

A microscopic image of biological cells, likely fibroblasts, showing a dense network of spindle-shaped cells. A dark, wavy outline of the map of Norway is superimposed on the image, centered in the upper half. The overall color palette is a range of blues, from light cyan to deep navy.

TROMSØ

THE HOT SPOT FOR COLD BIOTECH

TROMSØ – THE HOT SPOT FOR COLD BIOTECH

Tromsø is internationally recognized as an arena of world-class science within marine biotechnology. Numerous biotechnology companies are operating within the fields of health and nutrition, medical devices and molecular diagnostics. Highly skilled personnel from all over the world find their way to this region to find exciting opportunities within research and industry.

The region's biotechnology community is continuously growing thanks to a consistent long term strategy based on proximity to the Arctic and knowledge of the region's unique marine resources. Additionally, the growth of the biotechnology sector and the realization of its huge potential for value creation are enhanced by a comprehensive, long term commitment of cooperation

among research institutes, industry and public authorities in this region.

Over the years, joint efforts have created a well-developed infrastructure for exploring bioactive compounds in marine organisms, including research vessels, platforms for screening and structure determination and documentation laboratories. As a result,



the Norwegian Government selected Tromsø as the national center for marine bio-prospecting in 2009.

Tromsø's biotechnology community is organized within the biotech cluster, "BioTech North", a triple helix research & innovation cluster, focusing on research and commercialization of marine bioactive compounds from the Arctic. Tromsø's biotechnology actors benefit from well developed infrastructure for both research and industry that includes the Barents BioCentre, which offers state-of-the art laboratories and office facilities for rent. In addition, a new biotech industry park is being established and will include pilot facilities for process development, up-scaling studies and small scale production.

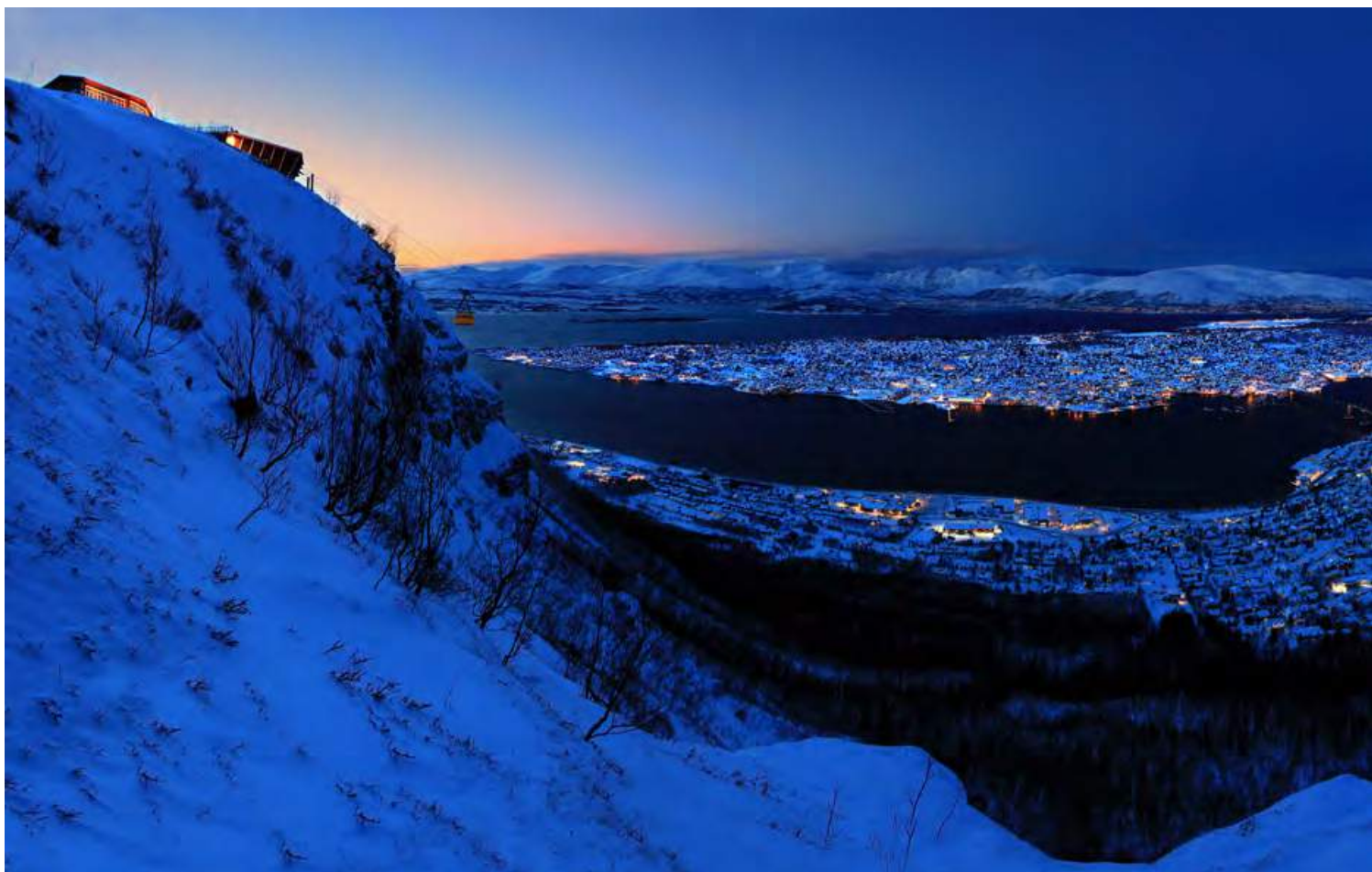




FOTO: MARIUS HANSEN

This brochure highlights Tromsø's biotechnology community, from science to industry. It also provides a snapshot of Tromsø, the Arctic capital, and the

city's beautiful surroundings. Finally it explains why Tromsø is The Hot Spot for Cold Biotech!



FOTO: RUDOLF SVENSEN

Marine bioprospecting can be described as systematic exploration of constituent parts, bioactive compounds or genes in marine organisms. These components are charted to identify whether they can be exploited for medicines or alternative applications within industries, including oil and gas, renewable energy, chemical and food industries.

Biotechnology is a combination of natural science and engineering and is defined as all technology that uses microorganisms, plant and animal cells, or parts of these to produce or modify medical products, to improve plant and animal products, and to develop microorganisms for industrial applications.



