was established, mathematics and the natural sciences were part of the Faculty of Philosophy. Fifty years later, in 1861, the Faculty of Philosophy was divided into the Faculty of Mathematics and Natural Sciences and the Faculty of Humanities and Philosophy. In the early days of the Faculty, in the 1860s, Peter Waage and Cato M. Guldberg discovered the law of mass action, the only law of nature discovered by Norwegian researchers. When the office of the rector was established in 1907, the world-renowned geologist Waldemar Christopher Brøgger was elected as the University's first rector. Kristian Birkeland's achievements relating to the establishment of Norsk Hydro (now Yara) in 1905, and his solving of the mystery of the northern lights, are known throughout the world. Fridtjof Nansen, the world famous Norwegian polar explorer and scientist who received the Nobel Peace Prize in 1922 for his humanitarian and peace-building work, worked in the field of zoology and oceanography at the Faculty in the first half of the 20th century. During the same period, Kristine Bonnevie, Norway's first female professor, was a driving force in the development of biology in Norway. Odd Hassel received the Nobel Prize in Chemistry in 1969, and in 2001 Christian Nygaard and Ole-Johan Dahl received the Turing Award – which is also referred to as the Nobel Prize in Computer Science. These are just a few of the Faculty's researchers and instructors who have contributed to the development of national and international knowledge through the years.

A large faculty

The employees and students at the Faculty of Mathematics and Natural Sciences are divided across nine departments and the Norwegian Centre for Science Education. The departments cover the breadth of the natural science subject areas, as well as mathematics, computer science and pharmacy. The activities of the Norwegian Centre for Science Education, which became part of the Faculty in 2018, are aimed at schools and day care centres. The Observatory, the first building built for research purposes at the University of Oslo, has an educational collaboration with the Oslo Education Authority. Technology – particularly ICT, biotechnology and nanotechnology – represents a large part of the Faculty's activities, both in the various subject areas and across the subject areas. The Faculty has programmes of study at the bachelor's and master's levels covering the entire breadth of mathematics, natural sciences and technology, a five-year professional pharmacy programme, and a programme for the educating secondary school teachers in mathematics and natural sciences. The Faculty manages the Norwegian School of Entrepreneurship and offers education in entrepreneurship, including social entrepreneurship.

There are 6,000 bachelor's and master's students and 800 doctoral students in the study programmes at the Faculty of Mathematics and Natural Sciences at the University of Oslo. The Faculty's departments also have school laboratories and organise annual Student Olympics. The Faculty's units are located at Blindern and at Kjeller. In 2024, a large part of the Faculty will be moving into the new Life Sciences Building.

The Faculty's departments

- Department of Biosciences
- Department of Pharmacy
- Department of Geosciences
- Department of Mathematics
- Department of Chemistry

A strong research faculty

In mathematics, natural sciences and technology, as well as in the professional pharmacy programme, the Faculty has many communities that deliver research results at a high international level. The Faculty's research communities do very well in competition for funding for basic research; nationally through Free Project Support (FRIPRO) and the Centres of Excellence (CoE) established by the Norwegian Research Council, and internationally through the European Research Council (ERC) and the Marie Sklodowska-Curie Actions.

As of January 2019, the Faculty is hosting three Centres of Excellence (CoE) and is a key participant in four others. In addition, the faculty is hosting a Centre for Research-based Innovation (CRI) and is a key participant in an additional four CRIs and three Research Centres for Environmentally Friendly Energy. At the start of 2019, researchers at the Faculty have been awarded more than 20 ERC projects. The Faculty also has a solid portfolio of research projects in partnership with commercial companies and entities in the public sector.

Research is about seeking the unknown; crossing boundaries and at times being groundbreaking

Education for the future

A comprehensive education initiative and the introduction of a new and broad portfolio of study programmes have made the Faculty a leading national actor in education and educational development. Over the past few years, the Faculty has strongly distinguished itself internationally through a comprehensive focus on the use of computing in science education, among other things. In this area, the Faculty also has been awarded a Centre for Excellence in Education. Students are involved in research activities from day one through acquainting them with important scientific issues and methods, in order to eventually participate in research themselves.

