



NTNU 2005

Research Education Innovation Dissemination

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NTNU:

Innovation and Creativity

The Norwegian University of Science and Technology (NTNU) in Trondheim represents academic eminence in technology and the natural sciences as well as in other academic disciplines ranging from the social sciences, the arts, medicine, architecture and the fine arts. Cross-disciplinary cooperation results in ideas no one else has thought of, and creative solutions that change our daily lives.

This brochure provides a taste of NTNU's diverse activities.

Read more at www.ntnu.no



The front page shows medical technology. Photo: NTNU Info/Ole D. Hesledalen
 Photo back page: NTNU SA/GT Nergård. Photo above: NTNU Info/Rune Petter Ness.
 Photos, pages 3, 8, 14 and 19: NTNU SA/Lars Martin Kræmer, Statkraft, ENGAS/Morten Grønli and NTNU Info/Rune Petter Ness.
 All photos p. 24: NTNU Info/Rune Petter Ness





Eight out of ten graduate engineers in Norway are educated here at NTNU.

NTNU is responsible for technological education nationwide, awarding approximately 80% of all Master of Science/advanced engineering degrees in Norway.

We specialize in technology and the natural sciences, but we also offer a wide selection of programmes in arts and aesthetics as well as the humanities, social sciences, economics and business and public administration.

We also award degrees in medicine, psychology, fine arts and music, and offer a comprehensive teacher education programme as well as a Master's programme in entrepreneurship.

In 2004, based on the Quality Reform, we further developed our programme structure. We revised the grading system, and established more study programmes and fields of study to make the alternatives clearer.

The figures for 2004

53,000 applicants for university entrance

8,500 primary applicants

20,000 students were registered in total

2,800 graduated

190 doctorates awarded

1,100 foreign students at NTNU

1,000 NTNU students studying abroad



Experts in Team cooperate with children from Singsaker School. ©Photo: Rune Petter Ness.

Cross-disciplinary experts

By mixing creativity and humour with anything from history to maths, NTNU creates Experts in Team (EiT).

Experts in Team is a compulsory subject in most Master's programmes at NTNU. Through cross-disciplinary challenges the students are trained in creative thinking and problem solving, and not least; they get a glimpse of how working life could be once their studies are finished. The experience from EiT is highly important as cross-disciplinarity spreads within

research, industry and the public.

The cross-disciplinary sphere often produces new methods and ideas, and the students are taught how to take advantage of this. They are split into cross-disciplinary teams called «villages», and each village has its own team leader, or so-called «village chief». The groups deal with

different themes and try to solve different problems, which could be anything from finding new methods for teaching scientific subjects in primary school to constructing hover trains in Trondheim.

EiT on the web: <http://www.eit.ntnu.no/>

Musical jubilee

Twenty-five years ago somebody had a bright idea: What if we establish a separate study programme for jazz musicians in Trondheim?

Since then, the «Jazz Course», which is a part of the Music Conservatory at NTNU, has been a concept in Norwegian musical life. This study programme may have had more influence on Norway's music than any other institution during the past 25 years.

environment where personal development is central. Several of today's prominent jazz musicians have their background from the Jazz Course. In 2004, jazz students from Trondheim released a concert CD with Chick Corea.

The Jazz Course has attracted talented students and provided a unique training

The Jazz Course on the web: www.jazzlinja.no



Photo: NTNU Info/Rune Petter Ness.

A Master's of the fit kind

A new Master's degree could be of great importance to the sports environment in Norway.

International Master of Science in Exercise Physiology and Sport Science is the title of the new Master's degree at The Faculty of Medicine.

Scientists from exercise physiology environments are constantly producing sensational results regarding both exercise methods and prevention of injuries. This knowledge is now to be continued through this new study programme. The subject is aimed at students with a solid background of physiology from health studies – such as nursing, occupational therapy, physiotherapy, biology or physical education subjects.

The students who graduate will be updated on research related to exercise and exercise effects, which equips the candidates to offer updated exercise guidance to athletes. The education includes exercise and exercise effects with the main focus being on the muscles' uptake and transportation of oxygen. The subject also includes theories and exercise methods in connection with diseases such as diabetes type II, osteoporosis, and COPD.

Several reputable coaches from Norwegian and international athletics have their background from this professional environment.



Photo: NTNU Info/Rune Petter Ness.

Student assignment caused uproar

A student assignment from a group of architect students caused emotional and political uproar, both within and outside the university.

The cause for the storm was that many people missed the fact that a brochure from the Faculty of Architecture and Fine Art was a student assignment. They thought it was a real plan from the university's management.

But they were wrong. The assignment, which was aimed at designing an overall development plan for Gløshaugen, was

part of a new project at the faculty: The students' work was organized to resemble a normal architectural office. The result was a description of Gløshaugen with outdoor areas and buildings, analysed in detail.

Over the past year, the discussion on how the entire NTNU could be localized at Gløshaugen has been a hot topic at the

university. The so-called «co-localization debate» deals with a possible re-localization of the faculties of humanities and social studies from Dragvoll to Gløshaugen, which already houses the technological and scientific faculties.

Despite the uproar – the students were awarded an A for their project.

How to create better researchers

Several NTNU students choose to spend their final year on an «integrated PhD degree» – an offer which involves slashing a year off a completed PhD study.

This new offer has many positive sides. It is not just a separate education for those who want to be researchers – it also provides the students with a more practical introduction to a researcher's everyday life. In addition, the time spent completing the PhD is reduced by a year.

The candidates are admitted to the PhD programme before they have completed their Master's, i.e. after the fourth year on the advanced engineering study. The

final year is a combination of the ordinary study programme and a PhD.

The arrangement has been approved for the following faculties:

Programme for Marine Technology (Faculty of Engineering Science and Technology), and Department of Computer and Information Science (Faculty of Information Technology, Mathematics and Electrical Engineering).



Pier stability – inspection of wave breaking. • Photo: Rune Petter Ness.



Educational exhibition at Oslo Spektrum, 20–21 January. Kari Støre Gulliksen is Head of the NTNU stand. • Photo: NTNU Info/Arne Asphjell.

Super recruiting at NST faculty

Active co-operation with the Norwegian industry has attracted more and better students to the Faculty of Natural Sciences and Technology.

In 2001, 69% of the materials technology students and 50% of the chemistry students failed in mathematics. Last year, the figures had dropped to 8% and 4% respectively. The reason behind this positive development is «Forum for Co-operation», a binding, co-operative project between the faculty and 22 enterprises.

«In brief, industry tells us which qualifications and students they need, and then we act on that,» says Fredrik Steineke, Project Coordinator. He believes having students alongside industry representati-

ves on the board of the Forum is one of the success factors.

The project has led to a renewed focus on recruitment and the drafting of a recruitment plan with clear objectives. In practice, students from the faculty go back to their old schools where they know the teachers and perhaps some of the students, and talk about the study alternatives.

In addition, the faculty takes very good care of its freshmen. They are offered extra lectures in mathematics and follow a

programme that evidently pays off.

Forum for Co-operation activities include:

- Initiatives aimed at the educational system where the goal is long- and short-term recruitment;
- Participating enterprises taking part in the guidance and support for the implementation of PhD degrees, Master's theses and projects;
- Participating enterprises hiring students for summer jobs.