FOTO: AUDUNRIKARROSEN

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SCIENCE BASE



FOTO: MARIUS HANSEN

The University of Tromsø

The University of Tromsø includes educational programs in marine science, biomedicine, telemedicine, physics, linguistics, multiculturalism and research related to Sámi and indigenous people. In biomarine science, the University offers educational programs in marine biotechnology and bioprospecting, aquamedicine and seafood science, in addition to general biology. The biotechnology program contains courses that provide candidates with the necessary knowledge to face tomorrow's challenges within marine bio-based industries by gaining skills in the use of both traditional and modern biotechnological tools and approaches.



Håp i Havet is an annual conference series in Tromsø organized by students from the Faculty of Biosciences, Fisheries and Economics at the University of Tromsø. The conference has a strong scientific focus on fisheries, biosciences and economics and is a key meeting place for business representatives and students. The conference was organized for the first time in 2000.



The University of Tromsø, Nofima, the Norwegian Polar Institute, the Northern Research Institute, Akvaplan-niva and the Institute of Marine Research are leading national and international players in their respective areas, with internationally strong positions within biomarine research. In total, approximately 500 researchers at approximately 10 institutions are engaged in biomarine research in Tromsø. Together, these organisations cover a broad spectrum of activities, yet they also cooper-

ate in Tromsø-based national and international research centers or networks including the marine bioprospecting center MabCent-SFI and the marine ecology network ARCTOS.

Both the geographic location, close to the richest and least exploited marine natural resources in the Arctic, and the available R&D infrastructure facilitate the development of strong biomarine research clusters and businesses in the Tromsø region. Sustainable develop-



FOTO: YNGVE OLSEN SEBBE

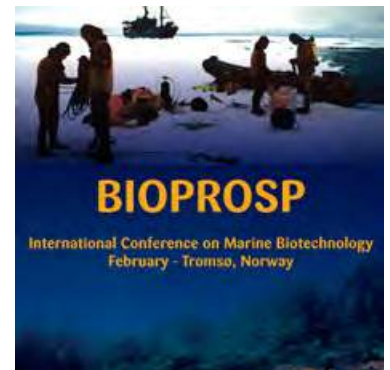
ment of these unique natural resources is widely accepted as vital for Tromsø's biomarine sector. Therefore, a solid scientific knowledge base of the region's ecosystems exists to provide a foundation for the exploration of the biotechnology potentials of the region's natural resources. Additionally, the development of scientific expertise within aquaculture and marine and arctic biotechnology has given Tromsø a favorable position for starting new biomarine projects and businesses.

The University Campus

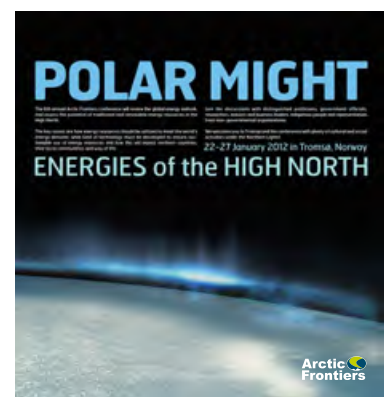
Nofima

The University Hospital of North Norway

Tromsø Science Park and the Barents BioCentre



BIOPROSP is an International Conference on Marine Biotechnology organised by commercial actors and research communities in Tromsø. Held in February every second year, BIOPROSP attracts over 250 delegates. Target groups are academic and industry researchers, decision makers, regulatory experts, investors and public facilitators engaged in all aspects of marine biotechnology. BIOPROSP showcases applications and the industrial development of discoveries based on bioprospecting.



Arctic Frontiers is an annual, week-long conference held in January which attracts around 600–700 scientists, politicians and business people. The conference focuses on the Arctic region – from its environment and living conditions to legislation and future business opportunities. The conference is broadcast directly via the Internet in English and with Russian translation. Media organisations, such as National Geographic, Stern, Al Jazeera and others, profile the conference internationally.

MARINE BIOPROSPECTING

Marine bioprospecting may be defined as the search for bioactive molecules and compounds from marine sources having new, unique properties and the potential for commercial applications. Amongst others, applications include medicines, food and feed, textiles, cosmetics and the process industry.

The Barents Sea, where temperate waters from the Gulf Stream and cold waters from the Arctic meet, is home to an enormous diversity of organisms, which are well adapted to the extreme conditions of their marine habitats. This makes these arctic species very attractive for marine bioprospecting.

The Norwegian government strategically supports the development of marine bioprospecting as it has the potential to contribute to new and sustainable wealth creation. Tromsø and the northern areas play a central role in this strategy due to excellent access to unique Arctic marine organisms and the presence of marine industries and R&D competence and infrastructure in this region.

Since 2007 science and industry have cooperated closely within MabCent-SFI on bioprospecting and the development and commercialization of new products.

MabCent-SFI

MabCent-SFI is one of fourteen Research-Based Innovation Centers initiated by the Research Council of Norway, and is the only one within the field of “bioactive compounds and drug discovery” that is based on bioactives from marine organisms. MabCent-SFI maintains a focus on bioactives from Arctic and sub-Arctic organisms. By the end of 2011, MabCent has tested about 200,000 extracts, finding several hundred “hits”. Through further research and development, some of these hits will become valuable “leads”, i.e. characterized compounds known to possess biological effects of interest.



FOTO: A. MESHRAH, UNIS

The commercial partners in MabCent-SFI are Biotec Pharmacon ASA and its subsidiary ArcticZymes AS, ABC BioScience AS, Lytix Biopharma AS and Pronova BioPharma ASA. ArcticZymes is also a partner in MARZymes, a project financed by the Research Council of Norway to find marine enzymes which are adapted to the extreme conditions in the Arctic.

The science partners in MabCent-SFI are Marbank, a national marine biobank located in Tromsø, Marbio, a medium/high-throughput platform for screening and identification of bioactive compounds and Norstruct a protein structure determination platform. MabCent-SFI is hosted by the University of Tromsø.

Bioprospecting is a multidisciplinary activity.

Collection



Extraction



Fractionation



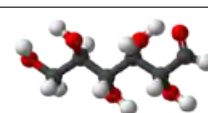
Bioactivity screening



Identification



Molecular characterization



Optimization

- DRUG LEADS
- BIOACTIVES

Commercialization





THE UNIVERSITY OF TROMSØ

University of Tromsø

www.uit.no



The University of Tromsø is the northernmost university in the world. 9,000 students and 2,500 staff study and work here. Teaching is research-based. The University's six faculties offer a broad range of study programmes with an emphasis on Northern issues. The academic community in Tromsø is highly international. More than 20% of the academic staff and 10% of the student body at the University of Tromsø are from abroad.