The Faculty has also established itself as a premise provider for the government's focus on education, which is cited, among other things, in Report No. 16 (2016-2017) to the Norwegian Parliament, *Culture for Quality in Higher Education*, and Report No. 4 (2018-2019) to the Norwegian Parliament, *Long-term Plan for Research and Higher Education 2019-2028*. The Faculty is a strong player in the development of interdisciplinary professional studies, particularly in respect of training pharmacists and secondary school teachers.

Department of Physics

Department of Informatics

Department of Theoretical Astrophysics

Department of Technology Systems

Norwegian Centre for Science and Education

An interactive faculty

The Faculty is a major contributor to the University of Oslo's major initiatives in the fields of *life sciences and renewable energy*. The Faculty is responsible for the management and development of national infrastructures for research, and many of the researchers are active in the development and use of major international research infrastructures. These are found on all continents, and from the Arctic in the north to Antarctica in the south.

The Faculty cooperates extensively with business clusters, commercial companies and entities in the public sector, and the Faculty is a major contributor to the ecosystem for innovation in Norway. Our employees actively participate in social debate and contribute to the formulation of policy. There is an extensive amount of popular science information disseminated by the employees at the Faculty.

The Faculty of Mathematics and Natural Sciences has research and teaching cooperation with all the other faculties at the University of Oslo and with the University's two museums, the Natural History Museum and the Museum of Cultural History. Cooperation with the Natural History Museum and with medical and health care groups outside the Faculty, however at the University of Oslo, has been and is extensive. In recent years, our cooperation with academic communities in humanities and social sciences has increased.

Europe is the Faculty's home ground, but the Faculty's researchers have a long-standing tradition of cooperation with academic communities in the United States. In recent years, interaction with academic communities in Asia, Africa, South America and Oceania has grown considerably.

Students and employees

6000
Students

800
Doctoral candidates

1100
Academic staff

450
Administrative/ technical staff

Stakeholders and their expectations

Academic colleagues throughout the world expect our researchers to conduct research at a high international level and contribute towards moving the research front.

Students expect the Faculty to deliver high-quality education that provides personal development and relevant competence in an engaging and evolving learning environment, thus helping to form a basis for good career opportunities.

Businesses and public enterprises expect the Faculty to contribute towards the creation of profitable workplaces and knowledge-based administration by educating candidates with a high level of professional and academic competence and conducting relevant research at a high international level.

The general public and organisations involved in political and social life expect the Faculty to help solve important local and global challenges for society. They also expect that we will contribute to the development of a strong forward-looking school, an efficient knowledge-based public health service for a growing and aging population, a competitive business sector, a knowledge-based political debate and all decisions related to such.

These stakeholder groups overlap a great deal in some cases, but overall they provide a picture of why we exist and what society expects from us. In this strategy, we seek to balance our considerations towards these stakeholders.

Selected highlights from the Faculty's history

The Observatory:
The Faculty's first building

Kristine Bonnevie: Norway's first female professor, a driving force in the development of biology in Norway

1811

The University of Oslo was established

1833

1864

Peter Waage and Cato M. Guldberg: Discovered the law of mass action, the only law of nature discovered by Norwegian researchers

1900

1905

Kristian Birkeland: Related to the establishment of Norsk Hydro (now Yara) in 1905, solved the mystery of the northern lights

Waldemar Christopher Brøgger:
Geologist, was elected as the University's first rector