Laboratory Master

Within certain fields, rapid development creates a constant need for new experts. That is why a Master's degree in Molecular Medicine has been established at NTNU.

After the mapping of the human DNA, the need for qualified personnel in laboratories has exploded. Researchers discover ever more about molecules in living organisms, and to keep up the pace, they need up-to-date knowledge from various fields. Students from this Master's programme qualify for management responsibilities in

molecular biology laboratories. The establishment of the Master's programme in Molecular Medicine is a further development of the long-standing co-operation between the Faculty of Medicine and the undergraduate Bioengineer programme at Sør-Trøndelag University College.

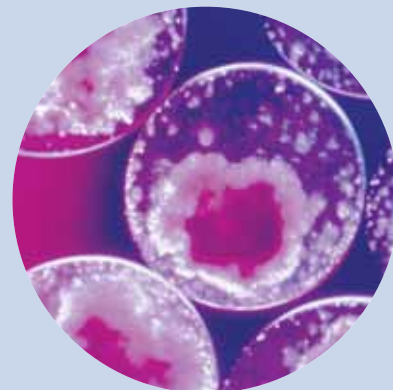


Photo: Damon Biotech/Dept. of Biotechnology

Satellite signed NTNU

Hopefully, the student satellite NCUBE1-Rudolf will shortly be sent into orbit. It will keep an eye on wild reindeer on the Hardangervidde from space.

NCUBE1-Rudolf, who got its curious name after a competition for pupils from fifth to tenth grade last year, will be launched from Baikonur in Kazakhstan at the end of May. It will be followed by the somewhat larger NCUBE2 in July, launched from Plesetsk near Archangelsk, Russia.

Norway's first student satellite will watch the wild reindeer on the Hardangervidde from above. In co-operation with the Norwegian University of Life Sciences, a collar has been developed that finds the reindeer's position via a GPS receiver. A transmitter in the collar broadcasts the position at regular intervals, and these signals are transferred to the satellite. In addition, the satellite can be used to improve ship traffic safety. A GPS receiver «sees» the ship's position and adds information about the ship's speed, course, cargo, name, and destination.

The satellite project, which started with an Experts in Team assignment in 2002, has become highly cross-disciplinary. The need for specialised transmitters and receivers, as well as stabilizing and positioning systems, has speeded up several professional environments at NTNU: the Department of Engineering Cybernetics, the Department of Mechanics, Thermo and Fluid Dynamics, and the Department of Telecommunications have all been involved with this work.

Today, two students and three staff members (one at NTNU and two on Andøya) work on the satellite project. One of them is Bjørn Pedersen at the Department of Electronics and Telecommunications.

«This project is not only cross-disciplinary. It has also been necessary to



Photo: NTNU Info/Nina Tveter

exchange knowledge across educational institutions and countries. The main ingredient, which is the satellite's mechanical structure, was the result of co-operation between California Polytechnic and Stanford University,» says Pedersen.

In addition, students at Narvik University College designed parts of the power supply and developed two ground stations for downloading data from the satellite. One

ground station is in Narvik and the other on (Spitzbergen) Svalbard. The University of Oslo designed and produced the mechanical structure, and the Department of Energy and Process Engineering and the University of Bergen designed the solar panels. The project was initiated and financed by Andøya Rocket Range and the Norwegian Space Centre.

On the web: www.ncube.no



Photo: NTNU Info/Tore Oksholen

Technology testing

Improvisation and role playing yield answers to which technology the hospital world needs.

Sometimes, new technology adopted by hospitals is less than optimal. The method «technology improvisation» is a tool used to map technology «vacuums».

The basic principle is simple: Real doctors and nurses play out a hospital

scenario until a need arises or the potential for new technology or new ways of using existing technology emerge. When this vacuum appears, the scene is frozen and the specific need is visualized through drawings and explanations.



Interdisciplinary cooperation keeps NTNU at the top

NTNU is at the forefront of technological research and education in Norway, with its foundation in the natural sciences. Our goal is to ensure that Norwegian technological competence remains at a high level internationally.

In 2004, the Faculty of Engineering Science and Technology was evaluated by the Research Council of Norway, and the results ranged from positive to very positive. The evaluation reveals that NTNU's research activities are at international levels.

NTNU puts a premium on interdisciplinary cooperation across academic disciplines and hopes to facilitate creative teamwork in all its subjects: Technology, the arts, the humanities, medicine, social science, architecture, and natural science.

The academic disciplines at NTNU and SINTEF cooperate on research, innovation and business development at ten Gemini centres.

The figures for 2004

6,000 scientific publications

1,300 research projects with external financing

30 research projects in the EU's 6th framework programme

13 Marie Curie training sites in the EU's 5th framework programme

6 strategic areas

10 Gemini centres in cooperation with SINTEF

3 Centres of Excellence

Telling Trøndelag's history

NTNU Archaeologists and historians have gathered Trøndelag's history into three volumes.

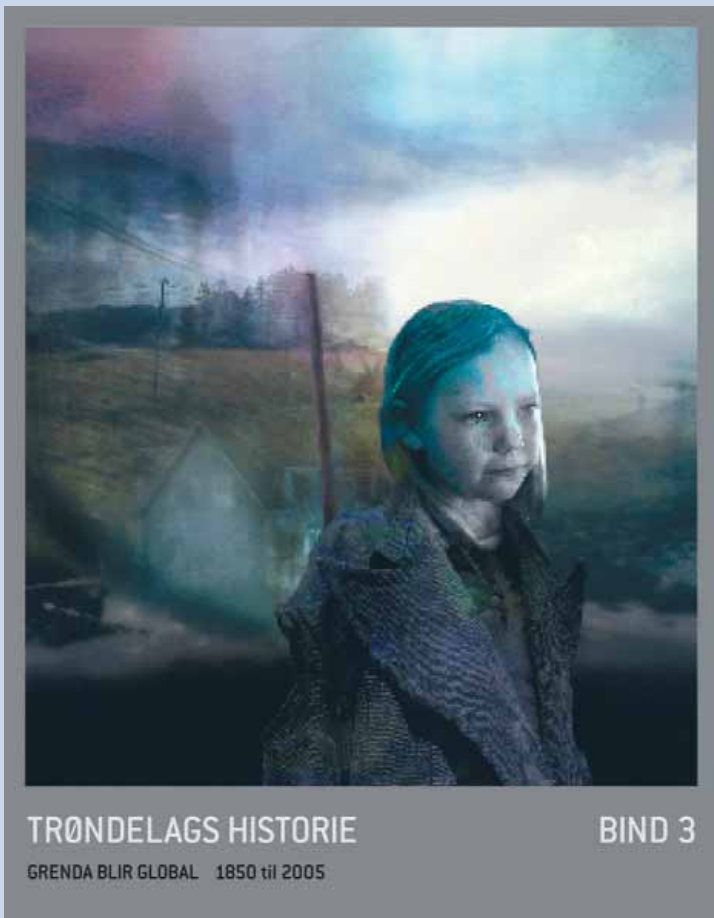


Illustration: Tapir Akademisk Forlag

The story of Trøndelag is a long one. Contributions from eleven writers were necessary before the work was complete. A great amount of Trøndelag's history is included in Norway's national history, in periodicals and numerous local history books, but this is the first time the entire region is presented in its entirety. Chief editor Ida Bull at the Department of History and Classical Studies promises her readers several gems and stories never previously told.

