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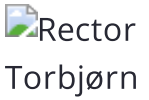
To those who studied or worked at the university premises at Rosenborg in Trondheim

By Torbjørn Digernes, Rector NTNU

(Published 2010)


Rector Torbjørn Digernes

"During the past decade some of the students and staff at the university's former premises at Rosenborg have suffered from cancer. Between 8000 and 9000 students and staff were engaged in natural science studies and research at Rosenborg between 1960 and 2000. The university moved from its premises at Rosenborg in 2000 and these were later demolished.

There is no doubt that the Rosenborg case affects many people, their friends and relatives. I understand that the indications about above-average frequency of some types of cancer and subsequent claims for compensation have caused concern. It has unfortunately proved to be very difficult to find a clear explanation of the above-average frequency of cancer. But it is important to be

aware that those who studied or worked at Rosenborg are *not* at greater risk of developing cancer than other Norwegians. If the working environment at Rosenborg was harmful, both experts and experience show that the risks of illness are reduced each year that passes from the time of exposure.

The university's former premises at Rosenborg.

Highest priority will always be given to protect the lives and health of our students and staff. We have tried our utmost to resolve this difficult matter since 1997, but this has raised more questions than clear answers. At the same time, when looking back on what was done I must admit that at the beginning we did not follow up those who were directly affected carefully enough. I apologize for this on behalf of NTNU and hope that those concerned will accept my apologies.

Everyone involved wants a complete explanation. Both those who have suffered from cancer and the working environment in laboratories at Rosenborg have been studied and assessed by experts. The latter have presented five reports with their findings. (See links to the final reports at the top of the right-hand margin.) The

Ministry of Education and Research has also decided that in 2013 there will be a new statistical analysis of the 8000 to 9000 students and staff

Chemistry laboratory. Photo: Arne Asphjell/NTNU

For me, the Rosenborg case is no ordinary matter. Following up the people concerned will continue to be given high priority as long as I am Rector at NTNU.

The purpose of this website is to answer any questions you may have. If you need further information or need to discuss matters with someone about the Rosenborg case, please contact NTNU's Health, Safety and Environment Division or the Norwegian Cancer Society's cancer helpline.

25 SEP 2015

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The Gunnerus Sustainability Award 2017 to Carl Folke

Professor Carl Folke has been awarded the 2017 Gunnerus Sustainability Award for his outstanding scientific work to promote sustainable development globally.

(Press release from NTNU and DKNVS 29 August 2017)

Carl Folke. Foto: M. Axelsson/Azote for Stockholm Resilience Centre

The Royal Norwegian Society of Sciences and Letters (DKNVS) and the Norwegian University of Science and Technology (NTNU) established the international Gunnerus Sustainability Award, which confers a prize of

The Gunnerus Sustainability Science Award

THE GUNNERUS SUSTAINABILITY SCIENCE AWARD

The Gunnerus Award in Sustainability Science will be awarded at a formal ceremony on **Thursday October 19th 2017 at 18:15** at Clarion Hotel and Congress in Trondheim.

Register for an exciting evening and

NOK 1 million (approximately USD 130,000), plus a gold medal and diploma.

The Gunnerus Award honours outstanding scientific work for sustainable development globally and aims to promote research and strengthen the scientific basis of sustainability. The award will be presented during NTNU's sustainability conference on 19 October.

The award winner

Professor Carl Folke is science director of the Stockholm Resilience Centre at Stockholm University, and director of the Beijer Institute of Ecological Economics at the Royal Swedish Academy of Sciences.

He is one of the founders of the Stockholm Resilience Centre and of the Resilience Alliance, and has played a key role in developing the International Society for Ecological Economics.

Folke has university degrees in economics, administration and biology, with a focus on ecology. He is an elected member of the Royal Academy of Sciences and the US National Academy of Sciences.

The award winner has been an environmental adviser to the Swedish government. He has collaborated with UN organizations in areas such as biodiversity, ecosystem services, water management and sustainable cities.

Folke has participated in the work on the Millennium Ecosystem Assessment. He has been a member of many scientific councils and committees, such as the National

three course meal with drinks and musical entertainment.

Register to attend the Ceremony

About Carl Folke

The research magazine Gemini writes about Carl Folke

Photos of Carl Folke

- Photo of Carl Folke (landscape)
- Photo of Carl Folke (portrait)

Photo credit: M. Axelsson/Azote for

Center for Ecological Analysis and Synthesis in Santa Barbara, California, and the International Human Dimensions Programme on Global Environmental Change.

Significant contributions

Folke has contributed in significant ways to sustainability as a field of research and is internationally considered to be one of the most important researchers in designing this new area of research.

In particular, he has helped stimulate research to better understand complex socio-ecological systems. He has been a pioneer in the pursuit of fruitful dialogue and cooperation between the social sciences, economics and natural sciences to illustrate the important sustainability challenges facing society.

Folke's initiative has opened new perspectives in understanding the dynamic interaction between human beings and nature, the features and services of ecosystems, as well as how socioeconomic conditions help to manage and maintain ecosystems' ability to cope with changes – their so-called resilience.

The award winner has created interdisciplinary environments for cooperation and contributed to the development of new research areas and approaches that have been adopted in science, education, politics and management, and more recently in the business community.

Stockholm Resilience Centre

About the Gunnerus Sustainability Award

> The Gunnerus Award in Sustainability Science conferred by the Royal Norwegian Society of Sciences and Letters and the Norwegian University of Science and Technology, honors outstanding scientific work promoting global sustainable development.

Leading the way

Folke's research stresses the importance of living systems at different levels of community development. It shows how we can strive for resilience in the ways we direct and administrate systems where society and nature interact. His work illustrates – in superb fashion – how social progress, prosperity and well-being depend on developments in the biosphere.

Professor Folke has given many scientific lectures as an invited expert at conferences around the world, in addition to his public lectures, seminars for politicians and media interviews.

In 1995, Folke was awarded the Pew Scholar Award in Conservation and the Environment. In 2004, he received the Sustainability Science Award of the Ecological Society of America.

Professor Carl Folke is a most worthy winner of The Gunnerus Sustainability Award 2017.

29 AUG 2017

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- About the Gunnerus Award at dknvs.no
- About the Gunnerus Award at Wikipedia

NTNU Sustainability Science Conference

The award is conferred at the NTNU Sustainability Science Conference 19 October 2017 organized by NTNU Sustainability.

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How your Brain Experiences Time

Researchers at the Kavli Institute for Systems Neuroscience have discovered a network of brain cells that express our sense of time within experiences and memories.

– This network provides timestamps to events and keeps track of the order of events within an experience, says Professor Edvard Moser. This area of the brain where time is experienced is located right next to the area that codes for space.

Professor Edvard Moser, Jørgen Sugar, a postdoc at the Kavli Institute, and professor May-Britt Moser. Photo: Erlend Lånke Solbu/Norwegian

Brief facts

What is episodic memory?

Your ability to recall and mentally relive specific episodes from your past is called episodic memory. This is the type of memories that you can visualize and talk about. The episodic memory is explicit in the way that its content is always anchored to a time and a place. Simply stated, episodic memories are a composition of what (content),

Broadcasting Corporation, NRK.

Albert Tsao, who took his PhD from the Kavli Institute and was supervised by the Mosers. Tsao is now postdoc at Stanford University. Photo: Private

See also:

- How your brain experiences time - Gemini research news
- Read the research paper in Nature

Telling time

Clocks are devices created by humans to measure time. By social contract, we agree to coordinate our own

where (position) and when (time). The brain area called medial entorhinal cortex is particularly important for mapping positions in space. This study suggests that the lateral entorhinal cortex may be important for putting experience into a temporal context. Information from both of these structures come together in the hippocampus to form episodic memories.

Where is the brain's subjective clock located?

The researchers recorded the time signal from a neural network in the lateral entorhinal cortex (LEC). LEC, the medial

activities according to clock time. Nevertheless, your brain does not perceive the duration in time with the standardized units of minutes and hours on your wristwatch. The signature of time in our experiences and memories belongs to a different kind of temporality altogether.

Over the course of evolution, living organisms including humans have developed multiple biological clocks to help us keep track of time. What separates the brain's various timekeepers is not only the scale of time that is measured, but also the phenomena the neural clocks are tuned to. Some timekeepers are set by external processes, like the circadian clock that is tuned to the rise and fall of daylight. This clock helps organisms adapt to the rhythms of a day. Other timekeepers are set by phenomena of more intrinsic origins, like the hippocampal time cells that form a domino-like chain signal that tracks time spans up to 10 seconds precisely. Today we know a great deal about the brain's mechanisms for measuring small timescales like seconds. Little is known, however, about the timescale the brain uses to record our experiences and memories, which can last anywhere from seconds to minutes to hours.

A Neural Clock for Experienced Time

A neural clock that keeps track of time during experiences is precisely what Albert Tsao and his colleagues at the Norwegian University of Science and Technology's Kavli Institute for Systems Neuroscience believe they have discovered. By recording from a population of brain cells

entorhinal cortex (MEC) and hippocampus (Hipp) are components of the hippocampal formation, which are located in the cortices of the left and right temporal lobes of the brain.

What is experienced time?

Subjective experience is the very substrate from which our concept of time arises. Time as we perceive it. Subjective time. Psychological time. Experienced time. Mind time. Episodic time. That time which flies when you're having fun, which stretches when you are waiting, and which nearly comes to arrest in the split

the researchers identified a strong time-coding signal deep inside the brain.

– Our study reveals how the brain makes sense of time as an event is experienced, says Tsao. - The network does not explicitly encode time. What we measure is rather a subjective time derived from the ongoing flow of experience.

The neural clock operates by organizing the flow of our experiences into an orderly sequence of events. This activity gives rise to the brain's clock for subjective time. Experience, and the succession of events within experience, are thus the substance of which subjective time is generated and measured by the brain.

Time Space and Memory in the Brain

– Today, we have a fairly good understanding of the way our brains process space whereas our knowledge of time is less coherent, Professor Moser says.

– Space in the brain is relatively easy to investigate. It consists of specialized cell types that are dedicated to specific functions. Together they constitute the nuts and bolts of the system, he says.

In 2005, May-Britt and Edvard Moser discovered grid cells which map our environment at different scales by dividing space into hexagonal units. In 2014, The Mosers shared the Nobel Prize in Physiology or Medicine with their colleague and mentor John O'Keefe at University

seconds of a catastrophe unfolding, is in its essence relational and relative to the multiple aspects of experience it is weaved into.

College London for their discoveries of cells that constitute the brain's positioning system.

In 2007, inspired by the Mosers' discovery of spatially coding grid cells, then-Kavli Institute PhD candidate Albert Tsao set out to crack the code of what was happening in the enigmatic lateral entorhinal cortex (LEC). This area of the brain is right next to the medial entorhinal cortex (MEC), where his supervisors, the Mosers, had discovered grid cells.

– I was hoping to find a similar key operating cell that would reveal the functional identity of this neural network, Tsao says. The task proved to be a time-consuming project.

– There didn't seem to be a pattern to the activity of these cells. The signal changed all the time, says Professor Moser.

It was only in the last couple of years that the researchers began to suspect that the signal was indeed changing *with* time. Suddenly the recoded data started to make sense.

– Time is a non-equilibrial process. It is always unique and changing," Professor Moser says. If this network was indeed coding for time, the signal would have to change *with* time in order to record experiences as unique memories.

Technological advancements

The Mosers needed only to decode the signal of one single grid cell to discover how space is encoded in the in the medial entorhinal cortex. Decoding time in the lateral entorhinal cortex proved to be a more complex task. It was only when looking at activity from hundreds of cells that Tsao and his colleagues were able to see that the signal encoded time.

– The activity in these neural networks is so distributed that the mechanism itself probably lies in the structure of connectivity within the networks. The fact that it can be shaped into various unique patterns implies a high level of plasticity, Professor Moser says. - I believe distributed networks and the combination of structures of activity may deserve more attention in the future. With this work, we have found an area with activity so strongly relating to the time of an event or experience, it may open up a whole new research field.

The Shape of Time

The structure of time has long been a disputed topic by philosophers and physicists alike. What can the newly discovered brain's mechanism for episodic time tell us about how we perceive time? Is our perception of time linear resembling a flowing river, or cyclical like a wheel or a helix? Data from the Kavli study suggest both are correct, and that the signal in the time-coding network can take on many forms depending on the experience.

In 2016, PhD candidate Jørgen Sugar joined the Kavli project to perform a new set of experiments that would test the hypothesis that the LEC network coded for

episodic time. In one experiment a rat was introduced to a wide range of experiences and options for action. It was free to run around, investigate and chase bits of chocolate while visiting a series of open space environments.

– The uniqueness of the time signal during this experiment suggests that the rat had a very good record of time and temporal sequence of events throughout the two hours the experiment lasted," Sugar says. - We were able to use the signal from the time-coding network to track exactly when in the experiment various events had occurred.

In the second experiment, the task was more structured with a narrower range of experiences and options for action. The rat was trained to chase after bits of chocolate while turning left or right in a figure-8 maze.

– With this activity, we saw the time-coding signal change character from unique sequences in time to a repetitive and partly overlapping pattern," Tsao says. "On the other hand, the time signal became more precise and predictable during the repetitive task. The data suggest that the rat had a refined understanding of temporality during each lap, but a poor understanding of time from lap to lap and from the start to end throughout the experiment.