1907

Odd Hassel:
Received the Nobel Prize in Chemistry

1969

The Life Sciences Building
is finalized

2024

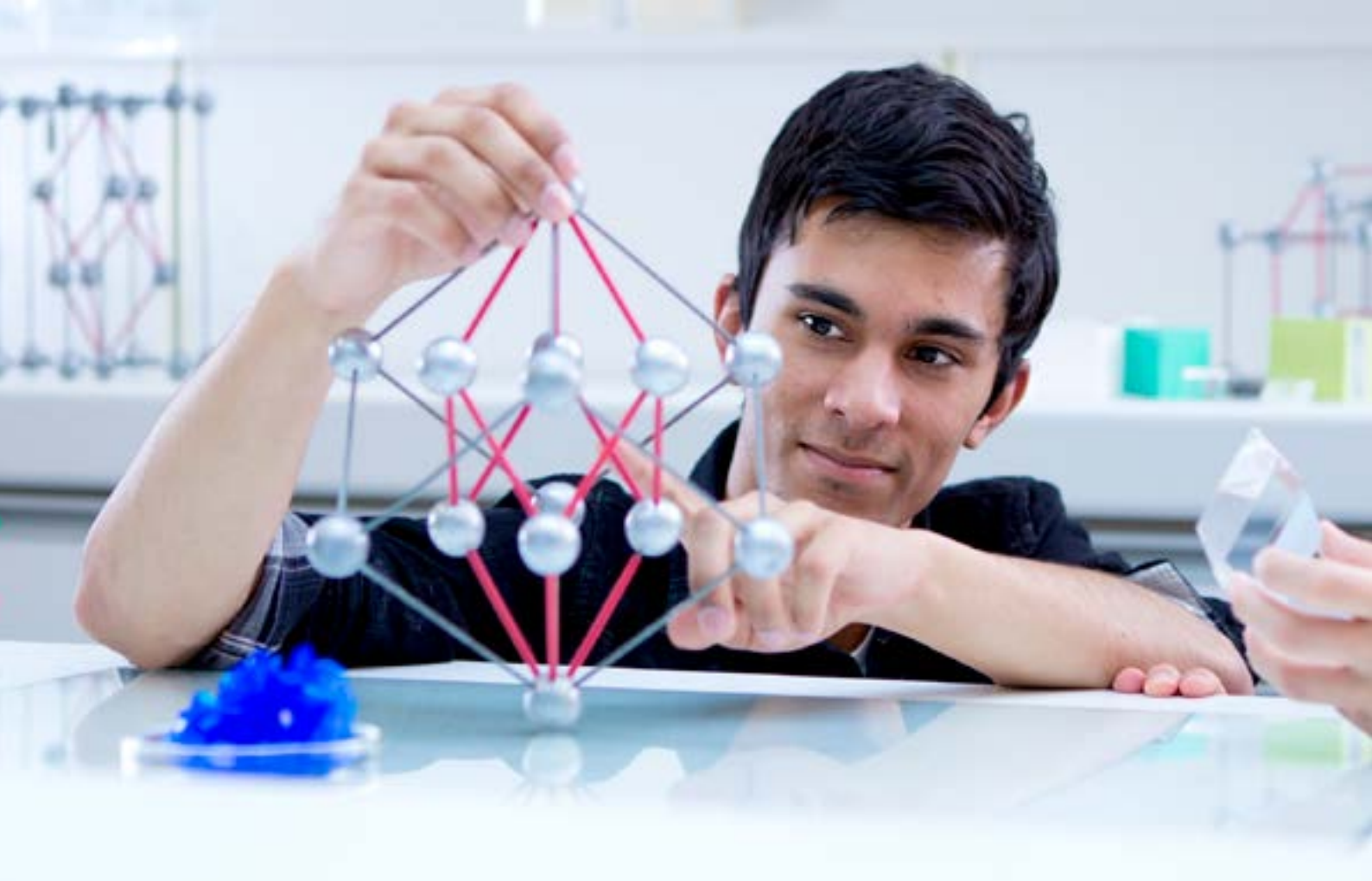
1922

Fridtjof Nansen: Professor of zoology and oceanography. Received the Nobel Peace Prize for his humanitarian and peace-building work

2001

Kristen Nygaard og Ole-Johan Dahl:
Received the Turing Award (referred to as the Nobel Prize in Computer Science)

- The lead lies in research
- Culture for learning



- Knowledge in use
- Focusing on people

Part II Ambition and direction

The cornerstone of our activities is free and independent thought.

The Faculty of Mathematics and Natural Sciences at the University of Oslo shall engage in research and education at a high international level. The quality and breadth of basic research places the Faculty in a special national position and forms a basis for raising the Faculty to the top European level of research-intensive universities.