The first volume is called «Landskap blir landsdel» (Landscape becomes region) and deals with as much as 9000 years of Trøndelag's history. The book opens with an introduction to the hunter groups who first started using this landscape after the last Ice Age, and rounds off in the Middle Ages. Volume two, «Fra pest til poteter» (From plague to potatoes), presents the period from the late Middle Ages and the great plague up until the end of the 1700s. At that time, Trøndelag was drawn into an international trading economy, which became one of the regional industry's characteristics. The final volume, «Grenda blir global» (The village goes global), begins with industrialism and class differences, and ends in the present.

These books were written in cooperation between NTNU and the counties of Trøndelag. Picture editor is Kirsti Moe from NRK.

The fastest at sea

At the Ship and Ocean Laboratory they are currently giving the finishing touch to a ship 300 metres in length and slender like a pen.



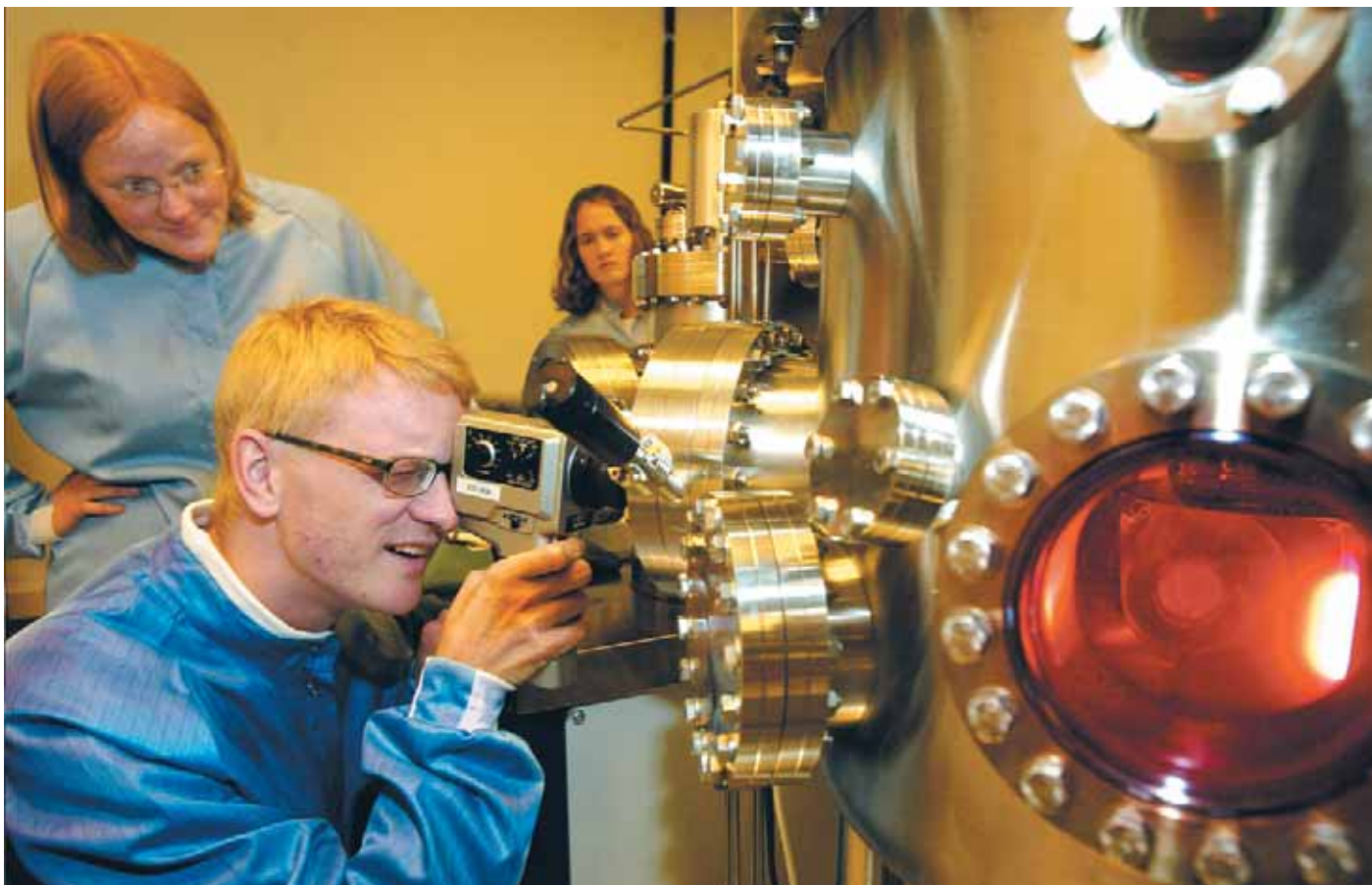
Illustration: MARINTEK.

Modern propulsion technology, advanced calculation programmes and creative engineers are all it takes to create a pentamaran – the super-fast cargo ship of the future.

SeaBridge is the name of the ship, constructed and designed at MARINTEK (part of SINTEF) in close cooperation with the British consultancy company Nigel Gee and Associates Ltd. The ship has five hulls – because the main hull is so long and narrow, it needs four supporting

hulls to maintain its stability. SeaBridge crosses the Atlantic in less than a week – even fully loaded.

The unique shape allows the ship to reach a speed comparable to that of land transportation: The cruising speed is as high as 40 knots (46 mph). Once the ship is launched, the plan is for it to transport heavy cargo along the North American coast, in the Mediterranean and between Northern and Southern Europe.



Thomas Tybell looks into an optic thermometer to check the temperature. • Photo: NTNU Info/Rune Petter Ness.

Major nano research

The nano research at NTNU is extremely promising. So we are building our own laboratory.

Nano researchers can move atoms and give materials certain qualities we have never seen before. So it doesn't take much to realize that the new NTNU Nano lab is but the start of something big.

In the lab, experiments at atomic level will be conducted – and we are really talking microscopic levels here: The pro-

portion of a nanometre to an ordinary metre is the same as that of a marble to the Earth, and the size of an atom is 1/10 of a nanometre.

NTNU's efforts within nanotechnology are cross-disciplinary: Both chemistry, physics, biology, electronics, and medical technology contribute to this work. The

building of the laboratory has already started, and this new resource provides new opportunities for a relatively young field within science. Some of the subjects chosen for further research are nano-electronics, bio-nanotechnology, and nanostructured materials.

How heavy is knowledge?

The mystery behind the term knowledge is the core of one of NTNU's priority areas for cross-disciplinary research.

In short, the main task of Forum for the History of Knowledge is to twist and turn, weigh and measure the term knowledge: What is knowledge? How does it come into being? How can we maintain it, organize it and renew it?