Professor Moser says the study shows that by changing the activities you engage in, the content of your

experience, you can actually change the course of the time-signal in LEC and thus the way you perceive time.

Will have an effect on the lives of people in the future

– For NTNU, it is naturally a great achievement that our Nobel laureates have again had a significant breakthrough, says Rector Gunnar Bovim.

– We are very proud today, and we congratulate May Britt Moser and Edvard Moser on this milestone. But the most important of all is what this will mean for research on Alzheimer's and other brain diseases. This breakthrough will have a positive effect on the lives of a great many people in the future, which is something that we as a university and a research institution value more highly than anything else – as expressed in our vision, "Knowledge for a Better World".

– This is a shining example of the importance of long-term research driven by curiosity. It has taken many years of research to arrive at these results, and there is every reason to give due credit: both to the researchers who have not given up along the way, and to the many contributors who have patiently provided funding over a long period.

Rector Gunnar Bovim add that in addition to NTNU, these include the Research Council of Norway, the Kavli Foundation, the European Research Council and several private donors.

By Rita Elmkvist Nilsen

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Nordic Five Tech establishes new network for artificial intelligence

Alternativ

The Nordic AI Network aims to make the Nordic region a global hub in AI research, education and innovation.

The Nordic Five Tech alliance of leading technical universities in Denmark, Finland, Norway and Sweden today announces the creation of the *Nordic Artificial Intelligence Network*. With global interest in the many opportunities of artificial intelligence (AI), the network will bring together, and harness, leading expertise in Denmark, Finland, Norway and Sweden. The network's primary aim is to take the landmark step of making the region a global hub in AI research, education and innovation.

– Increased international visibility of the AI research in the Nordics is an important dimension of the Nordic AI Network. We should not only focus on jointly moving the state-of-the-art of AI forward, but also base the network on common values and comparative advantages of Nordic societies, including transparency, trust, and

Kontakt

Ole Jakob Mengshoel

Professor Ole Jakob Mengshoel

- Department of Computer Science
- NTNU Open AI Lab
- Pictures from the AI-lab (Photo: Geir Mogens)

technology-orientation, says Pro-Rector for Research at NTNU, Bjarne Foss.

Nordic excellence

The Nordic AI Network will begin activities already in 2019 with selected events. In coming years, it will share educational resources, collaborate on research as well as study and share best practices and business models for collaboration with industry. Its activities will, overall, set the stage to communicate Nordic excellence in the field of AI and obtain competitive funding at both the national and European levels.

– AI is set to change the world and the Nordics must be part of this tremendous shift. Bringing expertise from across our countries under one umbrella through the Nordic AI Network is a crucial step in making the Nordics a global hub in artificial intelligence. We are very pleased to launch the network and build up activities in coming months, says Ilkka Niemelä, President of Aalto University in Finland.

Made at Nordic Five Tech

Made up of Aalto University, Chalmers University of Technology, the Technical University of Denmark, KTH Royal Institute of Technology and the Norwegian University of Science and Technology (NTNU), the Nordic Five Tech universities are each home to research institutes and centers dedicated to AI. The decision to create the Nordic AI Network was made at the meeting by the Nordic Five Tech presidents on 26 April 2019.

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Kon-Tiki2 expedition evacuated this evening

The Kon-Tiki2 expedition in the Pacific Ocean about 1000 nautical miles from land will now be abandoned. Pedro De La Torre from NTNU is among the crew members who will be evacuated this evening, Thursday 17 March.
The Kon-Tiki2 expedition consists of two balsa rafts built according to old principles, in the same way as Thor Heyerdahl's Kon-Tiki raft. The two rafts sailed before Christmas from Peru to Easter Island, which took six weeks. They started the return voyage to South America on 6 January 2016.

The two rafts are now about 1000 nautical miles from land.

The expedition has experienced major delays due to a great deal of unexpected bad weather and atypical wind directions. The past week has been particularly demanding, with wind speeds of up to 35 knots. Expedition leader Torgeir Higraff has therefore decided to end the expedition, after a total of 114 days at sea. The crew of 13 will be picked up by the cargo ship "Hokuetsu Ushaka", which is heading toward the rafts. The cargo ship is expected to arrive at about 8 pm Norwegian time.

Pedro De La Torre. Photo: Kon-Tiki2

NTNU's man on board

NTNU is involved in the expedition through the collection of research material in cooperation with several institutions. Pedro De La Torre from the Department of Marine Technology has been a crew member on the return voyage from Easter Island. NTNU has been in daily contact with De La Torre in the past week.

"We have become increasingly concerned during the past week, and we support the decision to abandon the expedition," says Head of Department Harald Ellingsen at the Department of Marine Technology.

The rafts had been expected to sail into westerly winds, which would have given them speed and wind in their sails towards their original destination, Valparaiso in Chile. Instead they have had intense headwinds due to strong easterlies. The unexpected and unusually unstable weather has been linked with the El Niño phenomenon, which has raged during the winter.

Photo: Kon-Tiki2

Floating research vessels

Even though the rafts will not be able to complete the entire route that had been planned, the research that has been conducted is valuable. The research comprises three main areas:

- marine debris (plastic and microplastics)
- climate impacts (CO_2 uptake in the sea, pH value, etc)
- biological primary production (plankton, algae, etc)

“The rafts are rigged as floating research vessels through a unique collaboration between NIVA, NTNU, Kongsberg Maritime, Norwegian Meteorological Institute, Nortek, Sperre, Opera, and the American research organizations NASA and NOAA”, says Cecilie Mauritzen, Chief Scientist of the expedition, in an announcement published on the Kon-Tiki2 website on Thursday 17 March.

Deciding what to bring from the rafts

The expedition members are now preparing a priority list of what they want to bring with them om board the cargo

ship “Hokuetsu Ushaka”, which is on its way to evacuate them.

The expedition has been in close contact with the Norwegian Embassy in Chile, and the Embassy has been in close contact with the Chilean Navy. Yesterday, they contacted ships in the area to find out which vessels were closest for carrying out the evacuation.

“Needless to say, it is sad to end the expedition. These rafts have proved to be exceptional vessels at sea. They have impressed us by their seaworthiness in all sorts of weather, over enormous and remote waters,” says expedition leader Torgeir Higraff in a press release.

The expedition has been supported by the Thor Heyerdahl Institute and the Ministry of Foreign Affairs, among others.

- See also: Kon-Tiki2-stamper på opprørt hav (“Kon-Tiki in stormy seas”, Gemini science news 11 March 2016 – article in Norwegian)
- See also: Kon-Tiki2 expedition in Heyerdahl’s wake (Gemini science news 23 November 2015)

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17 MAR 2016

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The Starmus festival moves to Norway

The world's most ambitious science and music festival is moving to Norway with an impressive lineup including Stephen Hawking, Nobel Prize-winning scientists and legendary musicians.

Trondheim, the technological capital of Norway, will be hosting the fourth Starmus festival on 18–23 June 2017.

Under the title "Life and the Universe", the festival will showcase the best from both the academic and cultural world. The academic superstar Stephen Hawking will present to his largest audience ever, and other confirmed participants include some of the world's leading scientists in the fields of physics, chemistry and medicine – in addition to a legendary cosmonaut, astronauts and an award-winning composer.

More names will be announced in the next month.

The Norwegian University of Science and Technology (NTNU) will host the festival, in close cooperation with the Ministry of Education and Research in Norway,

Trondheim municipality, Sør-Trøndelag county municipality and the Research Council of Norway.

About Starmus

The Starmus festival was established in 2011 by astrophysicist Garik Israelian. His aim was to make the most universal science and art accessible to the public. The first three festivals were held in the Canary Islands.

The Starmus board consists of Stephen Hawking, Brian May, Peter Gabriel, Richard Dawkins, Alexei Leonov, Robert Williams, David Eicher, Jack Szostack and the festival's founder, Garik Israelian.

"A very exciting opportunity." Stephen Hawking

"After three successful festivals in The Canary Islands, it is an honour to be invited to the scientific capital of Norway, Trondheim, to expand Starmus and reach even greater heights." Garik Israelian, founder of Starmus.

About Trondheim and NTNU

Situated just above 63 degrees north, the coastal city of Trondheim has a population of more than 188 000. NTNU is the largest university in Norway, with some 39 000 students and 6700 full-time equivalent staff.

NTNU has the main responsibility for higher education in technology in Norway, and it is the country's premier institution for the education of engineers. The university offers several programmes of professional study and a

broad academic curriculum in the social sciences, teacher education, humanities, medicine and health sciences, economics, finance and administration, as well as architecture and the arts.

Trondheim has a vibrant cultural life, and the city hosts festivals in genres such as jazz, blues, chamber music, world music, rock and pop. During the Starmus festival in June 2017, the sun will go down at midnight and rise at 3am.

About confirmed speakers

- **Stephen Hawking** – British theoretical physicist, cosmologist, author and Director of Research at the Centre for Theoretical Cosmology within the University of Cambridge.
- **May-Britt Moser** – Norwegian Professor of neuroscience and Founding Director of the Centre for Neural Computation and Co-Director of the Kavli Institute for Systems Neuroscience at NTNU. Awarded the Nobel Prize in Physiology or Medicine 2014 together with Edvard Moser and John O'Keefe for their discoveries of cells that constitute a positioning system in the brain.
- **Edvard Moser** – Norwegian Professor of neuroscience, Founding Director of the Kavli Institute for Systems Neuroscience and Co-Director of the Centre for Neural Computation at NTNU. Awarded the Nobel Prize in Physiology or Medicine 2014 together with May-Britt Moser and John O'Keefe for their discoveries

of cells that constitute a positioning system in the brain.

- **Alexei Leonov** – retired Soviet/Russian cosmonaut and Air Force Major General. On 18 March 1965, he became the first human to conduct extravehicular activity, exiting the capsule during the Voskhod 2 mission for a 12-minute spacewalk.
- **Charlie Duke** – American engineer, retired U.S. Air Force officer, test pilot and former astronaut for NASA. As lunar module pilot for Apollo 16 in 1972, he became the tenth and youngest person to walk on the Moon.
- **Robert Williams** – astronomer who served as the Director of the Space Telescope Science Institute from 1993 to 1998, and the President of the International Astronomical Union from 2009 to 2012.
- **Alan Stern** – American engineer and planetary scientist and the principal investigator of the New Horizons mission to Pluto and the Chief Scientist at Moon Express. Stern has been involved in 24 suborbital, orbital, and planetary space missions, including eight for which he was the mission principal investigator.
- **Brian Eno** – British musician, composer, record producer, singer, writer and visual artist. He is best known for his pioneering work in ambient and electronic music as well as his influential contributions to rock, worldbeat, chance, and generative music styles.
- **George Smoot** – American astrophysicist, cosmologist and one of two contestants to win the US$1 million

prize on *Are You Smarter than a 5th Grader?*. He was awarded the Nobel Prize in Physics in 2006 for his work on the Cosmic Background Explorer with John C. Mather.

- **Adam Riess** – American astrophysicist and Bloomberg Distinguished Professor at Johns Hopkins University and the Space Telescope Science Institute. Known for his research on the use of supernovae as cosmological probes. Riess shared both the 2006 Shaw Prize in Astronomy and the 2011 Nobel Prize in Physics with Saul Perlmutter and Brian P. Schmidt for providing evidence that the expansion of the universe is accelerating.
- **Jill Tarter** – American astronomer and former director of the Center for SETI Research. She has worked on a number of major scientific projects relating to the search for extraterrestrial life.
- **Michel Mayor** – Swiss astrophysicist and Professor Emeritus at the University of Geneva's Department of Astronomy. He is co-winner of the 2010 Viktor Ambartsumian International Prize, and the winner of the 2015 Kyoto Prize. Together with Didier Queloz, he discovered 51 Pegasi b in 1995, the first extrasolar planet orbiting a sun-like.
- **Robert Wilson** – American astronomer and 1978 Nobel laureate in physics, who with Arno Allan Penzias discovered the cosmic microwave background radiation. The award purse was also shared with scientist Pyotr Leonidovich Kapitsa, for unrelated work.

- **Walt Cunnigham** – retired American astronaut. In 1968, he was the lunar module pilot on the Apollo 7 mission. He was NASA's third civilian astronaut (after Neil Armstrong and Elliot See), and has also been a fighter pilot, physicist, entrepreneur, venture capitalist, author of *The All-American Boys*, lecturer, and host of the radio show *Lift-off to Logic*.
- **Susumu Tonegawa** – Japanese scientist who was the sole recipient of the Nobel Prize for Physiology or Medicine in 1987, for his discovery of the genetic mechanism that produces antibody diversity. Today he is one of the world's pioneers on studies of the substrate of memory in the brain.

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NTNU and three university colleges to merge

The NTNU Board approved a merger with university colleges in Gjøvik, Ålesund and Sør-Trøndelag today; NTNU name to be retained.

"I see great academic gains from this merger," says NTNU Rector Gunnar Bovim. "We will establish a unified university in Trondheim covering most of our educational areas at all levels. Parallel to this, closer cooperation with SINTEF will create greater opportunities for research at NTNU. From an international perspective, this is an important contribution to achieving the high ambitions Trondheim must have as a research city."

"Merging with the university colleges in Gjøvik and Ålesund will strengthen the academic opportunities in technology," Bovim says.

The partners anticipate that the merger will increase recruitment to all their study programmes, both in Norway and from abroad. They also believe that NTNU will be better positioned to obtain EU contracts and compete for highly qualified labour.