The Faculty is a steward of a long-standing tradition of knowledge built on collegial values and free, independent research. At the same time, the Faculty interacts with the wider world, and it shall be responsible at all times for any use of society's common resources. The Faculty shall promote the use of new and existing knowledge.

The Faculty's activities shall be based on magnanimity and generosity, both internally and externally. The Faculty shall be open and integrative. We must think in long-term perspectives, and we must deliver at the present time.

The Faculty's activities shall be marked by high ethical standards and high quality at all levels, and a willingness to be bold and to make innovative choices. The Faculty shall have clear priorities, cultivate creativity, be ambitious and be regarded as an international leader in its efforts to contribute to social development in general and sustainable development in particular. The Faculty shall be a key steward of scientific tradition and culture.

With these core values, the Faculty shall work systematically with perspectives related to ***sustainability***, ***convergence*** and ***bildung*** towards the year 2030 (see definitions of these terms on page 16). This shall take place throughout the entire breadth of the Faculty's activities and in selected areas in interaction with medical, humanistic and social science communities.

The Faculty's ambition is to be among Europe's leading communities for research, education and innovation

The lead lies in research

The Faculty shall meet the challenges of the future through research at a high international level.

International top level
Basic research is the mainstay of the Faculty's activities, and research at the Faculty shall maintain a high international level. The Faculty shall facilitate the development of additional academic communities that can assert themselves in competition with the rest of Europe and the world, are international leaders in their fields, and actively move the research front forward. The Faculty shall be an important contributor to the international knowledge community. International cooperation shall be developed further in areas where the Faculty has advantages or where it is of strategic importance to the further development of research at the Faculty.

Key societal actor
The Faculty has extensive research cooperation with research institutes, businesses and entities in the public sector. The Faculty shall facilitate expanded research cooperation with businesses and entities in the public sector, including increasing the supply of relevant social research projects. In projects of this type, convergence and sustainability will be a key part of the Faculty's work.

Academic renewal
Time and space, which are required to be innovative and develop good research ideas, are precious resources for our researchers. The Faculty shall actively, and with specific policy instruments, facilitate the development of new ideas and stimulate academic renewal. The Faculty has a particular responsibility for promoting interdisciplinary research, including radical interdisciplinarity in areas which have a particularly high degree of scientific and social importance.

Researcher training
The Faculty shall be a national leader in respect of providing education for researchers. The most important aspect of education for researchers is that the research involved shall be high-quality research, although priority shall also be placed on boosting transferable skills and providing guidance for various careers. Our candidates should be aware and strategic, have good cooperation skills and possess a high degree of ethical reflection.

Younger researchers
The Faculty shall develop policy instruments further to support younger researchers and their career development towards top academic positions and other career paths. The Faculty shall actively support young research managers with respect to applications, networking, scientific production, guidance and research management.

Recruitment
The Faculty shall establish the outstanding academic communities of the future through a combination of recruitment from their own ranks and targeted international recruitment, including the development of mechanisms for recruiting groups of researchers ("cluster hiring").

Research infrastructure
Large parts of the Faculty's research activities are based on the use of advanced scientific equipment. The Faculty shall invest in, including the establishment of access to, infrastructure that enables groundbreaking research in priority areas, in both disciplinary and interdisciplinary areas. The Faculty shall contribute to the build-up of infrastructures for basic long-term research at national level and actively participate in the development of selected international infrastructures in Norway and abroad. Handling increasingly larger volumes of data will be an important aspect of the development of infrastructures for research and education. The Faculty shall be a driving force for ensuring the availability and reuse of research data.

Culture for learning

Our candidates shall be successful both academically and professionally.

International top level

The education programmes at the Faculty shall maintain a high international standard at all levels and be closely connected to research, both academically and pedagogically. The Faculty's education shall build on excellence in research and provide clear, in-depth knowledge in the field in question, be based on the research front in learning-centred approaches and give the students integrated professional competence[1]. Sustainability and bildung will be of key importance in all our study programmes, and the education programmes shall generate synergies between an in-depth study of the subjects and an interdisciplinary breadth.