The forum is open to all academic disciplines, and the purpose is to initiate discussion, analyse and interpret the shapes and

mixtures of knowledge – from both historic and contemporary perspectives. The themes for the forum are globalisation, bioinformatics/bioethics, the technical room of mobility, knowledge history and creative group processes in cross-disciplinary teams.

Knowledge history on the web:
<http://www.ntnu.no/ffk/>



Photo: NTNU Info/Ole D. Hesledalen.

Hydrogen in focus

The discovery of hydrogen's properties at low temperatures and high pressure awarded Professor Asle Sudbø the cover story of the prestigious periodical *Nature*.

Asle Sudbø, Professor at the Department of Physics, has become a pioneer in the work on metallic hydrogen under extreme conditions. Some claim that his research represents a change of paradigm within this field of physics. So far, Sudbø and his PhD students have only made theoretical calculations of the new super fluid, by using NTNU's super-computer.

The hydrogen atom is the simplest atom as it consists of only one proton and one electron. At normal pressure and temperatures it is a gas. The discoveries made by the Department of Physics show that when hydrogen is exposed to extreme conditions, the gas is transformed into a metallic liquid – a liquid consisting of superconductive protonic and electronic liquids.

Sudbø's team discovered that the double superconductive property only occur at



Professor Asle Sudbø (right) and doctoral candidates Jo Smiseth (left) and Eivind Smørgrav. Photo: NTNU Info/Arne Asphjell.

minus 250° Celsius and at a pressure of 4 million atmospheres. And where are these conditions found? Well, researchers at Cornell University in USA are getting there by compressing hydrogen

into a small diamond cube. In cooperation with the NTNU team, the research team at Cornell hope to reach their goal within five years.

Advanced successor

A brand new «tailored» marine research vessel will shortly be docking at NTNU.

NTNU's research vessel Harry Borthen will be taken out of service, and its successor has already been ordered. The size of the new vessel will be modest, but in return it is equipped with state-of-the-

art marine technology. The ship is designed to accommodate a maximum of twenty students for teaching purposes. The vessel will also form the basis for oceanographic research, marine technology,

marine geology, fisheries research and marine biology. The ship is being built in Ålesund and the plan is to put it into service in February 2006.

Energetic pool

Energy sources are sometimes difficult to keep track of, but now at least NTNU and SINTEF have pooled their competence in this field.

Wave energy, hydropower, wind energy, solar energy, biomass, waste, hydrogen, and salt power are now gathered under one roof, even though the Centre for Renewable Energy (SFFE) is not a physical organization. It is rather a «superstructure» across departments and faculties.

For several years, both NTNU and SINTEF have made important

contributions within this type of research, but the need to gather all loose ends has been obvious. One of the cooperation objectives is to arouse interest in the industry. The structure is made up of a close network of researchers and a very modest administration and management team.

SFFE on the web:
<http://www.ntnu.no/sffe/>



Solar panels for demonstration. Photo: NTNU Info/Elin Fugelsnes.



Photo: NTNU Info/Rune Petter Ness.

Focus on Globalization

NTNU has chosen Globalization as a new thematic priority area.

Five of NTNU's priority areas are related to our technical and scientific profile. The sixth, Globalization, is primarily based in the humanities and social sciences. Some 140 researchers and 150 posts for recruitment at 28 institutions and six faculties, work on problems related to Globalization. Several of these have already drawn international attention.

The priority area is split into two:

- Production systems in a globalized world: How does the production of goods and services in one country affect production in others, and how may individual participants differentiate themselves when competing with others? Researchers will look for common patterns of particular importance to Norway.
- Cultural and social expressions of globalization: Which cultural and social expressions deal with changes in pat-

terns of cognition and interaction, and what is the significance of these changes?

Across these focus areas, three perspectives are particularly interesting: Historical processes, political and economic framework conditions, and ethical dilemmas.

Globalization on the web:
<http://www.ntnu.no/global/>

Away with paper files

Electronic patient records are regarded as one of the greatest information technology challenges for the health service. That may be the reason why NTNU is in charge of the Norwegian Centre for Electronic Patient Records (NSEP).

The purpose of introducing electronic patient records is to replace the current system of paper records with a computer-based filing system. And it is not just the task of finding new information technology systems for the health service NSEP is going to solve – they will procure whatever necessary to make such a system.

Researchers at NSEP look at how personally oriented health-documentation systems are designed, realized and used. In addition, they have a laboratory for testing of new technological ways of documenting patient information.

NSEP on the web: <http://www.ehr.ntnu.no/>



Photo: NTNU Info/Rune Petter Ness.

Laparoscopy – the surgery of the future

Wireless and digital transmission of information, speech-operated solutions, and extensive use of laparoscopy give shorter convalescence periods and reduce the risk of complications.

«The surgery of the future» at St. Olav's University Hospital houses the newest and most modern surgical equipment. Wireless and digital transmission of information, speech-operated solutions, and extensive use of laparoscopy and advanced visualizing techniques shorten the patient's convalescence period and reduce the risk of complications.

The two surgeries are equipped with new and modern technology in addition to solutions developed by researchers at NTNU and SINTEF through long-lasting cooperation at national competence centres. One of the surgeries is custom-built for endovascular treatment, and the other for treating abdominal diseases by means of laparoscopy.

«By using laparoscopy, we can offer our patients better treatment. This new technology allows us to conduct surgical operations with shorter convalescence periods and reduces the risk of complications. The incision we operate through is only one centimetre long. The patients are therefore often ambulatory the following day,» says Torill Hernes at the Department of Circulation and Medical Imaging and Head of Research within medical research and development work at SINTEF.

All information is digitally and wirelessly transmitted by means of speech-operated solutions with a reduced «brain» in each unit.

In an amphitheatre above the surgeries, an auditorium is under construction for students and visitors. Here the students can pay close attention to the activities down in the surgeries. They may even ask questions directly to the surgeon during the operation and otherwise observe by means of advanced display solutions.

Several large, international equipment vendors have taken a great interest in this project.



Photo: NTNU Info/Kim Nygård.



Close cooperation with Norwegian industry yields results

NTNU places great emphasis on research cooperation with Norwegian industry, and offers several courses on innovation. This work has produced results - NTNU students have won several competitions and been awarded prizes related to innovation.

NTNU participates in the project Innovasjon Midt-Norge with industry in Leksvik, Verdal and Orkanger. The students contribute with project assignments and trainee places for the development of the enterprises, at the same time as they gain relevant experience. SIVA, Innovation Norway and the university colleges in the counties Nord- and Sør-Trøndelag are also involved.

The figures for 2004

300 research projects in cooperation with industry

NOK 220 million in industrial funds to NTNU in 2004

180 new business ideas passed on for commercial use

9 new businesses originated at NTNU

14 subjects and study programmes in innovation and entrepreneurship

Hand in hand with Hydro

Close cooperation with industry means improved quality of research and education. NTNU cooperates with several of the most important participants, the largest being Hydro.

The cooperation is naturally related to Hydro's major business areas: oil, energy, and light metals.

Close cooperation with a group like Hydro is essential to a research and educational institution. To NTNU it means easier access to the problems within the industry, and improved opportunities to stay ahead in research.