More about the merger

More information about the merger

Rectors pleased

Bovim's colleagues at the partner university colleges are pleased with the decision to merge.

"We look forward to building the new university together. This will be a flexible model in the educational landscape. I see some challenges related to subject profiles and geographical distance, but these we shall certainly be able to solve," says Rector Helge Klungland at Sør-Trøndelag University College.

Rector Jørn Wroldsen at Gjøvik University College is looking forward to an exciting transition. "We have the ambition to add new expertise and innovative strength both in our region and nationally. I hope regional and central authorities will actively support the strategy that NTNU and the university colleges have laid out," says Wroldsen.

Rector Marianne Synnes at Ålesund University College is also happy about the decision. "The merger will enable us to fulfill our social mission even more effectively. This will also benefit our regional business sector and employment. We can become a stronger partner in both education and research," she says.

Disappointment in Narvik

Originally it was suggested that Narvik University College be included in the new university, but NUC is not part of the merger. The college is also the smallest of the partners.

“It is disappointing, especially that the northern Norwegian perspective is not part of such a large technology merger. But this has also been a useful and informative process where we have been looked at cooperation possibilities that we hadn’t thought of before,” says Rector Arne Erik Holdø of NUC.

Bovim emphasizes that NTNU still wants to expand its cooperation with other institutions and industry clusters across the country.

All the participating rectors are committed to working together to arrive at a common vision and effective academic and administrative organization of the new university.

It is too early to say exactly when the merger will take effect.

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NTNU Approved as First Norwegian Partner in Climate-KIC

Introducing NTNU

Climate-KIC Nordic is pleased to announce that our first Norwegian partner has now been approved. This is the very first KIC collaboration in Norway.

As part of Climate-KIC Nordic's expansion strategy in 2015 we are in dialogue with three top academic institutions in Norway, Finland and Sweden. NTNU - The Norwegian University of Science and Technology is the first new partner to join this year.

NTNU is based in Trondheim and is the second largest university in Norway with 23 000 students and 5000 employees. As of 2016 NTNU will merge with three smaller Norwegian university colleges and will subsequently be Norway's largest university with 37 000 students and 6500 employees.

NTNU has a national responsibility for technology research and education in Norway and educates 85 % of

What is Climate-KIC?

Climate-KIC is Europe's largest public-private innovation partnership focused on climate change, consisting of dynamic companies, the best academic institutions and the public sector.

Climate-KIC is one of three Knowledge and Innovation Communities (KICs) created in 2010 by the European Institute of Innovation and

the Master of Technology candidates and 90 % of the technology Ph.D. candidates in Norway. NTNU's main profile is in technology and the sciences, but the university also encompasses social science, humanities, art, architecture and medicine.

Consequently, NTNU has special opportunities and a specific mandate from the Norwegian government to engage in cross-disciplinary research and education. This includes to a very large degree also the climate area where long-term university-wide strategic programmes are running.

Key Areas of Expertise of NTNU – Smart Cities, Energy Systems and The Built Environment

Both Energy and Sustainability are key areas of expertise at NTNU, the cross-disciplinary strategic fields covering all the Climate KIC thematic platforms. NTNU is especially strong in the smart cities area, the energy efficiency field and in energy systems analyses – NTNU is hosting long-term national excellence centers and offers International Master's and Ph.D. Programmes in these areas.

NTNU is working on improving the built environment by developing competitive products and solutions for existing and new buildings. The goal is to achieve market penetration of buildings that have zero emissions of greenhouse gases related to material use, operation and demolition, with activities ranging from development of new materials e.g. nano insulation materials to realizing

Technology (EIT). The EIT is an EU body whose mission is to create sustainable growth.

full scale demonstration buildings. For more details please visit The NTNU Centre for Zero Emission Building: www.zeb.no

With its broad scope of disciplines in technology and social sciences, NTNU is aptly fit to contribute to the emerging field of smart cities and communities in a creative and innovative manner, and help solve complex urban challenges involving energy, climate, environment, mobility, economy, planning processes and citizens on the road to a low-carbon society. Find out more about the Smart Cities Initiative at NTNU: www.ntnu.edu/smartcities

NTNU engage in the development of sustainable energy solutions and policy support for transitions of the energy system through studies of energy economics, energy systems analysis, energy policy, energy markets, innovation and commercialization, socialization and domestication, energy cultures, energy efficiency and public engagement. The NTNU Centre for Sustainable Energy Studies: www.ntnu.no/censes

NTNU and the Corporate World

NTNU has close collaboration with industrial partners and a strong emphasis on innovation and entrepreneurship. In the newly published U-Multirank NTNU received a top score of A on indicators such as external funding and cooperation with industrial partners. NTNU has for subsequent years also been one of the highest ranked institutions in the Leiden ranking of universities collaborating with industry.

The NTNU innovation ecosystem includes the NTNU Technology Transfer AS, on-campus incubator, the NTNU School of Entrepreneurship, the NTNU Entrepreneurship Center, the Norwegian Research School in Innovation, student's initiatives such as Start NTNU and venture cups and regional triple helix cooperation. Approximately 20 spin-outs come out of NTNU every year.

NTNU offers some 40 international master programmes especially suitable for international recruitment and international collaboration. Mandatory entrepreneurship courses are included in all master programmes.

NTNU and Climate-KIC

NTNU is already involved in Climate-KIC activities as national coordinator for the ClimateLaunchpad competition. We are now moving ahead with activities in all areas with the newly appointed NTNU Climate-KIC Coordinator already liaising with the Leads of the Nordic office.

Susanne Pedersen, Director of Climate-KIC Nordic is very pleased to welcome NTNU as our first Norwegian partner:
"NTNU has since we initiated the dialogue shown utmost engagement and dedication – they have worked hard to establish an internal organization to handle Climate-KIC activities as efficiently as possible and we congratulate NTNU on their well-deserved success as the first partner to join this year.

We see NTNU as a key partner in our endeavors to penetrate the national turf. In close cooperation with NTNU we have been determining our road map in Norway in terms of which industrial partners to invite into Climate-KIC.

Together with NTNU we are now pushing forward and strive to include one or two major cities with climate ambitious agendas in to the community as well as four to five corporate partners within the coming year. This will give added value to the existing and expanding Nordic network – and to Climate-KIC as a whole."

For any further questions regarding NTNU as a new partner, please contact Nina or Irina.

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UiB and NTNU establish presence in Japan through the Norwegian Embassy in Tokyo

The University of Bergen (UiB) and the Norwegian University of Science and Technology (NTNU) are joining forces to establish a collaboration with Trade and Technology Office (Innovation Norway) of the Norwegian Embassy in Tokyo. The purpose is to strengthen research and educational cooperation with Japan.


Illustration picture

Photo: Thinkstock

Japan and Norway are marine nations with many common problems and challenges. UiB and NTNU already collaborate with Japanese institutions in areas such as oceanography, energy and environment. The collaboration includes research, research education and student exchange.

To strengthen and broaden this collaboration, UiB and NTNU now team up in creating a new position as adviser in Tokyo at the Trade and Technology Office (Innovation Norway) of the Norwegian Embassy.

– This is very exciting. We have great expectations for our new establishment in Tokyo, says UiB Rector Dag Rune Olsen.

– Japanese universities are of high quality, and we see many areas where we can cooperate. I look forward to deepening and strengthening our collaborative relationships in Japan, says NTNU Rector Gunnar Bovim.

Office at the Norwegian Embassy

NTNU and the University of Bergen unite on a locally recruited staff member who will be a part of the working community at the premises of the Trade and Technology Office at the Norwegian Embassy. The project will run for two years.

Rectors Gunnar Bovim (NTNU) and Dag Rune Olsen (UiB) will sign an agreement on this matter with Innovation Norway's CEO Anita Krohn Traaseth in Oslo on 11 December.

- Through our partnership in Team Norway at the Embassy in Tokyo, we want to give our full support to UiB and NTNU to succeed in Japan. These universities are pioneers in establishing international partnerships, says

Anita Krohn Traaseth in Innovation Norway.

Will strengthen and develop relations

A broad collaboration already exists between NTNU, University of Bergen and Japanese universities and research institutes. The aim is to utilize the effects of prolonged existing cooperation in the form of funded projects, publications and mobility for researchers and students. It may also be appropriate to develop cooperation with institutions in new fields. Through this project NTNU and the University of Bergen want to deepen their relationship with Japanese partners and expertise in education and research sector and the business sector in the country.

To achieve these goals, the project will contribute with concrete measures such as:

- Strengthen UiB and NTNU's relationship with partners in Japan
- Provide advice and information on Japanese institutions to NTNU and the University of Bergen
- Creating meeting arenas for researchers, students and management
- Facilitating the exchange of students and staff between NTNU and the University of Bergen and Japanese universities
- Link research and education activities to the business community

University of Bergen currently cooperates with Japanese universities in climate, marine, energy and polar research as well as Japanese linguistics, and will seek to collaborate in new areas such as health sciences, social sciences and law.

NTNU has longstanding partnerships with Japanese universities in disciplines and areas such as physics, mathematics, neuroscience, energy, environment, materials science and international politics. NTNU has a separate Japan Program and has since 2003 led the Kyoto International Forum for Energy and Environment KIFEE

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Help for migraine sufferers

(13.01.2014) Candesartan is just as effective as more the commonly prescribed propranolol when it comes to preventing migraine attacks, according to a new study from St. Olavs Hospital in Trondheim, Norway and the Norwegian University of Science and Technology (NTNU).

The researchers have also found that candesartan may work for patients who get no relief from propranolol.

"This gives doctors more possibilities and we can help more people," says Professor Lars Jacob Stovner, leader of Norwegian National Headache Centre, who also led the study.

If one drug doesn't work for the migraine patient, the other one may. Side effects may also vary from patient to patient.

Proves theory

The new study is a follow-up on a ten-year-old study from NTNU.

Candesartan is already in use by several doctors as a migraine prophylactic, but the NTNU follow-up study, which confirms the study from a decade ago, provides the proof that the drug actually works.

More than 20 percent of migraine patients report that they feel better even when they are given a placebo. But blind tests show that candesartan works preventively for another 20 to 30 percent of patients. The hope is now that candesartan will be even more commonly prescribed.

Migraines are thought to affect a staggering one billion people worldwide. Twelve percent of the Norwegian population suffers from migraines, or more than 500,000 individuals. This poses problems for the individual, but is also costly for society in the form of sick leave and reduced ability to work. Preventing migraines thus offers many benefits.

Triple blind test

The NTNU study was a triple blind test, which means that neither patients nor doctors nor those who analyzed the results knew whether the patients had been given placebo or real medicine, Stovner said.

Researchers tested both candesartan and propranolol. In all, 72 patients took part of the study this time, the same number as ten years ago. These patients were normally affected by migraine attacks at least twice every month. The patients used each treatment (candesartan,

propranolol or placebo) for 12 weeks, and also underwent four weeks before start and between the treatment periods without any medication at all. Thus every patient was part of the study for almost a year.

Candesartan was originally a medication used to treat high blood pressure, but Harald Schrader, a retired professor from St. Olavs Hospital in Trondheim, who himself had both high blood pressure and migraine, discovered by chance in the 1990s that candesartan also worked well for his own headaches.

This finding led to the subsequent studies of the drug. The studies received partial support from AstraZeneca, but the research was conducted independent of the drug manufacturer. Lars Jacob Stovner and Erling Tronvik, a postdoc, have been among the most active in the research.

Candesartan is today marketed under the name Atacand, while propranolol is marketed under the name Inderal. But there are also several copies on the market.

"The patent is running out," Stovner says.
This also means that more patients will have access to cheaper, generic forms of the medicine. Candesartan will now very likely be part of the guidelines for the prophylactic treatment of migraine the world over.

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PhD student death

NTNU offers support to all who are affected

(23.04.2014) "This is a tragic event for everybody at NTNU. We wish to offer our support and help to everybody who has been affected by this act of violence and subsequent death," said Rector Gunnar Bovim in a statement after the death of PhD candidate Farshad Goudarzi Tuesday.

Goudarzi was charged with attempted murder after assaulting a man with scissors at the NTNU Gløshaugen campus on Easter Sunday. Shortly after, he was found fatally wounded, and he died Tuesday night at St. Olavs Hospital. The motive for the assault is not known.

Thirty-year-old Goudarzi has been a PhD candidate at the Department of Structural Engineering since 2010.

The Rector expressed his deep sympathy for the relatives of the deceased student and the assaulted man.

"As an institution we will do everything possible to support and facilitate the grieving process," Rector

Bovim said. "We know this came as a shock to Goudarzi's colleagues, who are now being offered help. In this situation it is of great importance that we take care of each other."

The HSE division is available to anyone who wants someone to talk to about the tragic event.

An open meeting was held on Tuesday morning for staff and students at the department where the deceased PhD candidate was working. A memorial ceremony will be held later. Farshad Goudarzi was an Iranian citizen.

If you need someone to talk to, please contact:
HSE division by Hilde Apneseth, tel. 996 42 914.

Background information (University newspaper, Norwegian only)

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Emergency drill at NTNU on Friday 25 April

A large-scale emergency drill is scheduled to take place at NTNU on 25 April. The emergency drill will take place at the Sports Centre at Dragvoll, but the activity can affect employees and students on several campuses.

"Øvelse Dragvoll" is an LRS (local rescue coordination centre) drill. All the emergency services will be participating, as well as NTNU, SiT, HiST, the County Governor, local authorities and others.