FOTO: LARS NORDIMO

One of the main ambitions of the University is to be at the frontline of international research in marine biotechnology.

FACULTY OF BIOSCIENCES, FISHERIES AND ECONOMICS

Focus areas: aquatic and terrestrial ecosystems, climate, life in the arctic, marine bioprospecting, fish health, marine alimentary products, business and macro economics, resources and environment, markets and management of marine resources.

Department of Arctic and Marine Biology

Research Groups: Arctic animal physiology, Arctic marine system ecology, Freshwater ecology, Fish biology and population genetics, Marine plankton group, Molecular environments, Northern populations and ecosystems.

Norwegian College of Fishery Science

Research and education within marine biotechnology covers key elements of aqua medicine (fish health), seafood science and bioprospecting.

- Research on the immunity against viruses and bacteria in fish and invertebrates
- Development of new vaccine concepts and use of immune stimulators to improve vaccine efficacy and animal welfare
- Seafood science – quality and beneficial effects of marine food resources
- Utilisation of unused resources in high-value products for fish feed and seafood industries
- Marine bioprospecting – isolation and characterisation of modes of action of bioactive molecules from marine organisms
- Metagenomics: the exploration of the microbial gene pool in marine environments in the search for new bioactive molecules



FOTO: HENRIK ROMSÅAS

FACULTY OF HEALTH SCIENCES

Focus areas: high quality biological research, population surveys and biobanks, research related to common diseases, clinical research and research in the intersection between medicine and marine biology (marine bioprospecting).

Department of Clinical Medicine

Facilities/competence for phase 1–4 drug trials.

Department of Medical Biology

The research activity is concentrated on biomedical and basal biological projects, which also include marine biotechnology and bioprospecting in a health benefit perspective.

- Drug discovery in sea anemones and corals
- MicroRNA profiling and whole genome transcriptomics in Atlantic cod
- Mitogenomics in codfish and flatfish
- Health benefits of marine proteins and lipids
- Basal studies of the immune defense system in fish

Department of Pharmacy

Research allocated to the topic “Drug discovery for compounds from marine organisms with anti-cancer and anti-microbiological activities”.

- Isolation and structural characterisation of natural products
- Drug technology, biopharmacy, and quality assessment
- Drug synthesis and analysis



FOTO: LARS NORDMØ

FACULTY OF SCIENCE AND TECHNOLOGY

Department of Chemistry

Research activities include medicinal chemistry, drug discovery, functional genomics, systems biology and enzyme technology, using methods of organic synthesis, biomodelling, macromolecular crystallography, spectroscopy and calorimetry. State of the art NMR, MS and X-ray instrumentation highlight excellent department facilities. Marine biotechnology activities include extensive involvement in the Tromsø marine bioprospecting initiatives.

- Development of new biocatalysts from marine genome and metagenome libraries
- Discovery of potential drugs from marine bioprospecting efforts, including metabolites from marine microorganisms
- Design and chemical synthesis of anticancer and other targeted drugs
- Systems biology studies of marine microorganisms

MabCent-SFI

MabCent-SFI is one of fourteen Research-Based Innovation Centers initiated by the Research Council of Norway, and is the only one within the field of “bioactive compounds and drug discovery” based on bioactives from marine organisms.

Thus MabCent-SFI maintains a focus on bioactives from Arctic and sub-Arctic organisms searching for compounds for innovation and commercialization in areas where Norway currently has the potential to achieve a strong international position. The four commercial MabCent partners (*) are parts of an R&D synergy that includes different areas (pharmaceuticals, nutraceuticals, research tools etc.) and stages of development.

Through their interaction with the interdisciplinary expertise at the University of Tromsø and academic partners, the MabCent initiative helps stimulate research and innovation and the creation of standards for future marine-based discovery and development within marine bioprospecting and biotechnology.

At the end of 2011, MabCent has tested over 200,000 extracts/fractions. Among these, scientists have identified several hundred “hits,” some of which will eventually become valuable “leads”, i.e. characterized compounds known to possess biological effects of interest.

*Commercial partners in MabCent: Biotec Pharmacon ASA / ArzticZymes AS, ABC-BioScience AS, Lytix Biopharma AS and Pronova Biocare ASA

PLATFORMS



Smallstruct

Activities focus on determining the structure of new bioactive small molecules generated via the MabCent pipeline.



NorStruct

The Norwegian Structural Biology Centre (NorStruct) is a national research and service centre offering consulting, service, courses and collaboration to the Norwegian research community in structural biology techniques. The lab, located in the Barents BioCentre (Tromsø Science Park), is equipped with state-of-the-art instrumentation for the full pipeline, from protein production through high throughput crystallization and structure determination, to drug discovery related tasks.



BioStruct

The National graduate school in structural biology (BioStruct) is established as an arena for promoting structural biology in Norway and to provide expertise and tools for research-based education in the field. About 60 PhD-students from all over Norway are currently part of BioStruct.



Sysbio

The platform of integrated systems biology (SYSBIO) is a newly established technological service unit funded by FUGE-N. SYSBIO is affiliated to the Department of Chemistry and located in the new Barents BioCentre (Tromsø Science Park). SYSBIO offers help to researchers and research groups, primarily at the University of Tromsø, with the planning and execution of studies involving bioinformatics analysis.

Marzymes

MARZymes, a project financed by the Research Council of Norway, engages in finding marine enzymes which are adapted to the extreme conditions of the arctic.

Partners: UiT, NTNU, UMEÅ University and ArcticZymes.

RESEARCH INSTITUTIONS

Nofima
www.nofima.no



Nofima's expertise in biotechnology R&D is first and foremost located within the Marine Biotechnology department. The company currently expands its experimental pilot plant to host a national facility for up-scaled processing of marine raw materials.

Relevant areas of expertise:

- Enzymes and bioactive compounds from marine organisms
- Biochemicals and special products (oils, proteins, DNA etc.) for nutrient, food, cosmetic, medicine and biotechnology markets
- Viral and bacterial diseases and vaccine development
- Feed for the fry of marine fish
- Feed for new farmed species (sea urchins, king crab and Atlantic cod)
- Responsible for national cod-breeding program (breeding station, spawning and genetics)
- Processing and product development of seafood



FOTO: NOFIMA.NO

Northern Research
Institute – Norut

www.norut.no



Norut's department of Industrial and Medical Biotechnology has been established to meet the industry's need for a department of applied research and development. Norut will give priority to marine lipids, bioactive peptides and small organic molecules. Norut's R&D activities will be developed in close cooperation with biotech companies worldwide. Norut has access to modern laboratories and advanced equipment.