The petroleum sector

Through the scholarship programme Norsk Hydro-NTNU, the industrial giant supports several large projects at the Department of Marine Technology and the Department of Petroleum Engineering and Applied Geophysics. In 2001, the same year as the cooperation began, Hydro established a Virtual Reality Lab along with the latter.

During this programme period, Hydro has supported a field excursion to the Pyrenees, three PhD students and the purchase of laboratory equipment, in addition to several travel grants for lecturers and doctoral candidates in connection with article presentations.

Light metals

The cooperation in this field involves aluminium, particularly primary aluminium (the production of the metal), and secondary aluminium (the production of aluminium products).

The research environments focusing on primary aluminium cooperate with Hydro on the projects CarboMat and



Photo: NTNU Info/Paul Sigve Amundsen.

ThermoTech. The former deals with carbon materials while ThermoTech concerns thermodynamics, incombustible materials, and mathematical models. «These projects promote continuity and development of NTNU's fundamental and applied research,» says Trygve Foosnæs, professor in light metal production and high-temperature chemistry.

When it comes to secondary aluminium, NTNU and Hydro also have common interests. Hydro is involved in material

physics, process metallurgy, physical metallurgy, mechanical metallurgy, and electrochemistry. They also participate in certain projects, including casting and congelation of semi-products, design, production and testing of car components (crashworthiness and fatigue), and the development of a HVAC system based on CO2 technology from NTNU and SINTEF. The system is patented in Europe, the USA and Asia. It has been commercialized by Shecco Technology, a Hydro-based firm.

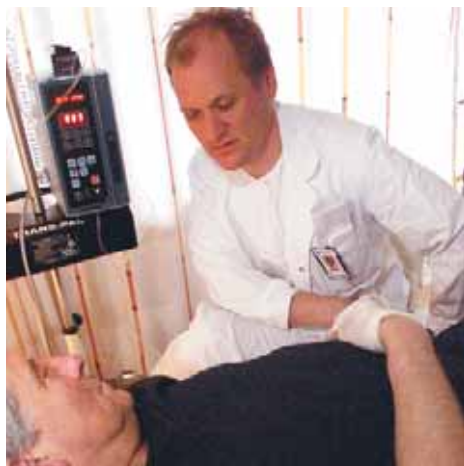


Photo: NTNU Info/G.K.

Patented pain

At the doctor's:

«Does this hurt?»

«Ouch!»

«Oh, sorry.»

When we talk about pain, it hurts more. More than one study has shown that this very communication is the largest limiting factor for good pain treatment. But how can pain be proven without the patient saying where it hurts?

The answer could be PAT-C, Palliative Assessment Tool – Computerized. This is an international research project develop-

ping a computer-based diagnostic tool that can be used on patients suffering from pain. In the initial project phase, the researchers will concentrate on patients who receive palliative treatment. Professor Stein Kaasa, Head of the Department of Cancer Research and Molecular Medicine at the Faculty of Medicine leads this project.



NTNU Technology Transfer Office AS – TTO. •Photo: NTNU Info/Arne Asphjell.

Sitting on a gold mine

NTNU Technology Transfer AS (TTO) holds 250 ideas from the university environments in its hands.

Some of these ideas are fresh, others more mature. The common denominator is that they are based on research results from NTNU. The incoming ideas are individually evaluated with regard to commercial potential. If they prove to have commercial potential, an optimal strategy is planned. The goal is to turn the research into new businesses and new work-

places. TTO is a tool for students and researchers with research-related ideas, and the portfolio currently holds 250 projects at various stages.

The company's principal task is to look at NTNU's activities and knowledge with a view to commercial use and value creation in society. TTO is a wholly-owned subsidi-

ary of NTNU and assists with communication, international networking, financing, and legal counsel in the commercialization process. NTNU Technology Transfer AS shares the focus of NTNU's strategic areas.

TTO on the web: www.tto.ntnu.no

Most modern in Europe

Once the integrated St. Olav's University Hospital in Trondheim is completed, there will be nothing to compare to it.

The building of the hospital is currently in Stage 1, and September 2006 will witness the opening of the Women-Children Centre, the Neuro Centre and the Laboratory Centre – the main building for research and teaching. A new Patient Hotel has already been inaugurated.

The new St. Olav's University Hospital will be a giant of some 200,000 square metres,

with multiple buildings and similar activities located on the same floor: Polyclinics on the ground floor, surgeries on the first floor and wards on the upper floors. The new St. Olav's University Hospital is also Norway's most complex ICT project. In this project NTNU has a central role.

The University Hospital on the web: <http://www.helsebygg.no/>



Photo: SINTEF Health Research.

Atmospheric freeze-drying



Photo: NTNU Info/Rune Petter Ness.

On the Hungarian plains, a factory for drying food «the NTNU way» is being built.

The factory, called Agro Aroma Nagyátad, has been established by NTNU's spin-off Dtech, working with Felleskjøpet and a Hungarian canning company.

«The factory is located more or less in the middle of a cornfield. That means extremely low transportation costs and a full overview of the raw materials,» says Professor Ingvald Strømme, who has spent 25 years of his working life dehydrating food. Professor Strømme is behind the technology and is one of the founders of the company Dtech.

Dtech holds several patents for the so-called atmospheric

freeze-drying method. Researchers at NTNU and SINTEF have spent years trying to «compose» this method. Compared with competing methods, it provides high product quality and is cost-effective as well as being both energy and environmentally friendly. Atmospheric freeze-drying is also very flexible in relation to changes in quality and costs.

The process, in short, is that the foodstuff is sent into sub-zero regeneration air which gradually reaches 20° Celsius. Drying food industrially reduces the humidity, condenses the water vapour, and preserves the heat.

Correct transfer from NTNU

The company Adactus may place Trøndelag on the mobile technology map.

Their business idea is to develop products based on modern standards for telecommunication. The tool is a new international standard for digital transfer of sound and images: MPEG-21.

When Norway starts using 3rd generation mobile telephony, UMTS, the need for software for transferring live images will arise. The challenges are to transfer images, video, and sound quickly and smoothly

to a wide range of terminals. This isn't easy as the terminal equipment can vary widely.

MPEG-21 is a so-called open framework for this kind of transfer. In practice, it means that the transfer unit maps the receiver equipment before starting the transfer. One of the major advantages is that the content supplier may disregard any difference in equipment since the pro-

cess happens automatically.

«MPEG-21 is the first standard that deals with correct handling of digital media resources,» says Peder Drege, manager of Adactus. His master's thesis laid the foundation of the company. Peder Drege is working in cooperation with Associate Professor Andrew Perkins and the community around Midgard MediaLab.

The idea boiler

Start NTNU is a shortcut for inventive NTNU students.

Many people have good ideas. But there is a lack of people who dare realize them. 'Start NTNU' is a student organisation that attempts to shorten the path from idea to action. The challenge is to prompt students and employees at NTNU to start their own businesses. In addition to informative homepages and numerous events and meetings, they run several projects, including:

- Venture Cup: A competition where the winners receive prize-money and the opportunity to develop

their ideas in cooperation with experienced entrepreneurs, business managers and professional investors.

- IdéAthlon: An arena for innovation where experts, students, and industry get together to generate ideas for student projects and master's theses.