How the drill will affect you

Yellow alerts will appear on ntnu.no and Innsida with information about an incident that has taken place at NTNU.

These will be labelled **"øvelse"**. Notifications will point to ntnu.no/alert, which is the university's external and internal information site for emergencies. **All the information on this page is part of the emergency drill, and you do not need to react to any of it.**

Limited access to the Sports Centre

The emergency drill takes place at the Sports Centre at Dragvoll. It will mainly affect the ground floor and 1st floor. Barriers and signs will be in place to make sure that the 2nd and 3rd floors are not affected.

There will be some restrictions with regard to movement to and from the Sports Centre between 8 am and 1 pm on the day of the emergency drill. Those who are not part of the drill will be escorted to/from the building when the course of the drill allows it. Some delays should be expected.

Sound, light and smoke effects

Sound, light and smoke effects will be used, and these might cause some disturbance for employees and students at Dragvoll.

Emergency drill scenario

A police-led planning group has developed the scenario and the media's role in the drill. The scenario will be a dramatic incident involving shooting/hostage-taking/mass injury at the Sports Centre at Dragvoll.

The emergency services will follow the police instructions for "shooting in progress". Further details about the scenario are not available.

To illustrate the nature of the emergency drill, this video from an emergency drill at the University of Nordland in 2013 can be useful.

NTNU's objectives for the emergency drill

Good interaction with the external emergency management and other services. An increased ability to handle emergencies involving several units at NTNU.

Subsidiary objectives

- Good handling of information and internal communication.
- Quick establishment of a good internal emergency preparedness.
- A clear definition of internal responsibilities at different levels.
- Establishing a correct division of responsibilities regarding notifications to the next of kin and the general public.
- Good media relations and facilitation of the media's work.
- A successful completion of the emergency drill, including correct use of status meetings, adequate logging and good internal information.

Involved units at NTNU

- The Central Emergency Preparedness Group and local emergency preparedness groups at HF/SVT/DMF
- Units based at the Sports Centre at Dragvoll
- HF/Faculty of Humanities: Department of Music and Dance (Dance Studies)
- SVT/Faculty of Social Sciences and Technology Management: Department of Sociology and Political Science (Sports Sciences)

- DMF/Faculty of Medicine: Department of Neuroscience (Movement Sciences)
- The Communication Division

Contact

Do you have questions about the emergency drill?

Please contact Lars Strømmen

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NTNU neuroscientists receive the 2014 Körber European Science Prize

(22.05.2014)

Edvard and May-Britt Moser, co-directors of the Kavli Institute for Systems Neuroscience at the Norwegian University of Science and Technology, have been selected for the €750 000 award from the Hamburg, Germany based Körber Foundation.

Their selection is yet another recognition of their seminal finding of specialized neurons called grid cells, which are critical in helping all mammals, including humans, find their way.

The Körber prize honors outstanding and excellent scientists working in Europe. The prize is awarded to research projects that show great potential for possible application and international impact.

The Mosers say they are both happy and humbled by their selection.

"We are overjoyed that our findings are receiving this much attention as a result of the awards we have received," May-Britt Moser says. "But we really want to use the opportunity to emphasize the team work that makes our findings possible. Science is teamwork, with faculty, students and technicians who all participate in producing the final outcome. We accept this award on behalf of the great team at the Kavli Institute."

Innovative research

The Körber Foundation said in a press release that it had selected the Mosers because of their work with "particularly innovative projects."

"In the course of numerous experiments conducted with rats and mice, the Norwegian brain research couple detected previously unknown brain cells which – like a natural navigation system – enable the rodents to have precise spatial orientation. This means that genuine mental performance can be demonstrated for the first time directly at a cellular level in the brain," the Körber Foundation wrote.

The Mosers intend to use the Körber prize money, about NOK 6.1 million, to determine how grid cells are formed, how they interact with the environment, and how they are modified by experience during development of the nervous system.

Prize money will help shed light on grid activity

"We are really grateful for the opportunity to invest in a new two-photon microscope,"

Edvard Moser says. "It will allow us to visualize the simultaneous activity of large populations of grid cells, and thereby help us understand how groups of grid cells cells interact."

The Körber prize is the latest of numerous awards that the Mosers have received. Most recently, in late April they were elected as Foreign Associates to the US National Academy of Sciences, an honour for which only a handful of Norwegians have been selected.

The Körber European Science Prize 2014 will be presented to May-Britt and Edvard Moser in the Hamburg City Hall on 5 September.

http://www.koerberprize.org/
http://gemini.no/en/notiser/2014/05/ntnu-neuroscientist-win-german-research-prize/

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Nobel Prize awarded to May-Britt and Edvard Moser

(Press release from NTNU 6 October 2014)
"This is wonderful news, first for May-Britt and Edvard Moser, but also for NTNU and Norway," says NTNU rector Gunnar Bovim.

This year's Nobel Prize in Physiology or Medicine was awarded to brain researchers May-Britt and Edvard I. Moser, Kavli Institute for Systems Neuroscience, NTNU. They share the award with John O'Keefe of University College London.

The Nobel Prize was awarded for the discovery of grid cells, which create a kind of internal GPS in the brain.

Congratulations from the Rector
"This is the first time the Nobel Prize in medicine has been awarded to Norway. It is not surprising that it has been awarded to the Moser husband-and-wife team," says Gunnar Bovim, NTNU Rector.

"Their work in neuroscience focusing on memory and sense of place is internationally groundbreaking, and they have already won most of the international awards that it is possible to achieve in their field," said Bovim.

"The award of the world's foremost scientific honour at this relatively early stage of their career is a strong statement about the level of their research. This is very inspiring for all of us," he said.

Bovim added that the whole university now congratulates their researcher colleagues, and will celebrate together with them.

"We have raised the flag," said the proud NTNU Rector, who was in Oslo when he heard the news about the prize. Since then, congratulations have been pouring in.

The brain's inner GPS

How do we know where we are? How can we find our way from one place to another? How does the brain code this information so that we immediately find the right route the next time we go this way?

The year's Nobel Laureates have discovered a positioning system, a kind of "inner GPS" in the brain, which makes it possible to navigate the environment.

In 1971, John O'Keefe discovered the first component of this positioning system. More than 30 years later, in 2005, May-Britt and Edvard Moser found another important

part of the brain's positioning system. They identified grid cells, which create a system of coordinates for determining position. Their further studies revealed how the different types of cell work together to allow us to understand where we are, and how to find our way.

The Nobel Laureates' discoveries have solved a problem that has perplexed philosophers and researchers for centuries: How the brain creates a map of the space around us, and how it enables us to navigate complex surroundings.

The Nobel Institute's press release (English)

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Edvard I. Moser: edvard.moser@ntnu.no

Photos of May-Britt Moser 6 October 2014

Stock photos of May-Britt and Edvard I. Moser.
The photos may be used freely in connection with reports on the brain researchers. Photo: Geir Mogen, NTNU

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NTNU professor named as one of Nature's top commentators in 2012

02.01.2013) Your morning cup of coffee just might be contributing to species extinction, says Edgar Hertwich, director of NTNU's Industrial Ecology Programme, in a commentary for Nature magazine. His pointed observations, based on a research article published in the same issue of the magazine, won the professor a place as one of the publication's top commentaries for 2012.

The research, by a group of Australian scientists, was published in the 7 June 2012 issue of Nature, and reported the results of a modelling analysis which showed that international trade can be the underlying cause of a whopping 30 per cent of threatened animal species extinctions. Hertwich's contribution was to the News and Views section of the magazine, in which invited scientists write commentaries that help explain the context of the most striking research reported in the remainder of the journal.

Edgar Hertwich

A new carbon footprint tool

Edgar Hertwich, director of NTNU's Industrial Ecology Programme, discusses the use of a new online tool that gives policy makers a virtual crystal ball, so they can understand the environmental consequences of

Hertwich's commentary describes how consumers may know that buying a set of chess figures made of ivory can mean the demise of an elephant, but other purchases -- such as a sausage, or a cup of coffee -- may also contribute to species extinction in a less obvious way. "If you buy a sausage, you cannot know whether the pig that was turned into the sausage was fed soy meal sourced from a farm that had just expanded into elephant habitat," he wrote.

Hertwich says the recognition was unexpected. "I was a little surprised myself," he told Universitetsavisa, NTNU's newspaper. "I have no idea what kind of criteria Nature used to evaluate the different contributions."

different government actions.

Read more about the development of the tool on NTNU's news pages.

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Climate events synchronize population dynamics

(17.01.2013) Climate change is known to affect the population dynamics of single species, such as reindeer or caribou, but the effect of climate at the community level has been much more difficult to document. Now, a group of Norwegian scientists has found that extreme climate events cause synchronized population fluctuations among all vertebrate species in a relatively simple high arctic community.

These findings may be a bellwether of the radical changes in ecosystem stability that could result from anticipated future increases in extreme events. The findings are published in the 18 January issue of *Science* magazine.

The Norwegian scientists, with lead authors from the Centre for Conservation Biology at NTNU, wanted to know how climate and weather events influenced an overwintering vertebrate community on the high arctic island of Spitsbergen, Svalbard, at 78 degrees N latitude.

Three herbivores and one fox species

They chose this simple ecosystem because it is

See what the Norwegian Broadcasting Corporation's science TV show, Schrodinger's Cat, has to say about the Science article (in Norwegian).

composed of just three herbivores in the winter -- the wild Svalbard reindeer (*Rangifer tarandus platyrhynchus*), the Svalbard rock ptarmigan (*Lagopus muta hyperborea*), and the sibling vole (*Microtus levis*), and one shared consumer, the arctic fox (*Vulpes lagopus*).

The community's population fluctuations were mainly driven by rain-on-snow events, the researchers found. Rain-on-snow is an extreme climatic occurrence that causes icing on the deep-frozen arctic tundra. The ice keeps reindeer from grazing on their winter pastures and also reduces food accessibility for the rock ptarmigan and sibling vole populations, causing extensive simultaneous population crashes in all three species in the winter and spring after the extreme weather.

However, the arctic fox, which mainly relies on reindeer carcasses as its terrestrial winter food source, didn't see a decline in its population size until a year after the herbivore die-offs. Even though the synchronized die-offs decrease the number of live prey available for foxes to eat, the high number of reindeer carcasses generates an abundance of food for foxes during icy winters and the subsequent spring and summer. This leads to high fox reproduction.

Icing disruptive

But almost no reindeer carcasses will be available during the following winter, mainly because those reindeer that survived the previous winter are more robust and also subject to reduced competition for food resources. At the same time, none of the other herbivores is able to recover in the summer after the icing. The net result is low fox reproduction and a strong reduction in the arctic fox population size one year after the herbivore die-offs.

"We have known for a long time that climate can synchronize populations of the same species, but these findings suggest that climate and particularly extreme weather events may also synchronize entire communities of species," says lead author Brage Bremset Hansen, from NTNU's Centre for Conservation Biology.

"Svalbard's relatively simple ecosystem, which lacks specialist predators, combined with large weather fluctuations from year to year and strong climate signals in the population dynamics of herbivores, are the likely explanations for how such clear climate effects can be observed at the ecosystem level."

In other, more complex systems, he says, community-level effects of climate can be present but are likely masked by other factors that tend to obscure the synchronizing effects of climate, which thus complicates the picture.

Implications for ecosystem functioning

Extreme rain-on-snow events are rare in most of the Arctic compared with Svalbard, where the climate is

oceanic and mild for the latitude. However, because the frequency of such rain-on-snow events leading to icing is closely linked to a rapidly warming arctic climate, the authors warn that changes in winter climate and extreme events may have important implications for ecosystem functioning and stability in the circumpolar Arctic in the future.

"Previous studies have shown that rain-on-snow and icing can also cause vegetation damage and reduce survival of soil microbiota," says Hansen. "But more importantly, we suspect that the strong effects of icing on the overwintering vertebrate community have the potential to indirectly influence other species and cascade throughout the food web. The die-offs among resident herbivores shape predator abundance, which could in turn affect the migratory prey that reside in the area in the summer, such as sea birds and barnacle geese."

Reference: Hansen, B.B; V. Grøtan, R. Aanes, B.-E. Sæther, A. Stien, E. Fuglei, R.A. Ims, N.G. Yoccoz, A.Ø. Pedersen. Climate Events Synchronize the Dynamics of a Resident Vertebrate Community in the High Arctic. Science, 18 Jan. 2013.

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New leadership for NTNU's top spots

NTNU's Board of Directors has selected new deans for the university's faculties and the university's museum. The new deans -- and those who will continue in their posts -- begin on 1 August 2013.

Faculty of Architecture and Fine Art (AB) - Fredrik Shetelig

Fredrik Shetelig (born 1960) has been selected as the new dean for the Faculty of Architecture and Fine Art (AB).

Shetelig is currently a professor of architecture and vice dean for education in the same faculty. He was educated at the Oslo Institute of Engineering and at the Architecture Division of the former Norwegian Institute of Technology (NTH, one of NTNU's predecessors). He was one of the founders of the Pir II Architects, where he was a partner and part owner until 2010.

Shetelig has won a number of architecture competitions and has broad experience from a range of large architecture projects. He was appointed as a assistant

professor at NTNU in 2005 and a professor from 2006.

Faculty of Medicine (DMF) - Stig Arild Slørdahl

Stig Arild Slørdahl (born 1959) has been appointed for a new four-year term as the dean of the Faculty of Medicine (DMF). He is a professor of medicine and has a part-time position as an attending physician at St. Olavs Hospital.