Norut offers:

- Expertise in synthesis and modification of small organic molecules and lipids
- Research into bioactive peptides and peptidomimetics

Institute of
Marine Research

www.imr.no



The aim of research and management advice provided by IMR is to ensure that Norway's marine resources are harvested in a sustainable way. IMR's main task is to advise Norwegian authorities on the management of aquaculture and the ecosystems in the Barents Sea, the Norwegian Sea, the North Sea and the Norwegian coastal zone. The IMR is a national institution under the Ministry of Fisheries and Coastal Affairs, with offices in Bergen, Arendal and Tromsø.



FOTO: HAVFORSKNINGSINSTITUTTET

Fram Centre

www.framsenteret.no

Fram Centre

The Fram Centre is the short name for FRAM – High North Research Centre for Climate and the Environment. The Fram Centre contributes to Norway's sound management of the environment and natural resources in the High North and contributes with inputs on climate-related issues. The Centre communicates science and research based knowledge to authorities, business communities and the general public. The Fram Centre is an important arena nationally as well as internationally and consists of about 500 scientists from 20 institutions involved in interdisciplinary research in the fields of natural science, technology and social sciences.

Bioforsk Nord

www.bioforsk.no/nord



Bioforsk, The Norwegian Institute for Agriculture and Environmental Research, conducts applied and specifically targeted research linked to multifunctional agriculture and rural development, plant sciences, environmental protection and natural resource management.

Areas of expertise:

- Secondary metabolites produced in plants
- Seaweed farming
- Management of freshwater fisheries

GenØk

www.genok.org



GenØk – Centre for Biosafety is an independent research organisation located at the University and the Science Park of Tromsø. GenØk is engaged in research, advisory services and capacity building related to biosafety. The centre focuses in particular on the environmental and health related consequences of the application of new bio- and nanotechnology.

Norwegian Polar Institute

www.npolar.no



The Norwegian Polar Institute (NPI) is dedicated to scientific research, mapping and environmental monitoring in the Arctic and the Antarctic regions. The institute advises Norwegian authorities on matters concerning polar issues, and is Norway's competent environmental authority in Antarctica. The NPI hosts several international secretariats.



FOTO: ©MAGNUS ANDERSEN, NORSK POLARINSTITUTT

Arctic Council

www.arctic-council.org



The Arctic Council is a high level intergovernmental forum for promoting cooperation, coordination and interaction among the Arctic States on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic. The secretariat is located at the Fram Centre.

SUPPORT STRUCTURES

BIOTECHNOLOGY CLUSTER

BioTech North
www.biotechnorth.no



FOTO: OLE MAGNUS RAPP

NATIONAL AND REGIONAL FUNDING PROGRAMS

Innovation Norway
www.innovasjon Norge.no



The Research Council of Norway
www.forskningsradet.no



**MABIT – R&D program within
Marine Biotechnology in Northern Norway**
www.mabit.no



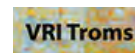
RDA-2 Tromsø
www.rdatromso.no



Troms fylkeskommune
www.tromsfylke.no



VRI Troms
www.tromsfylke.no



Regionale forskningsfond Nord-Norge
www.regionaleforskningsfond.no/nordnorge



BUSINESS DEVELOPMENT

Norinnova Technology Transfer
www.norinnova.no



Connect Nord-Norge
www.connectnorge.no

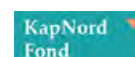


INVESTORS

Norinnova Invest
www.norinnovainvest.no



KapNord invest
www.kapnord.no



Sparebank 1 Nord-Norge Invest AS
www.snninvest.no



BioTech North is the biotechnology research and innovation cluster in Tromsø, the Arctic capital. Its members represent the entire value chain, from harvesting of marine organisms through research, product and process development, to manufacturing of products applied within health & nutrition, medical devices and molecular diagnostics. The strategic focus of BioTech North is to enhance the cluster's innovation and commercialization performance.



FOTO: ERLING SVENSEN

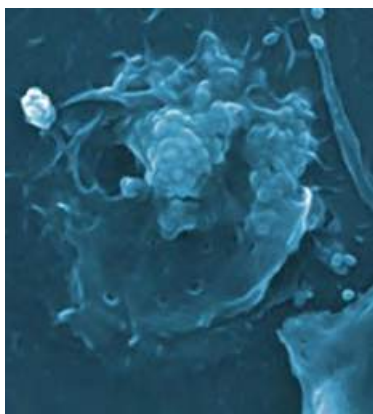
MABIT is a regional R&D program within Marine Biotechnology and a driving force in coordinating and strengthening biotechnological activities in Northern Norway. MABIT's objective is to contribute to increased value creation in fishery, aquaculture and the biotechnological industry in the region. MABIT organizes the biennial International Conference on Marine Bioprospecting – BIOPROSP – in Tromsø.

INFRASTRUCTURE



Research vessels

The research communities make use of three research vessels for a multiple range of activities related to marine research and education. «Hyas» (12 m) is used in near coastal waters for short expeditions. «Johan Ruud» (31 m) is utilised within the fjords and coastal areas of Northern Norway from Lofoten to Varangerfjord. «Helmer Hansen» (64 m) is specially designed for work in the North Sea, Barents Sea and Svalbard.



Development of vaccines

Efficient vaccines are paramount for the further development of Norwegian fish farming. New vaccines and strategies are required to combat diseases. An electron-microscopic image illustrates a white blood cell from a salmon which has absorbed tiny nano-particles containing a vaccine. The arrow points to a "lump" of nano-particles inside the cell.

Documentation Lab

The Documentation Lab is a joint project located at the Unit of Comparative Medicine (AKM), Faculty of Health Sciences, University of Tromsø. The Lab is approved for experimental animals (rodents, rabbits, sheep, pigs, aquarium fish and frogs) which are used in biomedical research. The Documentation Lab serves all users in the Tromsø region, including the faculties at the University of Tromsø, the University Hospital of North Norway, government research institutes and commercial firms in biomedical and biotechnological research.