- The project Girls and Innovation: Events for girls with ideas and the will to create something.

Start NTNU on the web:
www.startntnu.no



The firm ShipScan won the Venture Cup 2004. • Photo: NTNU Info/Arne Asphjell.

Business in culture

The Faculty of Arts is actively involved with NTNU's innovation and business development work.

The innovation projects at the faculty consist of two parts:

Internal competence building for students and employees, and the implementation of selected pilot projects which are closely followed. The ongoing pilot projects are:

The translator assistant

Today, we have robust, statistically based translation systems for English and certain other languages. Systems memorizing identical texts, preferably translations, are also used, but without any emphasis on Norwegian. A combination of these technologies stands out as particularly interesting to enterprises that need to translate documents from Norwegian to English, or vice versa. This is a cooperative project between the Department of Language and Communication Studies and the company LingIT AS. A demonstration tool, showing the method's technical and linguistic potential is under development.

Jazz as an export article

The business idea is to organize the export conditions for highly qualified Norwegian jazz musicians. The target group is anyone demanding live jazz music.

There is a great need for jazz musicians, but the limitations lie with the tight budgets of the individual arrangements. The Norwegian market is small and transparent, but booking abroad requires competence within sales, culture, and language as well as a network. Product and music competence is also necessary.



Photo: NTNU SA/Cathrine Dillner Hagen.

NTNU develops talents through the Jazz Course. The project deals with product development following this talent development – for NTNU students as well as for others.

Symbolic methods

In the project SIMAS, humanistic theories will shed new light on the interpretation of tools programming languages.

The project is an interdisciplinary cooperation between the Department of Language and Communication Studies at NTNU and the Faculty of Informatics and

e-Learning at Sør-Trøndelag University College.

Humanistic theories on language and communication are used to shed new light on how the symbolic tools in programming languages shape the way humans interpret problems and solutions. The emphasis is both on the possibilities and the limitations of existing programming languages. Based on this insight, new programming methods and tools providing new possibilities and solutions to existing limitations will be developed.

Shortening the wait

Using traditional methods, parents have to wait up to two years before they know whether or not their child has cerebral palsy. With LADDE, it will take three months.

The project LADDE develops a computer-based diagnosis tool for classification of cerebral palsy (CP) in new-borns that are ill.

The tool is efficient in a number of ways: When the child is three months old, an indication of CP will be clear. LADDE also contributes to the reduction of expenses in the public health service.

NTNU Technology Transfer (TTO) is behind the commercialization of LADDE, which has

been developed by Lars Adde, an expert in paediatric physiotherapy at the Faculty of Medicine.

LADDE has already been put to use: At the paediatric intensive care unit at St. Olav's Hospital, Trondheim, a laboratory for registration and analysis of children's spontaneous movements has been built. So far, 100 children have been examined at the laboratory.



Photo: NTNU SA/Kim Ramberg Haug.



The university plays a vital role in its dissemination of knowledge

Among NTNU's most important responsibilities is the crafting of a more positive image of technology and the natural sciences, as well as student recruitment.

As part of this effort, the university arranges discussions, seminars, exhibitions, and public lectures outside the university's walls. The university's own publications, such as the research journal Gemini, Spor (Footprints), and the web newspaper Universitetsavisa.no are also vital information channels that provide research news to the outside world. Research results are also presented on the web page www.forskning.no, where NTNU is both a contributor and a co-owner.

7,000 articles in (the written) Norwegian media

400 articles in the national media

400 popular science and feature articles

600 popular science lectures

80 mentions and features in the TV shows Newton and Schrødingers Katt

34,000 visitors to the exhibitions at the Museum of Natural History and Archaeology

10,000 visitors to the research market in the centre of Trondheim during the 2004 Research Days

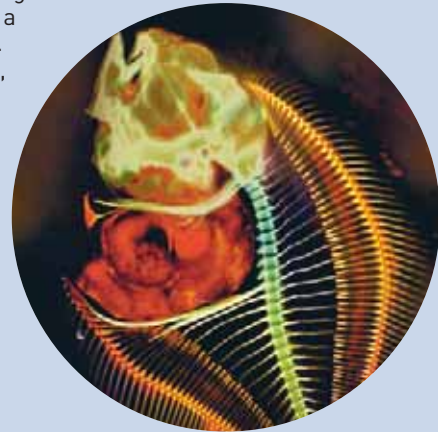
70 pieces included in the programme «Byen, bygdene og kunnskapen» (The Town, Rural Areas and Knowledge).

The figures for 2004

Ready-made fillets

Research dissemination could be so many things. It is often about showing what has never been seen before – and in a totally different way.

Tora Bardal, a bioengineer at the Department of Biology, usually photographs thin sections of tiny organisms for research purposes. The motifs are caught using light microscopes and a magnifying glass. In her spare time, she takes a more artistic look at her research. The pictures are treated with colours to emphasize structures and shapes in the natural patterns in tissues and skeleton.



All photos: Tora Bardal.

A popular museum

The Museum of Natural History and Archaeology in Trondheim has had a very busy year with a lot of activity and a large number of visitors. It has also been through a rebuilding process – which provided headroom for dinosaurs!



Photo: NTNU Info/Beate Horg

Beautiful columns and carvings emerged as the museum was renovated. This 'new' interior created the perfect frame for the exhibition «From deadly dinosaurs to the oil age», which included a 13 metre long and 5 metre tall Tyrannosaurus Rex.

As a supplement to the touring exhibition, the concept «From early geological periods to the oil age» was introduced. This production was the result of cooperation between NTNU, SINTEF, NGU and Statoil, and offered the general public lectures as well as exhibitions of drill bits and geological findings.

The Museum on the web:
<http://www.ntnu.no/vmuseet/>

The publicity-craving faculty

A unique dissemination project has made the Faculty of Medicine (DMF) top of the class in dissemination to the general public at NTNU.

The project itself is finished, but DMF has no plans of stopping here. It is currently working on casting an even stronger foundation in a growing dissemination culture. The latest news is that DMF is hiring its own Information Consultant.

To many researchers, dissemination of research to the general public is the most difficult part of their job. Researchers are not supposed to «push themselves forward», and in addition, the dissemination element is often given a lower priority,

for the sake of teaching and research.

In 1999, the management at DMF decided to take researchers' obstacles seriously, and headed by Faculty Dean Gunnar Bovim, they initiated the dissemination project. Today, six years later, they have achieved impressive results, including a doubling of the number of media features.

The project itself involved work in several areas, and some long-term measures were implemented: An internal group

identified about one hundred research projects; a class auditor arrangement for external journalists was established; the faculty initiated its own dissemination prize; and an adjunct professor in dissemination was hired.

The faculty has also started rewarding dissemination to the public in connection with budget allocations for the departments: The more that is disseminated to the public, the more money in the account.

Research out to the world

Last year, researchers at NTNU produced a total of 8,000 articles and lectures.

Some of them really distinguish themselves: Researchers at the Faculty of Medicine and the Department of Biology publish as never before. One of the reasons could be their arrangements that award and credit those who publish their work in international refereed journals (see: The publicity-craving faculty). «That prompts people to

make the extra effort,» says Eivind Røskaft, Head of the Department of Biology, in an interview for the newspaper *Universitetsavisa*.