Slørdahl received his medical degree (dr.med) in 1992, after which he specialized in internal medicine and heart disease. He was appointed as an associate professor at DMF in 1995 and as a professor from 2002.

Slørdahl has held a number of national and international positions, and is active in both academic and popular science outreach.

Faculty of Humanities (HF) - Anne Kristine Børresen

Anne Kristine Børresen (born 1964) has been appointed as the new dean of the Faculty of Humanities (HF).

Børresen is a professor of history, and took her doctorate in history (dr.art) in 1995. She was hired as an associate professor at the Department of History in 2004 and was appointed as a full professor in 2007.

Anne Kristine Børresen has written several books and has been a member of a number of different book committees. She has also been active in sharing her research in both popular and academic publications, and has been a visiting scholar at several universities abroad.

In addition to her research and publishing, Børresen has broad administrative experience at NTNU. She is currently a member of the NTNU Board as a representative of the academic staff.

Photo: Lars Gisnås

Faculty of Information Technology, Mathematics and Electrical Engineering (IME) - Geir Egil Øien

Geir Egil Øien (born 1965) has been appointed for a new four year period as dean of the Faculty of Information Technology, Mathematics and Electrical Engineering (IME).

Øien has been a professor at the Department of Electronics and Telecommunications since 2001. Øien was awarded his doctorate (dr.ing/PhD) at the Department of Telecommunications at NTH in 1993 and was employed as an associate professor at the University College in Stavanger (now the University of Stavanger) in 1994. In 1996 he was appointed associate professor at NTNU's Department of Telecommunications. Øien is a member of a range of boards and committees and has published extensively in the academic press.

Faculty of Engineering Science and Technology (IVT) - Ingvald Strømmen

Ingvald Strømmen (born 1950) has been appointed to a new four-year post as dean of the Faculty of Engineering Science and Technology (IVT).

Strømmen was awarded his doctorate (dr.ing/PhD) at the Department of Refrigeration Engineering at NTH in 1980. He was appointed an associate professor in the same department in 1982 and became a professor in 1993.

Strømmen has held a range of board positions in both research and the industry. He has published approxmiately 155 academic articles in national and international journals. He has won a number of awards and other recognition for his scientific work and for his creativity and innovation.

Photo: Universitetsavisa

Faculty of Natural Sciences and Technology (NT) - Anne Borg

Anne Borg (born 1958) has been appointed as the new Dean of the Faculty of Natural Sciences and Technology.

Borg is a professor of physics and vice dean for education at the faculty. Borg was awarded her doctorate (dr.ing/PhD) at NTH in 1988, and was employed as a research assistant at Stanford University that same year. From 1989 she has held scientific positions at NTH and SINTEF, was appointed an associate professor at the Department of Physics in 1993, and a professor at the same department in 1998.

Borg has published about 75 scientific publications internationally and is a member of numerous national and international scientific committees.

Faculty of Social Sciences and Technology Management (SVT) - Marit Reitan

Marit Reitan (born 1964) has been appointed as the new dean of the Faculty of Social Sciences and Technology Management (SVT).

Reitan is a professor and head of the Department of Sociology and Political Science. She was awarded her at the University of Oslo in 1998.

She was appointed associate professor in the Department of Sociology and Political Science in 1998 and professor in 2009.

Reitan is a director of several research and educational institutions.

NTNU Museum of Natural History and Archaeology (VM) - Reidar Andersen

Reidar Andersen (born 1953) has been appointed as new director of NTNU Museum of Natural History and Archaeology (VM).

Andersen is currently the director of the Norwegian Nature Inspectorate at the Norwegian Directorate for Nature Management. He was previously employed at the NTNU Museum of Natural History and Archaeology as a professor of conservation biology from 2006 to 2009, and at NTNU as a professor in the Department of Biology (1997 to 2005).

Reidar Andersen has his university degree from the University of Oslo (1981) and was awarded his doctorat (Dr.scient) at the University of Trondheim in 1989.

Pro-Rectors

Pro-Rector for Research - Kari Melby

Kari Melby will continue as Pro-Rector for Research and is the rector's principle deputy.

She has particular responsibility for overseeing research activities and strategies at NTNU. This includes the training of PhD candidates as researchers.

In addition, she coordinates the university's international contacts and is in charge of the university's gender equality efforts.

Pro-Rector for Education - Berit Kjeldstad

Berit Kjeldstad will continue as the Pro-Rector of Education.

She oversees the Director of the Student and Academic Division and the Director of NTNU University Library

Kjeldstad is the Chair of NTNU's Education Committee, and is the university's representative in the Mid-Norway Network and other education-related networks and groups.

Pro-Rector for Innovation - Johan E. Hustad

Johan E. Hustad will continue in his position as Pro-Rector for Innovation and External Relations.

The Pro-Rector for Innovation and External Relations is responsible for maintaining the university's relationships with innovation networks and regional, national and international businesses and industries. He also maintains contact with NTNU's Technology Transfer Office (TTO) and coordinates efforts related to the university's intellectual property rights (IPR).

Hi-resolution photos of all of NTNU's new leadership are available on Flickr.

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More women in NTNU's top spots

(19.03.2013) The proportion of women in NTNU's leadership will increase markedly when new appointees start on 1 August.

NTNU's board announced the appointment of 11 new leaders on Tuesday, 18 March. Three of the seven deans are women. All three pro-rectors will continue, while NTNU's Museum of Natural History and Archaeology will get a new director.

"We have a dynamic and competent management team that combines continuity with new blood," says incoming

NTNU Rector, Gunnar Bovim, who headed the selection committee.

The newly appointed deans are Anne Borg at the Faculty of Natural Sciences and Technology, Anne Kristin Børresen at the Faculty of Humanities, Marit Reitan at the Faculty of Social Sciences and Technology Management and Fredrik Shetelig at the Faculty of Architecture and Fine Arts.

Reidar Andersen has been appointed as the new director of NTNU's Museum of Natural History and Archaeology. He is currently director of the Norwegian Nature Inspectorate (SNO). The Faculty of Engineering and Technology Management will continue to be led by Ingvald Strømmen, Geir Øien will continue to lead the Faculty of Information Technology, Mathematics and Electrical Engineering, and Stig Slørdahl will continue as dean of the Faculty of Medicine. Kari Melby, Berit Kjeldstad and Johan Hustad will continue as pro-rectors for research (Melby), education and quality learning (Kjelstad) and innovation (Hustad).

Competent women

"This is a motivated, ambitious and competent group of people, each of whom will help make NTNU better able to solve the many problems that face society. Together they form a dynamic whole, with a valuable combination of management experience from NTNU and other businesses," says Gunnar Bovim, who will also begin in his position as the university's rector on 1 August.

"I am proud that NTNU now has a management team with a good gender balance. Five of the eleven newly appointed leaders are women. This says first and foremost that we have many talented women at the university. I hope this will be a clear signal to our outstanding women colleagues to take on leadership roles," the incoming rector said.

And there are many positions to be filled at the university. The first task for the coming deans will be to select a total of 52 new department heads. This makes NTNU the only university in Norway that has appointed leaders at all three levels.

Passionate about the university's vision

Bovim notes that NTNU has a very ambitious vision: Knowledge for a better world. "

As the newly appointed rector, I am passionate about this vision, and it is important for me to have leaders who feel the same. It is very tough to be a leader in the knowledge business. I am confident that this team has the ambition, skills and qualities that characterize good leaders. On behalf of the entire management team, I will say that we all look forward to taking on this job," Bovim said.

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Earth Hour at NTNU

(21.03.2013) NTNU as a university will go dark on Saturday 23 March for an hour to join in the worldwide consciousness-raising event, Earth Hour.

The event involves turning off all non-essential lighting for an hour beginning at 20:30 local time to raise awareness

about the seriousness of climate change.

"Sustainability is important to us all, both in our personal choices and in our professional lives," said NTNU's rector, Torbjørn Digernes, in announcing the university's decision to participate in the event. The university's students, staff and alumni are all being encouraged to participate as well.

For more information about Earth Hour, go to http://earthhour.org/

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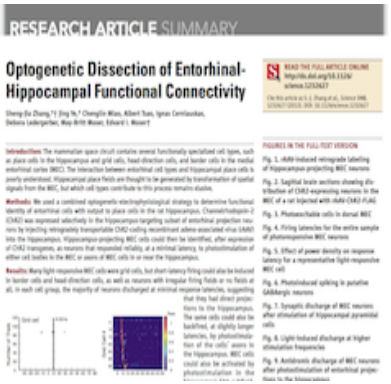
A “light switch” in the brain illuminates neural networks

(04.04.2013) Researchers from NTNU's Kavli Institute of Systems Neuroscience are able to see which cells communicate with each other in the brain by flipping a neural light switch. The results of their efforts are presented in an article in the 5 April issue of Science magazine.

There are cells in your brain that recognize very specific places, and have that and nothing else as their job. These cells, called place cells, are found in an area behind your temple called the hippocampus. While these cells must be sent information from nearby cells to do their job, so far no one has been able to determine exactly what kind of cells work with place cells to craft the code they create for each location. Neurons come in many different types with specialized functions. Some respond to edges and borders, others to specific locations, others act like a compass and react to which way you turn your head.

Now, researchers at the Kavli Institute for Systems Neuroscience have developed a range of advanced


RESEARCH ARTICLE SUMMARY

Optogenetic Dissection of Entorhinal-Hippocampal Functional Connectivity

The paper, **Optogenetic Dissection of Entorhinal-Hippocampal Functional Connectivity**, by Sheng-Jia Zhang, Jing Ye, Chengling Miao, Albert Tsao, Ignas Cerniauskas, Debora Ledergerber, May-Britt Moser and Edvard I. Moser, has been published in the 5 April issue of Science magazine, *Vol. 340 no. 6128 DOI: 10.1126/science.1232627*

techniques that enable them to identify which neurons communicate with each other at different times in the rat brain, and in doing so, create the animal's sense of direction.

"A rat's brain is the size of a grape. Inside there are about fifty million neurons that are connected together at a staggering 450 billion places (roughly)," explains Professor Edvard Moser, director of the Kavli Institute. "Inside this grape-sized brain are areas on each side that are smaller than a grape seed, where we know that memory and the sense of location reside. This is also where we find the neurons that respond to specific places, the place cells. But from which cells do these place cells get information?"

From spaghetti to light switches

The problem is, of course, that researchers cannot simply cut open the rat brain to see which cells have had contact. That would be the equivalent of taking a giant pile of cooked spaghetti, chopping it into little pieces, and then trying to figure out how the various spaghetti

strands were tangled together before the pile was cut up. A job like this requires the use of a completely different set of neural tools, which is where the "light switches" come into play.

Neurons share many similarities with electric cables when they send signals to each other. They send an electric current in one direction – from the "body" of the neuron and down a long arm, called the axon, which goes to another nerve cell next in line. Place cells thus get their small electric signals from a whole series of such arms.

So how do light switches play into all of this?

Viruses do the work

"What we did first was to give these nerve arms a harmless viral infection," Moser says. "We designed a unique virus that does not cause disease, but that acts as a pathway for delivering genes to specific cells. The virus creeps into the neurons, crawls up against the electric current, and uses the nerve cell's own factory to make the genetic recipe that we gave to the virus to carry."

The genetic recipe enabled the cell to make the equivalent of a light switch. Our eyes actually contain the same kind of biological light switch, which allows us to see. The virus infection converts neurons that have previously existed only in darkness, deep inside the brain, to now be sensitive to light.

Then the researchers inserted optical fibres in the rat's

brain to transmit light to the place cells that had light switches in them. They also implanted thin microelectrodes down between the cells so they could detect the signals sent through the axons every time the light from the optical fibre was turned on.

"Now we had everything set up, with light switches installed in cells around the place cells, a lamp, and a way to record the activity," Moser said.

10,000 times

The researchers then turned the lights on and off more than ten thousand times in their rat lab partners, while they monitored and recorded the activity of hundreds of individual cells in the rats' grape-sized brains. The researchers did this research while the rats ran around in a metre-square box, gathering treats. As the rats explored their box and found the treats, the researchers were able to use the light-sensitive cells to reveal how the rat's brain created the map of where the rat had been.

When the researchers put together all the information afterwards they concluded that there is a whole range of different specialized cells that together provide place cells their information. The brain's GPS – its sense of place – is created by signals from head direction cells, border cells, cells that have no known function in creating location points and grid cells. Place cells receive both information about the rat's surroundings and landmarks, but also continuously update their own movement, which is actually independent on sensory input.

"The biggest mystery is the role that the cells that are not part of the sense of direction play. They send signals to place cells, but what do they actually do?" wonders Moser.

"We also wonder how the cells in the hippocampus are able to sort out the various signals they receive. Do they ‘listen' to all of the cells equally effectively all the time, or are there some cells that get more time than others to ‘talk' to place cells?"

The findings are published in Science on Friday 5 April.

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Norwegian memory researchers receive Nansen Prize

(25.04.2013) The Fridtjof Nansen Award for excellence in science and medicine has been awarded to Norwegian University of Science and Technology Professors Edvard I. Moser and May-Britt Moser for pioneering work in memory research.

Edvard and May-Britt Moser are director and co-director respectively at the Kavli Institute for Systems Neuroscience / Centre for Neuronal Computation at NTNU.