An outstanding physical and digital learning environment

The Faculty shall be an international leader in the integration of digital competence into all its education programmes. This includes computing in all bachelor programmes from the first semester, and the continued inclusion of computational aspects in all study programmes. The Faculty shall be distinguished by outstanding learning environments and facilitate the development of employee competence with respect to teaching and education. The Faculty shall facilitate learning-centred approaches and the development of digital competence by continuous development of the students' physical and digital learning environment.

School and health

The Faculty shall maintain its commitment and contribution to the professional development of schools. The Faculty has a special responsibility to develop the best university teachers and educate highly qualified teachers for schools. Moreover, the Faculty has a special responsibility for the education of highly qualified pharmaceutical candidates for the public health service, administration and business sector. The Faculty shall develop continuing and further education offerings in selected areas where we have special expertise of great importance to schools, health care and society.

Recruitment

The education programmes at the Faculty shall attract the most professionally motivated students at all levels. We shall contribute to ensuring that the entire field is made available to a multitude of students, while providing at the same time special offers to students with a particularly high learning ability. The Faculty shall attract students who wish to cultivate their talent and achieve their goals in an engaging learning environment.

Sought-after candidates

The Faculty shall educate candidates with the knowledge and competence that is sought after in the labour market. The Faculty shall educate active problem solvers, who will be in the forefront to solve the challenges of today and tomorrow, including those related to climate, the environment and health care. The Faculty shall educate candidates who define the premises for future research and future social development, and who are capable of defining problems that are as yet unknown.

Continuous improvement

The Faculty's work on education programmes shall be marked by the continuous development of forward-looking academic content with a good balance between professional and generic skills, which also safeguards professional and academic traditions. The Faculty shall be marked by a culture for learning that stimulates and obligates both employees and students to do their best.

In areas of education where the Faculty is academically innovative, a solid knowledge base shall be developed for the educational practices of the future. The Faculty shall, in cooperation with other academic communities, both local and international, build competence in educational research. This is important in order to create the necessary foundation for the Faculty's high ambitions in education.

International educational cooperation

The Faculty shall prioritise formalised cooperation with the best universities in the world, to ensure attractive educational cooperation and excellent exchange opportunities for our students. The Faculty shall contribute towards realising the University of Oslo's ambition to establish cooperation on degrees between universities in Europe. This will mean that we shall participate in the development and management of joint education across national borders.

1 Integrated professional competence is competence in communication/dissemination, management, cooperation, ethical reflection, etc. as part of the science curriculum.

Sustainability: The world is facing major challenges. These challenges have been formulated well in the UN's sustainability development goals. The sustainable development goals express a long-term need for change that requires a considerable effort by the entire world. As a major and important contributor to important fields, the Faculty has a significant responsibility for ensuring that basic research and higher education are linked to these major global challenges. The Faculty's employees have a significant capacity in this area, both with regard to understanding problems and in terms of finding new solutions that are necessary for sustainable social development.

Convergence: Convergence is when several different factors – subjects, methods or ideas – that have different points of departure approach each other and form a whole. Convergence leads to the creation of new forms of work and new fields. Convergence creates new ideas and gives rise to new issues that nurture academic disciplines and develop these further. Convergence mirrors a dynamic cross-sector mindset and is becoming increasingly more important in modern knowledge development. Convergence and an interdisciplinary approach are needed to solve the challenges articulated in the sustainable development goals.

Bildung: Integrity, ethical reflection, mutual respect, constructive interaction and compassionate attitudes shall permeate the Faculty's activities. Our research-focused education programmes shall give students a basic understanding of the significance of knowledge development throughout history and into the future. Knowledge of how the physical world is interconnected has an intrinsic value. Bildung entails an admirable combination of general knowledge, insight, respect and conduct. Bildung has a natural association with the Faculty's ambitions to contribute more strongly to sustainable social development.

The Faculty of Mathematics and Natural Sciences offers advanced scientific equipment. At MiNaLab we have state-of-the-art cleanroom facilities for advanced material research.

Knowledge in use

Our academic communities shall be the leading partners for the business sector and entities in the public sector.

Relevant basic research

The growing societal importance of basic research and higher education has in the past few years unleashed stronger demands connected to making use of the knowledge that is produced. Mathematics, natural sciences and technology encompass areas that have seen increased interest and major growth for many years. Knowledge development in these fields has been and is essential for the cultural, social and economic development of the welfare state we know today.