Tromsø Aquaculture Research Station

Tromsø Aquaculture Research Station consists of a land facility for experimental studies of fish and shellfish, a fish health laboratory for the study of fish diseases, and a new full-scale sea hatchery for studies of fish and shellfish under natural conditions.

National Pilot Facility for Marine Bioprocessing

www.prosesslab.no

This multi-purpose pilot facility is designed to facilitate industry in their process development programs in order to produce new products at the pilot scale for premarketing and product testing. The pilot facility is capable of handling and processing different types of marine raw materials into dry extracted or hydrolyzed products as well as unrefined marine oil products. The pilot facility, maintained and operated by Nofima, will be a national pilot facility for marine bioprocessing starting in 2012.

Barents BioCentre Lab

Barents BioCentre Lab (BBC Lab) is designed to strengthen the development of new business within biotechnology and to contribute to a strong biotech cluster in the region. BBC Lab offers access to modern laboratories with advanced equipment and is a meeting place for industry and scientists, thus generating unique opportunities to develop new, innovative products and companies. The facilities of BBC Lab are available to any biotech company or institution, national and international.



FOTO: BARENTS BIOCENTRE LAB

Marbank

Marbank is a national marine biobank, established in close cooperation with the Ministry of Fisheries and Coastal Affairs. Marbank is responsible for collecting, preserving and cataloguing marine organisms from Norwegian waters, especially from Arctic areas, for research and commercial exploitation purposes. The mission of Marbank is to provide an easy accessible repository of frozen marine biological samples



FOTO: IMRANO

for R&D institutions and industries that search for novel compounds in marine organisms. The material archived and stored in the repository includes taxonomy samples, frozen biomass samples and genetic and biochemical extracts from marine microorganisms, plankton, algae, invertebrates and vertebrates.

Marbio

www.uit.no

Marbio is a medium/high-throughput platform for purification/isolation, screening and identification of bioactive compounds from Arctic and sub-Arctic marine organisms. Marbio screens for compounds with activities within several areas:

- Antibacterial activities
- Anticancer activities
- Immunostimulants
- Anti-inflammatory activities
- Antioxidants
- Antiviral activities
- Enzymes and inhibitors



FOTO: MARBIO

NorStruct

www.uit.no/norstruct

The Norwegian Structural Biology Centre (NorStruct) is a national research and service centre within the national initiative in functional genomics (FUGE). NorStruct offers consulting, services, courses and collaboration to the Norwegian research community in structural biology techniques. The lab is equipped with state-of-the-art instrumentation for the full pipeline from protein production to high throughput crystallization and structure determination and drug discovery.



Calanus finmarchicus is a small (3 mm) copepod and a central organism in the marine ecosystem, serving as food for pelagic fish. *Calanus finmarchicus* goes through twelve different stages in its one year lifecycle and is very rich in fatty acids. The annual production of this tiny copepod in the North Atlantic is many times higher than the combined biomass of all fish and mammals in the same ocean area. *Calanus finmarchicus* represents a new commercial resource for a wide range of biotechnology applications. Harvesting commercial quantities of this copepod is today possible due to improvements made in harvesting technologies.



The silvery herring offers golden opportunities

Nofima, SINTEF Fisheries and Aquaculture and the fishing industry are searching for unexplored bioactives (enzymes, drugs, lipids and functional proteins) from by-products of Norwegian spring-spawning herring.



The Tromsø Science Park/
Barents BioCentre Building.

FROM SCIENCE TO INDUSTRY

For decades the science environment in Tromsø has been acknowledged as an internationally leading region for marine biotechnology. This position has in turn resulted in an emerging industry comprising a range of biotechnology companies and state-of-the-art facilities.

Companies in the region are mainly, but not exclusively, based on marine bioactive compounds from the Arctic. They have originated either as spin-offs from the University of Tromsø, Tromsø's university hospital, or from the traditional fishery and harvesting industry. The close co-operation between industry and research and education nourishes further development of the region's biotechnology sector.

Due to the Tromsø region's unique proximity to the bio-marine resources of the Arctic, comprehensive research environment, and numerous knowledge based companies, the region has become an exciting hot-spot for biotechnology, offering job opportunities for a global work force.

The biotechnology companies operate within pharmaceuticals, dietary supplements and medical devices, but also fish health and feed, molecular engineering services, analysis and consultancy. These companies are highlighted on the following pages.

Enterprise	Nutraceuticals & food additives	Cosmeceuticals	Drug discovery & development	Medical devices & applications	Molecular diagnostics & engineering	Analysis & consultancy services	Aquaculture
ABC Bioscience	•		•				
Akvaplan-niva						•	•
ArcticZymes					•		
Ayanda	•		•				
Biotec Betaglacans	•	•	•	•			
Biotec Pharmacon	•	•	•	•	•		
Calanus	•						
Chitonor	•	•					
Clare	•	•					
Cognis		•					
ConCordix Pharma			•				
ConTra	•						
D'Liver						•	
Integrogen			•	•			
Lytix Biopharma			•				
Marealis	•						
n3 pharma	•						
Olivita	•						
Orthogenics				•	•		
ProBio	•		•				
Procelo				•			
Prophylix			•	•			
Scandinavian Dermal Innovations		•					
Trofi							•
Unilab Analyse			•	•		•	

ABC Bioscience

Key words:
Health & nutrition,
Bioprospecting,
Antioxidants

ABC Bioscience AS works with the identification and development of new bioactive substances to combat cardiovascular diseases. Central in this research is the detection and utilization of new marine antioxidants. Bioscience AS is partner in the Centre for Marine Bioactives and Drug Discovery, MabCent-SFI.