The Fridtjof Nansen Award of Excellence is awarded to Norwegian researchers, or researchers resident in Norway, who has shown scientific contributions of international significance on a very high level. Prize winners receive a medal, a diploma and 150 000 Norwegian kroner. Winners of the Fridtjof Nansen Award for Young Scientists receive a diploma and 50 000 Norwegian kroner. It can be awarded to Norwegian researchers or scholars resident in Norway under the age of 40.

The Fridtjof Nansen Award for Young Scientists in 2013 is awarded to Professor Bård Harstad for his research in political economy. Bård Harstad is employed by the Department of Economics at the University of Oslo.

The awards are presented by the chairman of The Nansen Foundation and Affiliated Funds, Professor Gunnar Nicolaysen, on the Annual meeting of on Friday 3 May 2013.

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NTNU, Singapore's IPI sign MOU to build international network

(26.04.2013) The Singapore-based non-profit company IPI and NTNU signed a Memorandum of Understanding (MoU) on Friday 26 April, making NTNU IPI's first Network Partner in the Nordic region. The alliance also gives NTNU, which is Norway's main technological university, premier access to Singapore industries that could commercialize the university's innovative research.

The partners chose to sign their two-year agreement on World Intellectual Property Day, to underscore the importance of intellectual property to the MOU and to the two organizations. They also signed the agreement "virtually," via live feeds and Smart Boards for the actual signing.

IPI's executive director, Dr Lim Khiang Wee, says his organization sees tremendous potential in the MOU signed with NTNU, based on NTNU's leading position in offshore and maritime technology, among other strengths.

"IPI builds and works with a network of international technology partners and intermediaries to search for the right technology to fulfil industry's requirements. NTNU is recognised as one of the foremost technology universities in the world with particular strengths in the offshore & maritime, ICT and healthcare sectors," Dr Lim said. "IPI is very honoured to have formed a partnership with NTNU and gain access to its portfolio of technologies."

NTNU's Pro-Rector for Innovation, Dr Johan E. Hustad, said he also has high hopes for NTNU's collaboration with IPI.

"NTNU recognizes Singapore's position as a central gateway to South-East Asia. We have also made note of the fact that Singapore has high ambitions related to making the city a leading IP hub in Asia. I am deeply impressed by what IPI has achieved since the company was established in 2011," Dr Hustad said. "NTNU will use our position as an IPI Network partner primarily to present and make available selected NTNU technologies and innovations to relevant industries based in Singapore."

Dr. Lim pointed out that the alliance gives NTNU access to IPI's extensive industry network, which is of great benefit to both partners.

NTNU will be able to leverage IPI's strong and close connection to the industry here to commercialize its

innovations," Dr Lim said. "I am confident that IPI can play a catalysing role in opening doors for opportunities for cross-border technology licensing and collaborations between NTNU and the Singapore-based enterprises."

NTNU's Dr Hustad noted that NTNU can use its position in the alliance to build or expand connections with Norwegian companies already established in Singapore.

"We will also use the collaboration with IPI as a platform to revitalize and strengthen ties to Norwegian companies with a strong presence in Singapore, in the short term in particular companies involved in shipping or other maritime areas," Dr Hustad said. "We feel confident that such future efforts will be actively supported by the relevant public authorities in Norway, such as the Ministry of Trade and Commerce and Innovation Norway".

IPI is a non-profit company established by Singapore's Ministry of Trade and Industry under the Research, Innovation & Enterprise 2015 Plan (RIE2015) to help Singapore-based enterprises source, acquire and adopt enabling technology and know-how. IPI assists enterprises in translating innovation objectives into specific intellectual property and technology requirements that enhance their business processes, products and services.

One of the key initiatives of IPI is to create a platform for technology and needs matching. IPI organises the TECHINNOVATION which is a premier technology marketplace and industry-technology matching event. It provides excellent opportunities for technology seekers and technology providers to gain access to a large and diversified pool of IP, technologies, technology needs and most of all to enterprises primed for innovation and collaboration.

NTNU is Norway's second largest university and the only university in Norway with a technological main profile. As a concrete follow-up of the Norwegian government's recently published White Paper on IPRs, NTNU is in the process of establishing the "Norwegian Academy for Intellectual Property" (NAIP), which will have as its main focus education and research related to the role of IP in innovation processes and value creation. In a recent European ranking, NTNU was ranked as the 4th best university in the world when it comes to collaboration with industry (based on the frequency and totality of joint

publications).

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Wild populations of great tits and earlier springs

(26.04.2013) One of the many changes that results from global warming is a shift to earlier springs - something that has led many biologists to worry what will happen to populations that have adapted to specific events with precise timing when that timing shifts.

Bernt-Erik Sæther, an NTNU

biologist and director of the university's Centre for Biodiversity Dynamics, was a co-author on a paper published Friday, 26 April in Science magazine that explores this problem.

Earlier springs have caused caterpillars to hatch and grow earlier than they used to. But great tits, which catch caterpillars to feed their young, have not been able to advance their timing of egg-laying to keep pace with the caterpillars. This has caused an increasing mismatch between the peak availability of caterpillars and the hatching of baby great tits, which has caused early offspring survival in great tits to decline.

That might make you think that great tit populations would also go into decline, but nearly four decades of data on great tit populations shows that this loss of great tit young in the spring has been offset by increased juvenile survival as well as increased immigration during winter. Thus, the mismatch in timing has not caused decline in pre-breeding population size.

The researchers observe that their findings "imply that natural populations may be able to tolerate considerable maladaptation driven by shifting climatic conditions without undergoing immediate declines."

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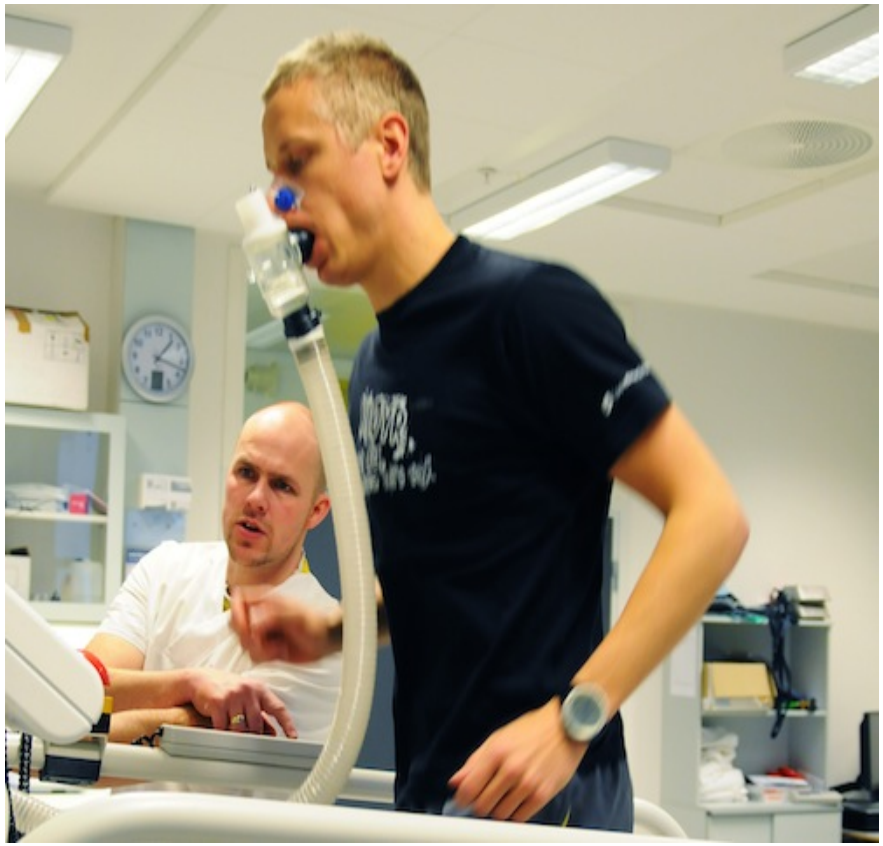
Fit in twelve minutes a week

(29.05.2013) It is a commonly held perception that getting in shape and staying there requires hard work and hours upon hours of training. New research shows the opposite – it seems that only four minutes of vigorous activity three times per week is enough to be fit and healthy.



Regular training improves maximal oxygen uptake (VO2max), which is a well-established measure of physical fitness. However, just how much exercise, and how intense that exercise should be to deliver the biggest benefit remains to be defined. Now, researchers from the KG Jebsen – Centre of Exercise in Medicine at the Norwegian University of Science and Technology (NTNU) in Trondheim have found that just three short high-intensity sessions (AIT) per week can make for substantial differences in the fitness of inactive men. Their results have just been published in PLOS ONE.

"Our data suggest that a single bout of AIT performed three times per week may be a time-efficient strategy to improve VO2max", says Arnt Erik Tjønna, a postdoctoral fellow at the center and lead author of the study. Tjønna says one of the advantages of this approach is that it is easy for people to incorporate into their daily lives.

The researchers measured changes in VO2max and traditional cardiovascular risk factors in 24 inactive but otherwise healthy overweight men after they completed a 10-week training session that involved three weekly high-intensity interval sessions. One group of 13 followed a protocol that has previously shown to be effective, consisting of four intervals of 4 minutes of high intensity exercise at 90% of maximal heart rate (HRmax) interspersed with 3 minutes of active recovery at 70% HRmax (4-AIT), commonly known as 4x4 training.

The other group followed a protocol that consisted of one 4-minute interval at 90% HRmax (1-AIT).

After training, VO2max increased by 10% in the group that had just one high-intensity session three times a week (1-AIT), while the group that followed the 4x4 regime increased its VO2max by 13%. Both groups saw decreases in their blood pressure, but the 1-AIT the group's blood pressures showed greater decreases than their 4-AIT counterparts for both systolic and diastolic readings.

Tjønna says while the results look promising, the number of study participants was small, which limits the scientists' ability to extrapolate their findings. He also

noted that people who are active probably won't benefit as much as the inactive participants did from the 1-AIT training regime.

"It has to be noted that the subjects were previously inactive, and the same effect on physical fitness cannot be expected in active individuals," he said. "Nevertheless, since we know that more and more people are inactive and overweight, the kind of improvement in physical fitness that we saw in this study may provide a real boost for inactive people who are struggling to find the motivation to exercise."

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UN Secretary-General asks student energy summit for help

(14.06.2013) "We need your help," UN Secretary-General Ban Ki-moon wrote an international student energy summit being held at the Norwegian University of Science and Technology (NTNU) in Trondheim this week.

"I invite all of you to join my Sustainable Energy for All initiative – we need your help, your fresh way of looking at the world – your world. We need you to ask the provocative, necessary questions, and identify the solutions, that will stimulate the green economy of the future", UN Secretary General Ban Ki-moon said in a letter to ISES2013, the International Students' Energy Summit being held this week at NTNU.

The letter came on 13 June, the first day of the summit, where more than 400 students from over 60 nations are participating in seminars, presentations and brainstorming sessions with energy industry leaders, politicians and policymakers from throughout Europe and North America. The summit will end on Saturday, 15 June.

"It is an honour to get this recognition, and the invitation from the UN Secretary General. This shows that the work we have done here is good and that it will be recognized, and we're proud of that," says Alexander Hanssen, an NTNU student and head of the ISES 2013 conference.
You can read the letter at the Secretary-General's website.

Future Energy Leaders
"We have decided to create a 'white paper' from ISES 2013 for the Secretary-General's 'Sustainable Energy for All Initiative'. This document will be drawn from the discussions taking place at ISES 2013, and especially from the Energy for All panel and workshop. We want to make sure that the Secretary-General gets a comprehensive response to the letter he sent us. We want to be involved in deciding future energy policies, and this is one step on the way there," says Hanssen says.

Hanssen says that the ISES meeting has been designed to give students the opportunity to meet today's leaders, to learn from them -- but also to teach them.

"Both generations have something to learn from each other," Hanssen says. "The older generation has experience, but students are good at looking at issues in new ways. We haven't yet learned what is impossible."

The Secretary-General seems to agree with Hanssen. "The leadership of youth is essential for meeting the demands of sustainable development," he wrote in his letter to the summit's participants.

Energy for all

The Secretary-General's letter invites ISES participants to help with his "Sustainable Energy for All Initiative".

This UN initiative focuses on energy access, energy efficiency and increasing the percentage of renewable energy in the energy mix, Hanssen says.

"We believe that we have highlighted all of these areas in the ISES 2013 programme, but we have a panel discussion with six people with different experiences and perceptions on energy access that specificall focuses on energy access."

The panel is called "Energy for All" and includes Liberia's Minister of Energy.

"Liberia is particularly interesting in this context," says Hanssen. "Only a fraction of the population has access to energy. Energy access is incredibly important because that is what drives development. People have to have access to energy to lift them out of poverty."

Good contact

The invitation from UN Secretary-General didn't just fall out of the sky. The student organizers have been working long and hard to

engage Secretary General Ba Ki-moon in the summit. He was invited to attend the ISES 2013, but was unable to attend.

In April 2013, Hanssen was involved in the UN High Level Meeting on Energy for the Post 2015 Development Agenda, which was held in Oslo.

"That was our first contact with the United Nations," says Hanssen, "and we have followed up since then."

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A tantalizing hint of an ancient trading town

(05.07.2013) A silver button. A set of balance scales.

When archaeologists Geir Grønnesby and Ellen Grav Ellingsen found these and other artefacts during a dig in mid-Norway, they realized they had intriguing evidence of a Viking-age trading area mentioned in the Norse Sagas.