The time frame for when new knowledge becomes useful varies. The Faculty traditionally prioritises long-term tasks, both in research and education. This is how it should also be in the future, but a long-term perspective is based on constructive interaction with the present. The Faculty shall maintain its strong basic research profile, while at the same time the Faculty should also make the results available in the present.

The Faculty's strong basic research profile contributes significantly to the fact that the University of Oslo ranks high among research-intensive universities throughout the world. At the same time, the University of Oslo asserts itself well among Europe's leading universities with regard to innovation. The combination of being strong in respect of both basic research and innovation is interesting and shall be developed.

Innovation and creativity from research

In the years to come, the world will find that the distance between basic research and innovation is diminishing. In this situation, the Faculty will have a particularly important role in ensuring that knowledge is adapted to the needs of society and that this knowledge is put to use. The Faculty shall be a driving force for ensuring that research contributes to creativity and innovations in the business and public sectors. The Faculty shall support employees who wish to further develop their research findings into products, services and solutions that can be used in the business and public sectors. Sustainability shall be a key focus of the Faculty's work on innovation and creativity.

Innovation and entrepreneurship in education

The Faculty's most important contribution to innovation and social development is the education of good candidates who will enter the workforce in the business and public sectors and participate actively in the social debate. Training in entrepreneurship shall be a key part of the education programmes at the Faculty.

Strategic partnerships

The Faculty has a large portfolio of partners in the business and public sectors, both nationally and internationally. We shall develop this cooperation further and in particular seek the development of long-term strategic partnerships with selected businesses and entities in the public sector. The Faculty shall be a preferred partner for the business and public sectors.

Policies and major tasks

The Faculty's extensive expertise in mathematics, natural sciences and technology makes the University of Oslo a key contributor to carrying out major national tasks. The Faculty shall actively contribute to a knowledge-based formulation of policy through participation on public boards and committees and through involvement in the social debate.

Communication

Through professional communication, we shall make the Faculty's activities visible, both internally and externally. The Faculty shall develop varied and targeted forms of communication with different groups in society and in step with the times. The general presentation of research from the global knowledge community is an important task for the Faculty. Professional communication shall contribute to an enlightened social debate, while at the same time resulting in increased visibility for our activities, increased pride concerning the Faculty's activities and a good reputation.

The Faculty's strong basic research profile contributes significantly to the fact that the University of Oslo ranks high among research-intensive universities

Focusing on people

The Faculty shall be an attractive and inclusive place of work and study.

Working and learning environment
People are our most important asset – our employees and our students. The fact that our activities take place in everything from new and newly refurbished premises to premises that require substantial investments in order to function optimally is a challenge. New buildings and the development of old buildings will in the years to come provide great opportunities for further development of the working and learning environment at the Faculty.

It shall be generally known that the working and learning environment is so good that it is an important reason for choosing the Faculty of Mathematics and Natural Sciences as a place of work and study. Our employees and students shall work together, with commitment and dedication, towards shared goals, and the Faculty shall be marked by a culture that is supportive and inclusive.

Broad professional development
The Faculty shall facilitate the professional and career development of its employees and students and allow space for the development of new ideas and concepts. We shall stimulate cooperation and the development of individual employees and students by, for example, facilitating increased interaction in our academic communities and encouraging creative work. All employees shall be given an opportunity to develop their skills and creativity.

Organisation and management
The Faculty shall be marked by dynamism and a willingness to change. Administration and infrastructure shall interact with – and effectively support – our core tasks of education, research, innovation and dissemination. Administrative and technical competence shall be utilised across all units and levels, including other units at the University of Oslo. The Faculty shall be marked by continuous organisational development. The Faculty shall have a management at all levels that supports our values and ambitions, and which best utilises the overall amount of talent, qualifications, capabilities, knowledge and ambitions that our employees possess.