Akvaplan-niva

Key words:
Arctic
environmental
research,
Aquaculture,
Laboratory
services,
Advisory
services

Established in 1986, Akvaplan-niva is a private research and advisory services company providing expert knowledge and advice on the environment and on aquaculture. The company combines research, decision support and technical innovation into practical and cost-effective solutions for businesses, authorities, and other clients world-wide. The company's portfolio of services includes environmental monitoring surveys, impact and risk assessments, decision support for petroleum operations, Arctic environmental research, aquaculture design and management, R&D on new aquaculture species, and a number of accredited environmental, technical, and analytical services.

www.akvaplan.niva.no

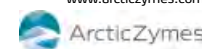


ArcticZymes

Key words:
Cold adapted
enzymes,
Bioprospecting,
Genetic engineering

ArcticZymes AS develops manufactures and markets cold adapted enzymes for use in molecular DNA technology and diagnostics. The enzyme products originate from Arctic marine organisms, and are recombinantly produced. ArcticZymes is collaborating with several bioprospecting programs fueling the pipeline for new enzyme based products, and is a partner in the Centre for Marine Bioactives and Drug Discovery, MabCent-SFI. ArcticZymes is a subsidiary of Biotec Pharmacon ASA.

www.arcticzymes.com



Ayanda

Key words:
Health & nutrition
(Pharma &
Supplements),
Marine oils

Ayanda AS is an innovative business partner and manufacturer of consumer ready pharmaceuticals and food supplements based on marine oils, and offers high quality products and reliability through the whole supply chain. Ayanda AS is a fully owned ProBio subsidiary.



www.ayanda.com



Biotec Pharmacon

Key words:
Immuno-modulation,
Beta-Glucans,
Marine Enzymes,
Bioprospecting



Biotec Pharmacon ASA is a publicly listed company on the stock exchange (Oslo Børs). The company is a principle contributor in the field of developing immuno-modulatory products and cold adapted marine enzymes. The company operates through its subsidiaries Biotec BetaGlucans (100% owned) and ArcticZymes (96%). Biotec Pharmacon is partner in the Centre for Marine Bioactives and Drug Discovery, MabCent-SFI.

www.biotec.no



Biotec BetaGlucans

Key words:
Immunomodulation,
Beta-Glucans

Biotec BetaGlucans AS develops, manufactures and markets immune modulating compounds, in particular Beta-Glucans for new and effective solutions within wound care. The company spearheads research on products that may prevent or treat diseases caused by failure, imbalance and over-reaction of the immune system.

www.biotec.no



Calanus

Key words:
Health & Nutrition,
Marine oils,
Hydrolysate

Calanus AS is a Norwegian biomarine company founded on competence on ecologically sustainable harvesting of the zooplankton species, *Calanus finmarchicus*, and on scientific and technological expertise related to development, manufacture and use of health- and nutrition products. The company also develops bioactive compounds based on this abundant biological resource of the North Atlantic Ocean. The company is currently conducting a human clinical study on type-2 diabetes with its lead product, Calanus® Oil. Calanus® Oil will soon be launched in selected markets, pending regulatory clearance.



www.calanus.no



Chitinor

Key words:
Health & cosmetics

Chitinor AS is a manufacturer of high quality chitin-based biopolymers from the Arctic cold water shrimp *Pandalus borealis*, for use in biomedical, cosmetic and life-science applications. Chitinor AS is a fully owned subsidiary of Seagarden ASA.

www.seagarden.no



Clare

Key words:
Functional food,
Dietary supplements,
Marine lipids,
Antioxidants

The Centre for lipid and antioxidant research, Clare AS, identifies and develops products that contain Marine Phospholipids (MPL) for use in nutraceuticals, pharmaceuticals and cosmetic products. Clare's R&D focuses on documentation of the health effects of **Omega3MzPL™**

<http://clarecorp.com/>



Cognis

Cognis is a leading supplier of innovative, environmentally sound products and formulations based on the marine raw material chitin. Cognis offers winning solutions and ready-to-market concepts for cosmeceuticals and personal care.



ConCordix Pharma

Key words:
Health & nutrition,
Drug delivery
technology

Concordix Pharma AS develops pharmaceutical products utilizing Probio ASA proprietary drug delivery technology – ConCordix®. This technology has been developed during the last 6 years in cooperation with NTNU and Ayanda AS.



ConTra

ConTra AS develops and manufactures biotechnological products used as processing aids in the fish feed and fish products industry.



D'Liver

Key words:
Large molecule drugs,
Biopharmaceuticals,
Bioavailability,
Drug delivery

D'Liver is a company based on research on liver uptake mechanisms. With this specialized knowledge D'Liver will contribute to increased bioavailability of biopharmaceuticals by providing unique products and services related to liver uptake challenges.

www.dliver.no



IntegroGen

Key words:
Large molecule drugs,
biopharmaceuticals,
bioavailability, drug
delivery

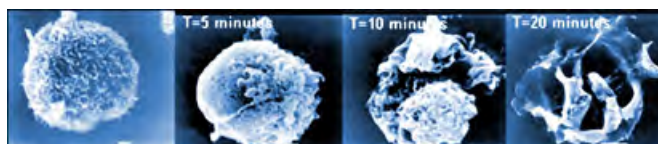
IntegroGen AS develops therapeutics for treatment of cancers due to mutations. These types of cancers are resistant to chemotherapy and are metastatic. IntegroGen's compounds are generated by a proprietary platform technology for the detection of compounds that are able to restore the function of mutated proteins. This may offer patients a significantly more safe, practical and economical alternative to gene therapy.



Lytix Biopharma

Key words:
Pharmaceuticals,
Drug discovery

Lytix Biopharma AS develops novel antimicrobial peptide-based drugs for the treatment



of resistant bacterial and fungal infections, as well as first-in-class oncology treatments. The company uses proprietary and in-depth knowledge of the general lytic peptide pharmacophore to develop synthetic drug-like molecules that retain the positive characteristics of lytic peptides whilst offering excellent stability and low cost of goods. Lytix Biopharma is a partner in the Centre for Marine Bioactives and Drug Discovery, MabCent-SFI.

www.lytixbiopharma.com



Marealis

Key words:
Health & nutrition,
Marine peptides



Marealis AS focuses on the development and commercialization of novel bioactive peptides from sustainable marine sources of the Arctic Ocean for human health and food ingredients. Marealis AS is owned by Stella Polaris AS.

www.marealis.no



n3 pharma

n3 pharma develops and produces novel ingredients based on bioactive compounds from the Arctic. The company has a particular focus on marine lipids, and applies to cGMP API. n3 pharma AS is a fully owned subsidiary of ProBio.



OliVita AS

Key words:
Dietary supplements,
Marine oils,
Health & nutrition.

Olivita AS is a supplier of dietary supplements. Their main product combines omega-3 fatty acids, natural antioxidants and inflammation soothing components from seal oil and olive oil, respectively. The product has a strong anti-inflammatory effect and reduces the development of atherosclerosis. It may prevent stroke and other inflammation related diseases such as arthritis, psoriasis as well as auto-immune diseases. The product is developed through more than 20 years of research including nine clinical trials.