The finds came from two separate boat graves in an area in Nord-Trøndelag County called Lø, a farm in part of Steinkjer. The archaeologists, who both work at the Norwegian University of Science and Technology's University Museum, were there to conduct a routine investigation required because of an upgrade to Norway's main national highway, the E6.

But instead of a simple highway dig, the researchers found themselves with a potential answer to an unsolved puzzle about a mysterious Viking trading place that is named in ancient sagas, but that has never before been located.

"These finds got us thinking about the descriptions in the Sagas that describe Steinkjer as a trading place," the researchers wrote of their findings in Vitark, an academic journal published by the University Museum from Dec. 2012. "The Sagas say that Steinkjer, under the rule of Eirik Jarl, was briefly even more important than Nidaros, before Olav Haraldsson re-established Nidaros as the king's residence and trading city.

Norway's medieval capital

Nidaros, now the modern city of Trondheim, was Norway's capital during Viking times, and the country's religious centre. The world's northernmost Gothic Cathedral, Nidarosdomen, was built in Trondheim, with its first stones laid in 1070 over the grave of Olav Haraldsson. The oldest existing parts of the cathedral date from 1183.

As a medieval city and a religious capital, Nidaros played an important role in international trade throughout the Middle Ages. The Lewis Chessmen, an exquisite set of 12th century chess pieces worked out of walrus ivory and whales' teeth, are widely believed to have been crafted in the Trondheim/Nidaros area, and traded away.

Olav Haraldsson was the Norwegian king who is often credited with bringing Christianity to Norway and whose sainthood, first proclaimed in 1031, a year after his death, was confirmed by Pope Alexander III in 1164.

Not surprisingly, he features in a number of different Norse and Icelandic sagas. It was these sagas that mention a major trading place in Steinkjer that was even larger than Nidaros. But until archaeologists started the dig in Lø, they had few clues as to where this Viking-age commercial powerhouse might be found.

1000 years of dirt and development

Archaeologists seeking to find a 1000-year-old trading place have precious few leads to pursue.

Almost certainly there were no permanent buildings, which would be the easiest to find, and many items that would have been traded would be made of organic materials that might not survive the ravages of the centuries.

Apart from finding obvious clues, such as coins or metal or glass items that were clearly from foreign lands, archeologists have to rely on much more subtle evidence that can stand the test of time.

One such hint that a location might be a trading place is the geography of the place itself, the researchers wrote in Vitark.

"Even though there is no archaeological proof that there was a trading place in Steinkjer during Viking times, there are several aspects that support this idea," the researchers wrote.

Most importantly, they note, Steinjker is located in a natural trading areas, at the mouth of a river at the innermost part of Trondheim fjord. It is also in a place where farmers have been working flat fields for centuries.

Swords, beads and jewelry

Another clue that archaeologists use to locate the possible trading place is a detailed map of the locations of all kinds of different archaeological finds that might suggest trade.

The logic here is that greater numbers of traded goods are more likely to be found in close proximity to a place of trade, with fewer traded goods found farther and farther from trading areas.

So the researchers plotted all relevant finds from Nord-Trøndelag County, and again and again, the finds suggested a major trading area in Steinkjer.

Beads made of amber and glass are commonly traded, and the area around Steinkjer was rich with finds of these goods, with 254 beads found in 28 different locales, the researchers said.

While nearby Stjørdal had a higher number of bead finds – 485 beads, all told – the researchers noted that most of those beads came from two large finds, which makes it less likely that the beads were linked directly to a trading place.

Twenty-two examples of a special kind of Viking-age sword, called the H sword based on the design of its hilt and one that is associated with trade, were also found in Steinkjer, the most of any area in Nord-Trøndelag.

Five of six pieces of imported jewelry found in Nord-Trøndelag were found in Steinkjer, while six of 10 imported brooches from Nord-Trøndelag also came from Steinkjer.

Scales and a button

While beads, swords and imported jewelry help suggest that Steinkjer was home to a major trading place, two specific finds, in boat graves in Lø, were among the most persuasive finds.

One, a silver button made of braided silver threads that appears to have originated in the British Isles, suggests that the person in the grave had a high status.

The second is a set of balance scales found in another boat grave. The balance scales were constructed in a way that led the archaeologists to believe it came from the west – not from Norway.

Scales themselves naturally suggest trade, and when the researchers looked at all the scales found in Nord-Trøndelag, they again found a clear concentration in the Steinkjer area.

Under the church, in the city centre

If all of these concentrations of finds support the location of a major trading place in Steinkjer as mentioned in the Norse sagas, then where is it?

Here, the archaeologists can only make an educated guess. Based on the fact that sea levels were four or five metres higher in this area 1000 years ago, the location of the existing church in Steinkjer is the most logical place for the trading place to have been, the researchers say.

But confirmation of the fact that Steinkjer was a major trading area in the Viking age raises yet another puzzle: If Steinkjer was such an important area for international trade, why did trade eventually shift to Trondheim, as it did?

Grønnesby says that the shift in trading areas was surely due to the tremendous power struggles between different rulers in the area. Nidaros along with Levanger, another trading area, simply had more support than Steinkjer. "We see that Steinkjer disappears in the sources in the Middle Ages while the same sources show that (nearby) Levanger was a trading post," he notes.

Nevertheless, determining the exact answer will require finding more than silver buttons, scales and beads – and may be an answer that we will never really know.

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Designer droplets open new possibilities

(04.07.2013) By designing droplets using electricity, researchers have opened new possibilities in physics. This technique could possibly be used for everything from extracting oil from wells to creating makeup and food.

You've seen Hollandaise sauce or mayonnaise that has separated, or that shiny layer of oil that forms on top of skin cream. This mixture of water and oil is called an emulsion, but it can be difficult to keep emulsions from separating. A special substance called an emulsifier is used to keep the mixture stable and prevent sseparation.

This is an ongoing problem for the food and medical industries, as well as for oil recovery. In fact, the petroleum industry also has to deal with the opposite problem, which is to separate oil that is pumped up from a well in a mix of water and gas.

Now, researchers from the Norwegian University of Science and Technology have found a new method to control how drops of oil behave, using electricity. The

results were published in late June in the prestigious journal Nature Communications.

NATURE COMMUNICATIONS | ARTICLE OPEN

Active structuring of colloidal armour on liquid drops

Paul Dommersnes, Zbigniew Rozynek, Alexander Mikkelsen, Rene Castberg, Knut Kjerstad, Kjetil Hersvik & Jon Otto Fossum

Affiliations | Contributions | Corresponding author

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Abstract

Abstract · Introduction · Results · Discussion · Methods · Additional information · References · Acknowledgements · Author information · Supplementary information

Adsorption and assembly of colloidal particles at the surface of liquid droplets are at the base of particle-stabilized emulsions and templating. Here we report that electrohydrodynamic and electro-rheological effects in leaky-dielectric liquid drops can be used to structure and dynamically control colloidal particle assemblies at drop surfaces, including electric-field-assisted convective assembly of jammed colloidal 'ribbons', electro-rheological colloidal chains confined to a two-dimensional surface and spinning colloidal domains on that surface. In addition, we demonstrate the size control of 'pupil'-like openings in colloidal shells. We anticipate that electric field manipulation of colloids in leaky dielectrics can lead to new routes of colloidosome assembly and design for 'smart armoured' droplets.

Subject terms: Physical sciences · Fluids and plasma physics · Materials science

At a glance

Figures | Compounds

Figure 4 Figure 5 Figure 6 Figure 7

The "pupil effect"

"We have conducted a very simple experiment to show that we can control particles on the surface of oil droplets using an electric field," explains Jon Otto Fossum, a professor in the Department of Physics at the university.

The researchers used micrometre-sized particles of clay and silicone oil droplets for their experiment. First, the clay particles coated the droplet, but when the voltage was turned on, the clay particles made a ring around the drop. By controlling the strength of the electrical voltage, researchers can control how the particles accumulate in the ring, much like the way your eye controls how much the pupil opens in response to light.

The researchers were also able to control the emulsion's properties with electricity. Its features can be turned on and off quickly, without adding new chemicals.

Food, medicine, and more oil?

The new method may possibly be useful in the production of foods, household products, and cosmetics,

as well as in developing new ways to transport drugs in the body and for enhanced oil recovery. The "pupil effect" may possibly also be used as an optical element controlled by an electric voltage.

"It is also interesting that we have shown that we can use an electric voltage and environmentally friendly clay particles to control droplets, which means that we might be able to design these kinds of emulsions without adding chemicals. This could be important for applications where you want to avoid introducing foreign chemicals into the environment, such as in the oil industry," says Fossum.

More ideas

Fossum says the experiment is basic research in physics, and offers a number of possibilities across disciplines. The research group has thought of several different applications for their finding that they may consider filing patents for, but they do not want to discuss specifics.

"The physical or chemical control of emulsions is very important for many areas of technology and for many different applications," said Fossum.

Fossum says next step is to expand their understanding of what the experiment illustrates, and to perform more laboratory experiments with particles other than clay, and with other types of fluids. At the same time, the researchers are exploring some of the ideas they have about how their technique can be applied.

Citation: Active structuring of colloidal armour on liquid drops. Paul Dommersnes, Zbigniew Rozynek, Alexander Mikkelsen, Rene Castberg, Knut Kjerstad, Kjetil Hersvik & Jon Otto Fossum Nature Communications4, Article number:2066. doi:10.1038/ncomms3066

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New rector at NTNU - Gunnar Bovim

"We should not just think small thoughts. Our task is to create knowledge for a better world, a world that our grandchildren can be proud of," Bovim says.

We toured NTNU's major campuses with NTNU's new rector, as he commented on the main issues facing NTNU in the near future. Among his priorities is improving the way the university educates its students, promoting a vibrant campus life after 5 p.m., and a call for more of the academic staff to communicate their findings to the general public.

See the video (in Norwegian, duration: 8.50 minutes)

NTNU's rector Gunnar Bovim.

Location 1: Øya campus, with St.Olav Trondheim University Hospital and NTNU's Faculty of Medicine.

Interviewer: On Thursday 1 August, Gunnar Bovim was formally installed as the new rector at NTNU. First we asked him about his immediate impression of the university, now some eight years after he left the position as dean of NTNU's Faculty of Medicine.

Rector Bovim: Thanks for the warm reception. I'm really looking forward to get started, and have been preparing for this day these last months. I've been visiting many of NTNU's exciting research communities, and seen that NTNU has really changed. NTNU is developing in a very positive way, and I'm proud of having the opportunity to be a part of NTNU's progress in the coming years.

Interviewer: NTNU's Faculty of Medicine, that you some years ago were the dean of, is renowned for its high

quality research. Two of the four new centres of excellence are connected to this Faculty, and they also have a fine record when applying for projects in the European Research Area system. What may other research communities at NTNU learn from their success?

Rector Bovim: I think all research communities at NTNU may draw on each other's experience. There is quality both at the Faculty of Medicine and at NTNU's other faculties. We may learn a lot from those at the front in their field. In addition to learn from each other within NTNU we must also pay serious attention to the scientific world outside our university. I think we may expect some major initiatives. We should therefore be prepared to establish new groups with the aim of attaining an international standard, in all of NTNU's disciplines. I look forward to being involved in such a process.

Interviewer: In NTNU's strategic area Health, Welfare and Technology, perhaps this building we now see will play an important part? It is the new Norwegian Knowledge Centre for the Health Services at Trondheim University Hospital.

Rector Bovim: In total the buildings for health care services at Øya encompass some 200 000 square meters. One quarter of that area – some 50 000 square meters – is for research and education at NTNU. This puts NTNU in a fantastically privileged position, ranking us foremost amongst universities in Northern Europe. It gives us both academic possibilities and societal duties.

Location 2: Dragvoll campus

Interviewer: In his new, blue electric car, rector Bovim will be travelling between the multitude of NTNU's campuses in Trondheim.

Interviewer: We are now in the central walkway at the Dragvoll campus – where the humanities and the social sciences are located. Today is a very quiet day, but in a few days, when the students start pouring in, this place will be seriously crowded. The wish list for additional buildings at NTNU is indeed long. Should NTNU keep two campuses or should we concentrate the university at just one big campus?

Rector Bovim: Some people say that NTNU of today has two campuses. The reality is that NTNU's departments are spread on locations all over Trondheim – making it truly a "university city". Furthermore there is presently a "campus project" directed by NTNU's owner – the Ministry of Education and Research. The goal of this project is to find out how NTNU's need for additional space should be taken care of in the near future. I have the sincere impression that our owner is interested in good solutions for NTNU. It is therefore our task to contribute to the project's quality by bringing forward at an early stage all relevant facts and viewpoints, providing the best possible basis for the final decisions.

Interviewer: Many at this campus do not always feel at home within a university focused on science and technology. It may still be a challenge to create a team

spirit and a sense of common cause, across the wide range of disciplines within NTNU? How will you go about improving this situation?

Rector Bovim: I am really enthusiastic about NTNU's present vision and strategy. The main task is "Knowledge for a better world". That is a very tangible concept, and I'm really concerned about not degrading it in any way. Some say that we are a small university in the periphery. That is totally wrong. We at NTNU have a true potential and a vision to contribute with solid knowledge for a better world. This requires a concerted effort from all of the disciplines within NTNU's wide range of competence.