Gender balance and diversity
The Faculty has challenges related to gender balance in permanent academic positions, in managerial positions and in several study programmes. Recruitment of the best candidates of both genders, irrespective of their ethnicity, religion, functional abilities, sexual orientation and socio-economic background, etc. is important for the sustainable development of the Faculty and for strengthening our international position in respect of research, education and innovation. We shall work on the organisational, structural and cultural fronts to achieve a better gender balance among our employees and students, and to ensure equal opportunities and treatment for everyone. The challenges associated with diversity shall be identified and resolved so that we can benefit from the positive effects of having a diverse working environment. We shall work systematically and with a long-term perspective to establish a culture among our employees and students that is based on equality and the equal treatment of all. This shall be reflected in all our priorities and actions.

Recruitment
The Faculty shall work systematically with the development of recruitment processes, both for individuals and groups of individuals ("cluster hiring"), to ensure the best qualifications at all levels and for all the functions required to achieve the Faculty's ambitions. The recruitment processes shall be efficient, predictable, transparent, quality assured and based on the values and ambitions of this strategy.

Part III
Thematic initiatives

Life sciences

Life sciences are all about understanding the make-up, structure and function of living organisms, and how living organisms mutually affect each other and interact with their environments. *Life sciences* are of key importance for enabling society to meet major challenges in respect of health, food, climate and the environment. The Faculty engages in extensive and interdisciplinary cooperation locally, nationally and internationally on understanding and treating disease. With regard to research under the heading *earth and space sciences*, our researchers in the field of *life sciences* are keen to understand the processes and phenomena affecting the environment and climate. Our researchers, across the Faculty's units, participate in large projects together with other health care environments at the University of Oslo and the university hospitals. These projects involve researchers from the majority of the Faculty's subject areas, and increasingly researchers from humanistic and social science disciplines. The Faculty's focus on *life sciences* represents a large and important part of UiO:Life Science, which is a large interdisciplinary initiative to enhance the level of quality and interaction in research, education and innovation in *life sciences* across the various units at the University of Oslo.

Earth and space sciences

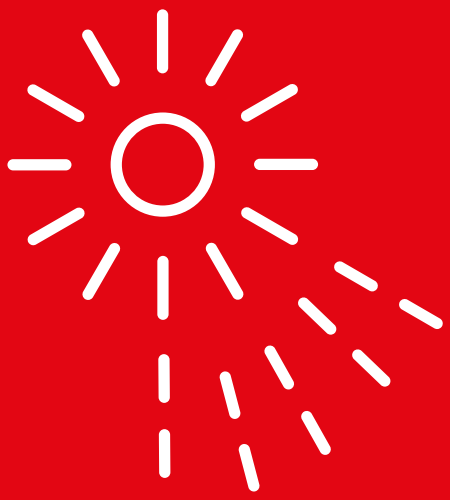
Earth and space sciences encompass studies of the earth we live on and the infinitely large universe we are a part of. The research ranges from the interior and surface of the earth, via the atmosphere of the earth to the solar system, sun, stars and on to the galaxies and the entire universe. The research is applied to a broad range of areas such as the understanding of processes that form hydrocarbons and valuable minerals on the surface of the earth, how carbon can be stored in the earth's crust, and how water circulates on the surface of the earth – in the oceans, on land and in the atmosphere. Atmospheric research provides better and more precise weather forecasts and a greater understanding of climate change. Other research provides answers to questions that people have been asking ever since the dawn of mankind: what are the beautiful northern lights and how do they affect vital systems on earth, what is the connection between processes on the sun and on earth, whether life exists elsewhere in the universe, when and how was the universe created, what does it consist of and when and how will it end, and what is mankind's place in it all?