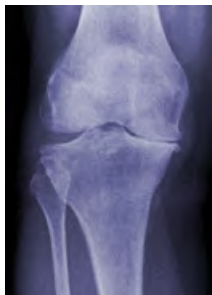


www.olivita.no



Orthogenics

Key words:
Molecular diagnostics,
Osteoarthritis,
Joint disease,
Treatment



Orthogenics AS develops molecular diagnostics and new treatment principles for Osteoarthritis (OA), based on patented discoveries of bacterial provocation in OA pathogenesis. Orthogenics' well-equipped ServiceLab, located in Tromsø Science Park, delivers molecular analyses to the company's own R&D-projects as well as to customers in other fields such as medicine and aquaculture.

www.orthogenics.no



ProBio

Key words:
Health & nutrition,
Marine oils

ProBio ASA is a leading producer of high-quality Omega-3 for pharmaceutical and nutraceutical products. ProBio has developed more than 2 000 unique product formulas and has a customer portfolio with more than 200 trademark owners on the international food supplement and pharmaceutical market. ProBio's product organizations Ayanda AS and ConCordix Pharma AS offer innovative Omega-3 formulas and proprietary product concepts in the "business to business" market for consumer ready food supplements and pharmaceuticals.

ProBio's third product organization n3pharma AS is responsible for the production of ingredients based on arctic raw materials, particularly marine oils with high EPA and DHA contents. ProBio's head office and R&D department are located in Tromsø with production in Norway and Germany.



www.probio.no



Procelo

ProCelo AS develops diagnostic kits for clinical diagnosis of infectious diseases based on real-time PCR for a variety of diagnostic platforms. The company offers diagnostic kits to public and private microbiological laboratories through dedicated distributors.



Prophylix Pharma

Key words:
Immunology,
Prophylactic
treatment

Prophylix Pharma AS is developing a new prophylactic treatment against Neonatal Alloimmune Thrombocytopenia (NAIT), a serious condition which affects the newborn and remains an unmet medical need.

www.prophylixpharma.com

Prophylix Pharma AS

Scandinavian Dermal Innovations

Key words:
Cosmeceuticals

Scandinavian Dermal Innovations AS develops and markets unique ingredients for high-end cosmeceutical products. Ingredients are based on bioactive compounds from the Arctic, discovered by Scandinavian Dermal Innovations in close cooperation with research institutions such as Bioforsk and the Marbio screening platform.



www.scandiderma.com

SCANDINAVIAN
Dermal Innovations

Trofi Eximo

Key words:
Cosmeceuticals

Trofi is a business segment within the Odd Berg Group and consists of the companies Tromsø Fiskeindustri AS and Eximo AS. Core activities are production of marine phospholipids and starter feed for marine larval and juvenile fish as well as handling of marine raw materials and process development.

www.oddberg.no
www.trofico.no

 **TROFI**

Unilab Analyse

Key words:
Chemical analyses,
Organic compounds,
Laboratory services,
Consultancy

Unilab Analyse AS is a leading analysis company within the area of organic analyses. Unilab Analyse provides consultancy, chemical analysis services and interpretation of analysis results. Unilab has outstanding analysis expertise regarding mineral oils, environmental pollutants and organic oils and lipids. Unilab Analyse may also provide consultancy services for the pharmaceutical and nutraceutical industry, including toxicological and pharmacological evaluation of new chemical entities and well-characterized bioactive compounds. The company also offers analysis services that includes geochemical analyses and enzymatic detection in blood plasma and serum.

www.unilab.no

Unilab
analyse as

BIOMARINE SCIENCE AND BUSINESS OUTSIDE TROMSØ

SCIENCE IN NORTHERN NORWAY

UNIS

www.unis.no



Universitetet i Nordland

www.uin.no



BUSINESS IN NORTHERN NORWAY

Vesteraalens

www.vesteraalens.no



Akvaren

www.akvaren.no



Lerøy

www.leroy.no



EWOS

www.ewos.com



Skretting

www.skretting.com



Norcape Biotechnology

www.duemiljoe.no



Nordlaks

www.nordlaks.no



Biomar

www.biomar.no

Pelagisk inkubator

www.pelagiskinkubator.no

Novasea

www.novasea.no

ACD PharmaceuNcals

www.acdpharma.com

Cermaq

www.cermaq.no



Northern Biolabs

www.northernbiolabs.no



TROMSØ

With a population of 70,000 and some 9,000 students and a centre for education and research – Tromsø is known as the capital of the Arctic.

Vitality

Tromsø is a lively place with a busy city centre. It has a vast range of nightlife, entertainment and outdoor activities and a wonderful and ambitious cultural diversity all enjoyed by the flamboyant, often humorous and sociable residents. The population grows each year by approximately 1,000 people – signalling that people enjoy life here in Europe's northernmost “capital city”.

A recent survey of living conditions indicated that the inhabitants of Tromsø enjoy a comfortable lifestyle. This may be attributed to the large number of inhabitants with higher education, combined with a vast range of leisure and cultural activities offered in the city and natural surroundings. The survey also concluded that Tromsø is a



FOTO: MARK CARANDANG

good provider of family services, such as high quality child-care, school and health care facilities. And, Tromsø has an International School to serve families from abroad, meeting the needs of an increasingly international city.

Tromsø also hosts the world's northernmost University and the world's northernmost Botanical Garden, as well as, a salt water aquarium, glassblowers, a golf course, indoor ice rink, top division sports teams, a majestic cathedral, a Catholic church, a mosque and some of the best restaurants in Norway.

The Arctic Council secretariat was recently established in Tromsø, joining Nammco – North Atlantic Marine Mammals Commission – who has been here for years. Many oil companies have also, or are about to, establish offices in the Tromsø region. The latest addition to Tromsø's ever expanding portfolio of companies is the multinational Aker Solutions – a leader within the oil services industry.

Competence and commerce

Tromsø's technology, research and university centres play a leading role in Norway. Internationally Tromsø is at the forefront within space industry and polar, fisheries and Northern Light research. Tromsø is the centre of bio-prospecting in Norway, with a major





FOTO: GAUTE BRUVIK

part of the Norwegian expertise situated at the Barents BioCentre.

The majority of Norwegian fish exports are sold from Tromsø, and the town is home to numerous private export companies. It also holds the headquarters for the Norwegian Seafood Export Council. The Fram Centre for the High North includes several institutions, with the two principal environ-

mental institutes being the Norwegian government's Norwegian Polar Institute and the company Akvaplan-niva. As a result of the University's targeted efforts to strengthen biomarine research and cooperation between industry, commerce and public authorities, the region is recognized as having a comprehensive foundation for the biotechnological industry.