The publication figures are taken from the research database Frida, which records all professional, scientific and popular science work produced at NTNU.



Head of Department Eivind Røskaft (right). ©Photo: NTNU Info/Synnøve Ressem.



The Research Market 17 September, 2004. • Photo: NTNU Info/Rune Petter Ness.

Active research days

In the warm autumn sun, NTNU occupied the centre of Trondheim with its fascinating research, displays, and activities for the townspeople.

NTNU's informative «occupation» of the town centre has become an annual tradition, and this year the Research Market lasted for two days instead of the previous one. The extra day – a Saturday – turned out to be a major success – more than

10,000 people stopped by.

Nearly 30 stands were put up and the public could test their skills in a ski-jump simulator, make slime, be their own power station, and work in a laboratory

where chemistry, physics, and biotechnology were the main ingredients. They could also become closer acquainted with their own hearts, and participate in a research project on text messaging and mobile phone habits.

New style

Gemini UNG: Research dissemination on youth terms.

How can we make young people interested in research? Mobile telephony, love, shopping, and music technology are some of the themes discussed by researchers in Gemini UNG – the first ever special youth edition of Gemini. The journal presents research unceremoniously and in a straightforward way, not least by taking youth interests seriously.

The target group is 15 to 17 years old. A total of 85,000 copies of the journal were distributed to junior and senior high schools all over the country.

Gemini UNG on the web:
<http://www.ntnu.no/gemini/ung>



Photo: NTNU Info/Kim Nygård.

Between town and university

A lot of exciting things take place at NTNU's laboratories. But what exactly happens in a dissemination laboratory?



Photo: Sverre A. Børretzen/Scanpix.

The knowledge park Faros is a new communication arena between town and university. The idea is to make a tool for research dissemination in different shapes and for various channels – all in the name of interdisciplinarity. NTNU's floorage at Kalvskinnet is the rendezvous for NTNU employees who wish to share their research results with colleagues and the rest of the town.

The first concrete result of Faros is the exhibition «TECHNE – technology and modern Norway 1905–2005», one of four exhibitions marking the anniversary of the termination of the union between Norway and Sweden. TECHNE displays technology history in a new

and untraditional way, by presenting the interaction between culture and technology through six stories: The Journey, Industrial Nature, The Factory, The Family, One Cure for Everything, and Fear and Control. Faros will open the TECHNE exhibition at the Museum of Natural History and Archaeology, Trondheim on 27 May 2005.

More projects are under development: «Signals», part of the cross-disciplinary project «Aesthetic values» at the Faculty of Arts which opens in the spring, and «European knowledge in Trondheim», a larger project for 2010 still at the planning stage.

Faros on the web:
<http://www.ntnu.no/faros>

Award Winning research dissemination

The research journal Gemini was elected Business Journal of the Year 2004.

«Research dissemination at its best.» That was the jury's verdict on Gemini. The journalists were also highly praised for their ability to make the articles interesting and relevant because they are placed in human contexts. The prize was presented at the autumn seminar for the Norwegian Communication Association.

In 2003, Gemini underwent a face-lift. The changes included a new layout and more pages. The result was a modern and topical journal that evidently makes an impression. Gemini is a joint venture between NTNU and SINTEF.

Each year six Norwegian issues and one

English issue are published. The 60,000 copies are distributed all over the country.

Gemini on the web:
www.ntnu.no/gemini

A university of innovation and creativity

This brochure has been created on the basis of NTNU's new communication platform.

The purpose of the communication platform is to provide NTNU with a clearer and more uniform image, and to boost the general knowledge of and about NTNU. Five promises and a slogan – «NTNU – Innovation and Creativity» – are at the heart of the communication platform and describe NTNU's identity.

The concept includes guidelines for visual and linguistic expressions. One

of the measures is to promote NTNU by actively publicising the best stories and results of the university.

The communication platform will be a tool in all promotion of NTNU. The platform was developed by the Information Division in close cooperation with an interdisciplinary process group and the advertising agency Bennett.



Cover of recruitment brochure (detail). Photo: Arild Juul.

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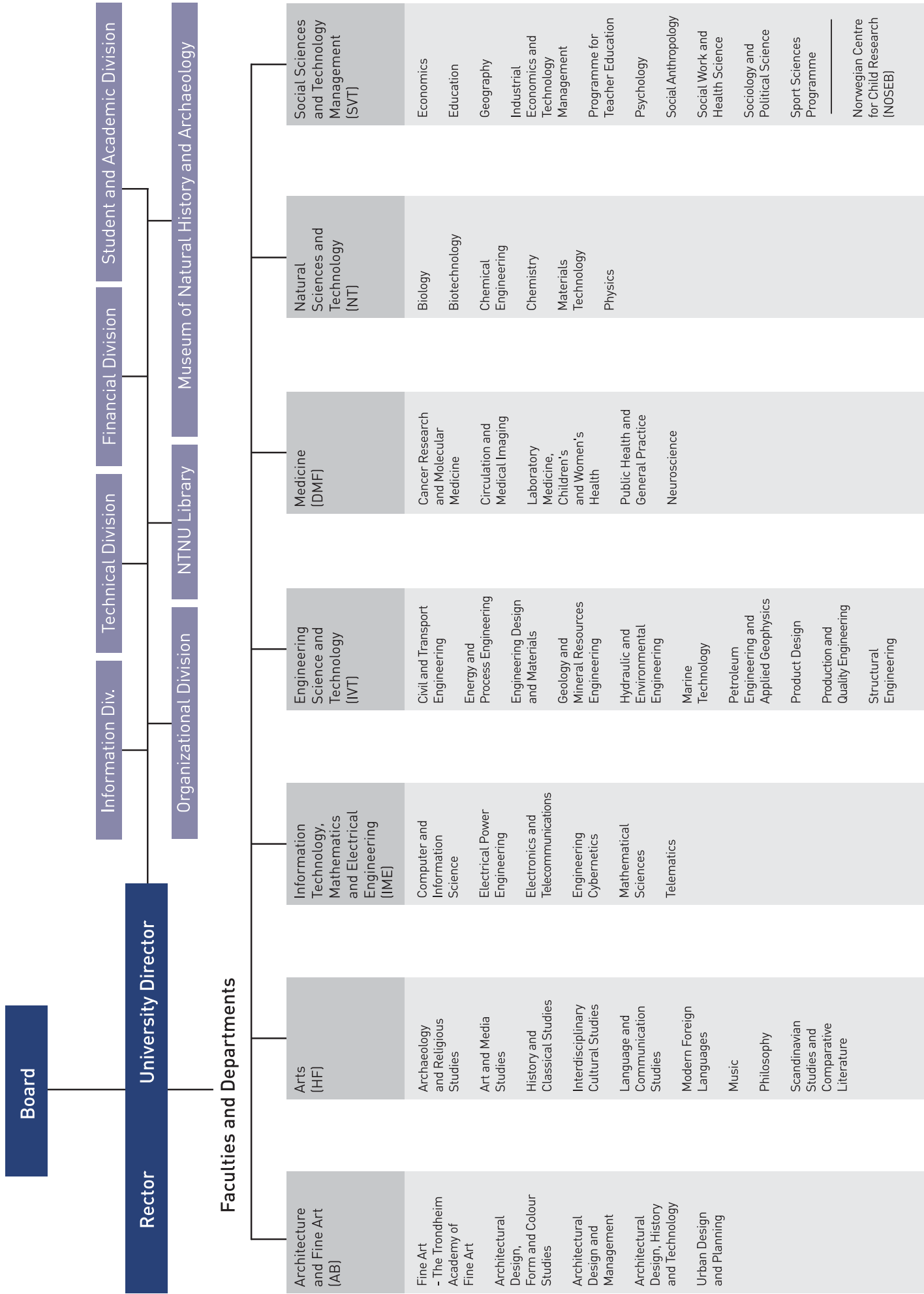
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**Key financial data 2004 (in NOK million):**