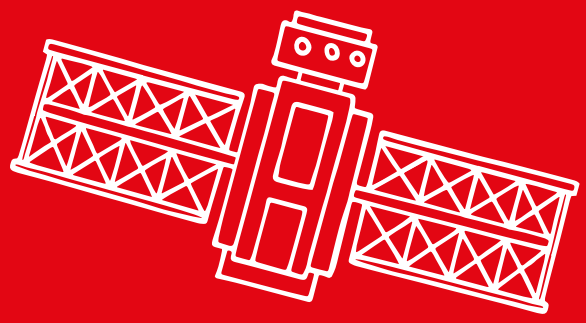
Energy and material sciences

Sustainable social development will require a fundamental conversion to renewable energy supplies and the production of materials, with a dramatically different environmental footprint. *Energy and material sciences* include research on materials for the production and storage of energy and the development of technology for the energy systems of the future. Basic research on physical and chemical material properties is fundamental to the development of better, more efficient and environmentally friendly solar cells, batteries, fuel cells and catalysts. Energy systems encompass how the individual components work together in a system, the integration of renewable energy sources and how "smart" systems can make the distribution and consumption of energy more efficient. The Faculty shall develop knowledge and solutions for the necessary conversion to sustainable energy systems and help ensure that everyone has access to energy that is clean, affordable, reliable and socially fair. The Faculty's focus on *energy and material sciences* represents a large and important part of UiO:Energy, which is an interdisciplinary initiative designed to enhance the level of quality and interaction in research, education and innovation in renewable energy across the various units at the University of Oslo.

Digitalisation and computational science

The basis for the Faculty's focus on *digitalisation and computational science* is naturally linked to basic knowledge development in computer science and mathematics. The use of advanced computations in combination with other knowledge, from, for example, the Faculty's other thematic initiatives – *life sciences, earth and space sciences* and *energy and material sciences*, is becoming increasingly important. Data science, including machine learning and computational science, are key areas on which the Faculty focuses and where it has strong academic communities across the various subject areas and entities. Digitalisation is a driver of convergence between the various disciplines, which will in turn create opportunities for addressing problems that require radical interdisciplinary approaches. The Faculty's commitment to digitalisation is comprehensive and is being developed in order to support international cooperation on research and education. This commitment concerns how we shall design and use secure information systems in the future, etc. The use of digital resources is also of key importance in research and education, and a large share of our interaction with businesses and entities in the public sector concerns the development and use of digital resources.





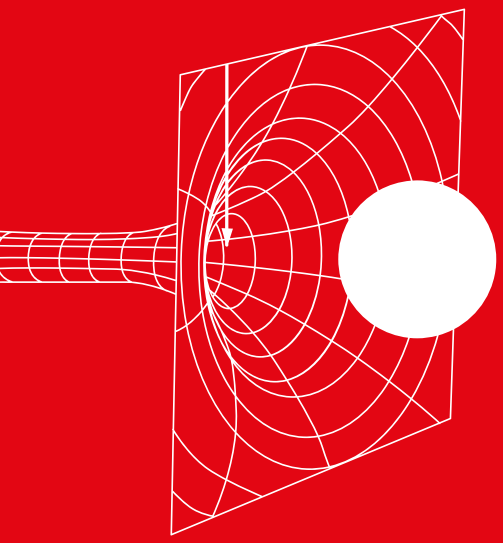
Research is about seeking the unknown;
crossing boundaries
and at times being groundbreaking.

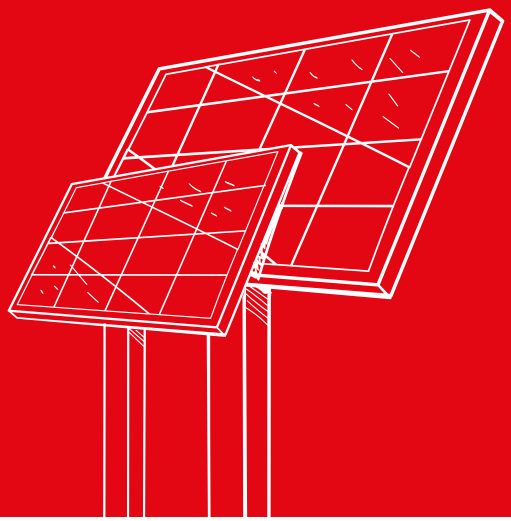
Learning is about acquiring new knowledge,
skills and general competence;
crossing boundaries and at times being
groundbreaking.

Barriers are built that must be broken down,
and boundaries are defined that must be eliminated.

There are boundaries that we can live with,
but these must also be challenged.

Limitless development of knowledge
is the key to the future.





Design/illustration: Anagram Design

UiO : Faculty of Mathematics and Natural Sciences
University of Oslo