FOTO: MARK LEDINGHAM

Climate in Tromsø

- Thanks to the Gulf Stream, Tromsø has a moderate climate in relation to its latitude. The coldest month is January when the average temperature is minus 4.40 °C, while the warmest month is July when temperatures average 11.80 °C.
- Minus 18,40 °C and plus 30,20 °C are the lowest and highest temperatures ever measured in Tromsø.
- Tromsø is located at the very centre of the Northern Lights belt and is one of the best locations for observing this magnificent natural phenomenon.
- The midnight sun in Tromsø lasts from 21 May to 21 July.
- The Polar Night lasts from 21 November to 21 January, the latter being the day "Soldagen" is celebrated – the day the Sun returns to Tromsø.



FOTO: GAUTE BRUVIK



FOTO: WWW.TRINT.ORG

Tromsø International School

Tromsø international school has become a significant resource for the families of foreign and Norwegian employees. To compete nationally and internationally, it is vital for Tromsø and northern Norway to secure intellectual competence and a stable workforce. In 2011, more than 140 different nationalities were registered as residents of Tromsø, with nearly one out of ten residents in Tromsø having an international background.

TROMSØ



FOTO: JARL STIAN OLSEN

Festivals in Tromsø

Bukta Open Air Festival takes place at the start of July every year and attracts around 8,000 visitors.

Some of the other festivals:

- Nordic Youth Film Festival
- The National Reindeer Sledding Championship
- The Latin Festival No Siesta Fiesta
- Tromsø Trombone & Lowbrass Festival
- The Debut Week, the annual student festival
- Tromsø Theatre Festival
- Døgnvill, rock music festivals in late summer and mid-winter
- Barentsjazz, international jazz festival
- Tromsø Beer Festival
- Fucking North Pole Festival – punk rock etc.
- Humorfestivalen
- Tromsø International Church Music Festival
- Tromsø World Music Festival
- Ordkalotten, International Literature Festival
- Tromsø Silent Movies Days
- Insomnia, festival for future music and technoculture
- Tromsø Food Festival
- Polar Fokus Photo Festival

The scenery in and around Tromsø will take your breath away; you are surrounded on all sides by fjords, sea, islands and mountains.

The great outdoors

Many people choose to live in Tromsø because of the beautiful scenery and the unspoiled countryside. The town is surrounded by natural beauty, with fjords, narrow sounds, islands and majestic peaks. Every type of skiing and skating sport is represented here, with a large number of clubs for winter sports. The town even has a club for people who go swimming in the ice-cold sea every Friday afternoon, no matter the time of year or weather.

You don't have to go far from Tromsø to reach the mountains, with the spectacular Lyngen Alps starting within the town boundary. This stunning range of peaks is increasingly popular with local and international off-piste skiers. Only 6 km from the town centre, Tromsø



FOTO: PAUL WENNER

has its very own downhill skiing centre with several lifts and slopes for all ages and capabilities. Crosscountry skiers hardly have to leave the town with the wonderful network of floodlit trails and tracks nearby to populated areas. These are in use all year round, both on skis or without.

A cable car, open all year, carries passengers up to the Fjellheisen restaurant that sits 420 metres above the town. The land around the restaurant is gently rolling and perfect for cross-country skiing in winter and walks in





FOTO: AUDUN RIKARDBSEN

summer. One of the most demanding yet popular peaks to climb in the area is Tromsdalstinden, rising 1,238 metres above sea level.

Not to forget the coast: with the vast stretches of sea, myriad islands and the beautiful archipelago off the coast of Tromsø, this is a perfect setting for sailing, windsurfing, kayaking, diving and all other sports and activities related to water and the sea. Tromsø even has its very own “spa-boat” – an old traditional fishing boat that has been converted to house a sauna, hot tub, and Turkish bath.

Cultural adventures

Some 7,000 people buy close to 60,000 tickets for the five day long Tromsø International Film Festival (TIFF), which is held just as the sun returns over the horizon in January, after two months of the long Polar Night. One week after TIFF, the Northern Lights Festival starts. This is a musical festival, presenting music and dance from all genres, with a focus on our neighbours to the east. In total, Tromsø hosts more than two festivals a month, providing the very backbone of the city’s lively cultural scene.



Travelling to Tromsø

In 2009, Tromsø Airport – situated only 4 km from the town centre – had departures to 100 destinations, both domestic and international. Passengers may choose from 12 direct flights to and from Oslo, with a flight time of 1 hour and 45 minutes. Other destinations included Evenes (Harstad–Narvik), Alta, Kirkenes, Bodø, Trondheim, Bergen, Murmansk, Arkhangelsk, Svalbard, and during selected periods of the year, to Stockholm. You may also travel by ship to neighbouring towns in the region.

The Coastal Express (Hurtigruten) has daily departures from Tromsø year round, both to the north and south.



FOTO: AUDUN RIKARDBSEN

TROMSØ REGION FACTS

- Tromsø – the Arctic capital has a population of approximately 75,000
- The University of Tromsø is the northernmost university in the world with a total of 9,000 students and 2,700 employees
- The University Hospital of North Norway has 6,000 employees
- FRAM Centre, the High North Research Centre for Climate and the Environment, hosts amongst others the Norwegian Polar Institute and the Arctic Council

BIOTECHNOLOGY

- Approximately 500 researchers are engaged in biomarine sciences at the University and eight other R&D institutions
- There are around 25 biotech companies in the Tromsø region with around 500 employees. These biotech companies develop and produce products applied within
 - Nutraceuticals
 - Cosmeceuticals
 - Medical devices & applications
 - Drug discovery
 - Molecular diagnostics and engineering
 - Analysis & consultancy services
 - Aquaculture
- The national marine biobank – Marbank – is located in Tromsø
- Tromsø has a national leading role within marine bioprospecting and hosts MabCent SFI – Centre for marine Bioactives and Drug Discovery
- The national pilot facility for marine bioprocessing is located in Kaldfjord, nearby Tromsø
- Tromsø Science Park has a significant focus on life science
 - The Barents BioCentre hosts common infrastructure and modern high-tech laboratories for rent
 - Innovation actors focus on life science, offering services and support such as incubators and business development
- BIOPROSP – the International Conference on Marine Biotechnology – is arranged every second year in Tromsø



www.biotechnorth.no



Tromsø kommune

www.tromso.kommune.no

MABIT

www.mabit.no

2012