Income statement:		Balance sheet:	
Funding from UFD and other ministries:	2527.455	Total assets:	1382.772
Funding from the Research Council of Norway:	508.995	Total equity:	84.856
Income from externally financed activities:	383.041	Appropriation on obligations:	504.712
Sales of property, equipment, etc:	0	Total liabilities:	793.204
Other income:	83.160	Total liabilities and equity:	1382.772
Total revenue:	3502.651		
Wage costs:	-1995.185		
Investments and maintenance:	-188.759		
Other operational expenses:	-1167.897		
Total operational expenses:	-3351.841		



The Faculty of Architecture and Fine Art

is responsible for education, dissemination and research, as well as architectural and artistic activities in the various creative design disciplines. This requires focus on individual commitment, creativity and ethics. It also demands a broad interdisciplinary approach to the subject and to problem solving.

Project work and problem-based learning are at the heart of our educational approach. Both artistic and scientific reflection are important in moving beyond traditional working methods and established solutions. This work and cooperation with other faculties has enabled the Faculty of Architecture and Fine Art to make substantial contributions to a number of study programmes, dissemination activities and research work.

The main priorities of the faculty are: The use of Wood as a Material; Resources and the Environment; Architecture; Management and Financial Matters; Settlement and Cultural Understanding; Protection, Refurbishment and Renewal; Architectural Theory and Aesthetic Communication; Tools, The Medium and the Study of Form.

The Faculty of Engineering Science and Technology

provides education within 30 competence profiles, mainly MSc degrees, in the following programmes: Civil Engineering and Environmental Technology; Energy and Environmental Technology; Geosciences and Petroleum Technology; Marine Technology; Industrial Design; Product Development and Production, and Engineering Science and ICT. The faculty offers 7 international Master's programmes, and emphasizes the importance of good working conditions for its students.

In 2004, an international evaluation under the direction of the Research Council of Norway, evaluated 14 out of 26 research groups at the faculty as Excellent or Very Good at scientific quality and productivity. The faculty hosts a Centre of Excellence called the Centre for Ship and Ocean Structures and participates in the International Centres for Geohazards. In addition to a significant contribution to NTNU's established thematic priority areas, research initiatives on Profitable Production in Norway and Sustainable Infrastructures are under development.

The Faculty of Information Technology, Mathematics and Electrical Engineering

is responsible for research, education and dissemination in the academic fields of computer technology, electronics, technology of electrical

energy, energy planning and environment, information science, mathematics and statistics, telecommunication, telematics, technical cybernetics, as well as the industrial mathematics study programme in the Physics and Mathematics department.

The faculty offers 5-year integrated programmes of study at the Master's level in technology (advanced engineering): Computer Technology; Energy and Environment; Communications Technology, and Technical Cybernetics. The faculty also offers a 5-year Master's degree in teaching in the natural sciences as well as study programmes at the Bachelor's and Master's levels in biomathematics, informatics, mathematics and statistics. More than 60% of Norway's Master's students in ICT study at this faculty.

The faculty has a comprehensive doctoral programme with currently more than 300 PhD students from Norway and abroad. Great emphasis is placed on developing interdisciplinary efforts that allow the academic fields of the faculty to make contributions with their generic technologies and methods, for example within the health sector. The faculty collaborates closely with several universities and research institutes, as well as national and international businesses.

The Faculty of Arts

provides education, research and dissemination of knowledge in the humanities – history and subjects related to art, culture, literature and languages. The faculty works to preserve the traditions within the humanities and humanistic issues in the context of a university of science and technology. It subsequently offers a wide range of subjects where the emphasis is both on the specific discipline and interdisciplinary research and education.

This is reflected in a new curriculum where interdisciplinary courses – including European Studies with Foreign Languages, Management of Cultural Heritages, Music Technology, Language Technology and Medieval Studies. The faculty also participates in other interdisciplinary study programmes such as the integrated Master's degree in teaching in languages. In March 2004, Globalization was adopted as NTNU's sixth strategic area, hosted by the Faculty of Arts. This priority area is highly interdisciplinary and covers the humanities, social sciences, and technology. Projects within philosophy, language, literature, media science, religion, history, the fine arts, and culture are central in this research effort.

The Faculty of Natural Sciences and Technology

is responsible for research, education and dissemination in biology, biotechnology, physics, chemistry, chemical process engineering and materials technology. The faculty is becoming esta-

blished as a national centre for research in the natural sciences, the environment, processing and materials sciences, as well as the interplay between these areas. The faculty offers study programmes in the natural sciences such as chemistry, physics, biology and biotechnology at both the Bachelor's and Master's level, and has Master's and PhD degrees in physics and mathematics, chemistry and biotechnology, as well as materials technology.

New fields of research correspond to the national efforts within functional genome research, nanotechnology and new materials. The faculty has numerous cooperative partners in national and international industry and the public sector.

The Faculty of Medicine (DMF)

conducts research, education and dissemination in medicine and the health sciences. The goal of the faculty is to educate skilled medical personnel and promote medical research in line with the NTNU profile. For those studying medicine, there is particular emphasis on pedagogical methods such as problem-based learning (PBL), communication training and scientific reflection. The faculty cooperates with other NTNU faculties in a number of study programmes, one of which is a Master's in Health Science.

The research priorities are Medical Technology, the Health Study in Nord-Trøndelag (HUNT) and translation research. The faculty enjoys close cooperation with St. Olav's University Hospital, Helse Midt-Norge and other NTNU faculties in many aspects of research and education. SINTEF Health Research is also an important cooperative partner in research activities. An important task for DMF is looking after NTNU's interests in the construction of the new university hospital at Øya, Trondheim.

The Faculty of Social Sciences and Technology Management

organizes its education and research through the departments of Geography, Industrial Economics and Technology Management, Economics, Social Work and Health Science, Sociology and Political Science, Education, Psychology, Sport Sciences, and Social Anthropology.

In addition, the faculty includes the Programme for Kinetic Science, the Programme for Teacher Education, and the Norwegian Centre for Child Research (NOSEB). Courses are also offered in interdisciplinary studies such as media science, IT and finance, and African studies. The faculty has been awarded a Centre of Excellence, the Centre of the Biology of Memory, and participates in another such centre with the International Peace Research Institute, Oslo – the Centre for the Study of Civil War.



NTNU – Norwegian University of Science and Technology