Location 3: Marine Technology at Tyholt

Interviewer: We are now at the laboratories for marine technology in Trondheim, at Tyholt. Here NTNU cooperates closely with SINTEF and MARINTEK. Together they plan to build an Ocean Space Centre. Do you think the centre will open for business in your coming term as rector?

Rector Bovim: It is a highly exciting and ambitious project, which we truly hope to bring about. I cannot promise that it will be realized within the first few years. The project illuminates the close cooperation between NTNU and SINTEF. There are many fields where this cooperation is highly visible. We may be rightly proud of this cooperation, and it is definitely something to develop further.

Location 4: University Museum at Kalvskinnet campus

Interviewer: Here at Kalvskinnet campus we find the NTNU University Museum, where science communication to the general public is a major task. However, too many of NTNU's academic staff are rather silent in this communication. How may they be inspired to communicate more of their work to the general public?

Rector Bovim: In this context openness is central. To have the scientists enthusiastically communicate their findings and questions central to their research is a major part of the university's main tasks. Some concentrate this communication only to the scientists in their own field, which of course is important. But I'm also seriously concerned about engaging the general public in this communication. It is clearly a part of our societal duty to disseminate our knowledge to the general public. I hope we can promote this activity, both as a response to direct questions, but also through our own initiatives presenting our findings to society as a whole.

Location 4: Gløshaugen campus

Interviewer: We are now at the Gløshaugen campus behind the Main Administration Building, soon to be the outdoor venue for the annual enrolment ceremony. On 13 August you will face some seven thousand new NTNU students. What will be your main message?

Rector Bovim: First I regard it as a privilege that 7000 young persons, in their prime years, attend our university to study. I hope that I will be able to tell them how much

we appreciate their choice. Furthermore I intend to encourage them to stick to the enthusiasm they have when coming here. We will help them retain that enthusiasm, and educate them into persons with a purpose in life.

Interviewer: In previous interviews you have hinted that NTNU perhaps is resting too much on previous educational successes, and has not enough ability for renewal. How will you approach this issue?

Rector Bovim: My reflections were not meant as criticism about the present state, as NTNU has many fine qualities. It is, however, important for NTNU as a university to be forever engaged in improvement and development. We have to be at the forefront regarding what study programmes we provide and the accompanying educational methods. We must attract those young persons that will be entrusted with bringing the nation into the future.

Interviewer: You want a campus where the lights are not turned off at five p.m. How might that be obtained?

Rector Bovim: To truly be a student in an academic environment is not limited to "9 to 5". It is an activity that follows you through the whole day. A real campus shall encompass innovative learning, coffee bars, arenas for discussions, maybe a literary society, and places for informal meetings between academic staff and students. This might make the campus a vibrant place to, a place

where you want to come also in your off-time, a place where the lights are still on after five p.m.

Interviewer: You've previously said that your main concern as rector at NTNU will be to "lift in place some large stones"? What are the largest building blocks you have set your eyes on in the near future?

Rector Bovim: We should not engage in small thoughts. NTNU is on both a national and international mission that shall not be taken lightly. Our task is, as previously stated, knowledge for a better world, a world that our grandchildren might be proud of. Those that come after us will hopefully admit that we made some right choices. One factor is creating scientific communities that gain international standing. Another one is offering high quality study programmes that really attract students. A third factor is convincing business and industry that cooperating with NTNU will truly benefit their progress. Those are "large stones" that yet have to be given a more concrete form. But I'm now just beginning my term as rector, engaging in a dialogue with the staff and students at NTNU how to proceed in these matters. This is a job I truly look forward to.

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LSD and other psychedelics not linked with mental health problems

(19.08.2013) (Updated 04.06.2015, see text below). The use of LSD, magic mushrooms, or peyote does not increase a person's risk of developing mental health problems, according to an analysis of information from more than 130,000 randomly chosen people, including 22,000 people who had used psychedelics at least once.

PhD Teri Krebs and clinical psychologist Pål-Ørjan Johansen, former employee at the Department of Neuroscience, used data from a US national health survey to see what association there was, if any, between psychedelic drug use and mental health problems.

The authors found no link between the use of psychedelic drugs and a range of mental health problems. Instead they found some significant associations between the use of psychedelic drugs and fewer mental health problems.

The results are published in the journal PLOS One and are freely available online.

Previous research

Researcher Teri Krebs talks about her work from 2012 on BBC World News

Read about their previous publication in Nature magazine.

Symptoms and mental health treatment considered

The researchers relied on data from the 2001-2004 National Survey on Drug Use and Health, in which participants were asked about mental health treatment and symptoms of a variety of mental health conditions over the past year. The specific symptoms examined were general psychological distress, anxiety disorders, mood disorders, and psychosis.

Armed with this information, Krebs and Johansen were able to examine if there were any associations between psychedelic use and general or specific mental health problems. They found none.

"After adjusting for other risk factors, lifetime use of LSD, psilocybin, mescaline or peyote, or past year use of LSD was not associated with a higher rate of mental health problems or receiving mental health treatment," says Johansen.

Could psychedelics be healthy for you?

The researchers found that lifetime use of psilocybin or mescaline and past year use of LSD were associated with lower rates of serious psychological distress. Lifetime use of LSD was also significantly associated with a lower rate of outpatient mental health treatment and psychiatric medicine prescription.

The design of the study makes it impossible to determine exactly why the researchers found what they found.

"We cannot exclude the possibility that use of psychedelics might have a negative effect on mental health for some individuals or groups, perhaps counterbalanced at a population level by a positive effect on mental health in others," they wrote.

Nevertheless, "recent clinical trials have also failed to find any evidence of any lasting harmful effects of psychedelics," the researchers said, which supports the robustness of the PLOS One findings.

In fact, says Krebs, "many people report deeply meaningful experiences and lasting beneficial effects from using psychedelics."

"Other studies have found no evidence of health or social problems among people who had used psychedelics hundreds of times in legally-protected religious ceremonies," adds Johansen.

What's the bottom line on psychedelic use?

Psychedelics are different than most other recreational drugs. Experts agree that psychedelics do not cause addiction or compulsive use, and they are not known to harm the brain.

When evaluating psychedelics, as with any activity, it is important to take an objective view of all the evidence and avoid being biased by anecdotal stories either of harm or benefit, the researchers say.

"Everything has some potential for negative effects, but psychedelic use is overall considered to pose a very low

risk to the individual and to society," Johansen says, "Psychedelics can elicit temporary feelings of anxiety and confusion, but accidents leading to serious injury are extremely rare."

"Early speculation that psychedelics might lead to mental health problems was based on a small number of case reports and did not take into account either the widespread use of psychedelics or the not infrequent rate of mental health problems in the general population," Krebs explains.

"Over the past 50 years tens of millions of people have used psychedelics and there just is not much evidence of long-term problems," she concludes.

Both researchers were supported by the Research Council of Norway.

The article will be freely available online at the PLOS ONE website after 5 pm EDT, August 19, 2013.
http://dx.plos.org/10.1371/journal.pone.0063972

See also: Previous research by the authors on LSD for alcoholism

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The following changes have been made in this article:
On 1 June 2015, the text was updated to make it clear that Pål-Ørjan Johansen was not employed at the Department of Neuroscience when the press release was issued (change in the second paragraph).

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High cholesterol riskier for middle-aged men than women

(15.08.2013) High cholesterol levels are much more risky for middle-aged men than middle-aged women when it comes to having a first heart attack, a new study of more than 40,000 Norwegian men and women has shown.

The study, just published in the September issue of Epidemiology, shows that being a middle-aged male and having high cholesterol levels results in a negative synergistic effect that the researchers did not observe in women. However, current clinical guidelines for treating high cholesterol levels do not differentiate between men and women.

Middle age risks for men

"Our results suggest that in middle age, high cholesterol levels are much more detrimental for men than women, so that prevention efforts in this age group will have a greater potential to reduce the occurrence of a first heart attack in men," said Erik Madssen from the Norwegian University of Science and Technology's (NTNU) Department of Circulation and Medical Imaging, who was

first author of the paper with Lars Erik Laugsand, also from NTNU.

The researchers used data from the second Nord-Trøndelag Health Study, a county-wide survey carried out in 1995-1997 in Nord Trøndelag, Norway, that included blood sample collection from 65,000 people. Because the researchers hypothezised that female sex hormones could possibly protect women with respect to the prevalence of first heart attacks, they restricted their analysis to participants who were younger than 60 years old at the time of the survey.

More than three times more heart attacks

In the end, the researchers had information from 23,525 women and 20,725 men who fit this category. During the nearly 12 years of follow-up on the participants who were younger than 60 years when the survey was conducted, there were 157 new cases of heart attacks in women and 553 in men.

They also conducted a secondary analysis of participants who were 60 years old or older at the time of the survey, which gave them another 20,138 individuals for the analysis. However, there was no evidence of a negative synergistic effect in male participants in this age group.

"Our findings suggest that middle-aged men with an unfortunate cholesterol profile have a significant additional risk of myocardial infarction than what previously has been thought," Madssen and Laugsand

said. "Thus, these men should be treated more aggressively than what often is the case today, so that more infarctions can be prevented and lives can be saved."

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Neolithic arrows melt out of high mountain snowfields

(29.08.2013) Climate change is melting high-mountain snowpacks and glaciers the world over. NTNU archaeologist Martin Callanan has published a paper in Antiquities where he describes five Neolithic arrowshafts and a Neolithic longbow that were discovered in 2010–11 in the Oppdal area.

Callanan told Melissa Hogenboom, a BBC science reporter that "the number and antiquity of some of these artefacts is unprecedented in the almost century-long history of snow patch surveying in the region."

But, he added, "as the climate continues to heat up and the snows melt away, one wonders what long-term price there will be to pay for these glimpses of the frozen past."

Callanan says that finding these ancient bows and arrows helps archaeologists to better understand ancient hunting techiques, and perhas what might have attracted hunters to the area where the bows were found. However, he said, as climate change accelerates

snowpack melting, there is a new urgency to "discovering and recovering these fragile perishable artefacts."

Read the BBC's news story on the finds.

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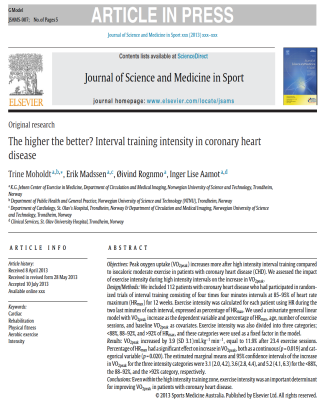
High intensity training good for cardiac patients

(20.09.2013) High-intensity exercise is shown to be protective against coronary heart disease (CHD) and is well known as a popular and time-saving approach to getting fit. But what about people who already have heart disease? Previously, these patients were told to exercise, but only at a moderate intensity to protect their hearts. More recently, however, researchers have found that high-intensity exercise is very beneficial for these patients. But how intense should these sessions actually be?

A new study from the K. G. Jebsen – Center of Exercise in Medicine at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway examines this question in detail. Researchers analyzed data from four randomized, controlled trials conducted at the center to try to determine what characterized the most effective high-intensity training programme for this patient group.

The researchers used changes in VO2max, which is peak oxygen uptake, as a measure of the effectiveness of the

Read more



ARTICLE IN PRESS

Journal of Science and Medicine in Sport

Original research

The higher the better? Interval training intensity in coronary heart disease

different exercise regimes. The study participants (n=112) were aged 18+ and all had coronary heart disease.

The exercise period lasted for 12 weeks. The participants either ran/walked on treadmill, walked uphill outdoors or trained in a group, all following the 4x4 exercise model. The 4x4 exercise model involves 4 minutes of high-intensity exercise followed by 3 minutes of moderate-intensity exercise, repeated 4 times.

"When we compared VO2max before and after the training period, we found that the number of training sessions, the subject's age or baseline fitness levels had no impact," says Trine Moholdt, a postdoctoral fellow at the center and lead author of the study. "But the intensity of the intervals had a significant effect, and seems to be the most important characteristic of an effective interval session."

Dose-response relationship

The intensity of the training was categorized according to the participant's heart rate zone (% of maximum heart rate (HRmax)). High-intensity training is when an individual's HR during intensive periods is 85-95% of HRmax.

Overall, VO2max increased by 11.9 % after an average of 23.4 training sessions during the 12-week period for all subjects.

However, when participants exercised at an intensity that was greater than 92 % of their HRmax during the high-intensity periods, the effect was even greater than at the lower intensity levels, indicating that there is a dose-response relationship even in the 85-95% high-intensity zone.

Practical questions

Moholdt says that people who start exercising using interval training often have lots of practical questions. How much incline should their treadmill have? Can they shorten their lower-intensity time to just 2 minutes? Why 4 minutes and not 5?

"Knowing that pushing yourself to over 90 % of HRmax may save you from an extra training session that week, encourages us to investigate even the small details," says Moholdt.

"When people give priority to exercise in their otherwise busy lives, they want to know that they are doing it the right way. At the same time, I want to emphasize that all exercise is better than none! Some people are not able to exercise at high intensity because of other health problems, and one should then look for other alternatives."

The four studies, which were composed of patients who either had acute coronary syndrome or angina pectoris, confirmed previous findings that high-intensity exercise is safe, even for patients with CHD. Moholdt says it would

be interesting to see if these finding hold true for healthy subjects, as well as for patients with more severe heart disease.

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Fighting fat with Botox

(04.10.2013) You may know Botox from its use by the rich and famous to eliminate facial wrinkles. But now Helene Johannessen, a PhD candidate at the Norwegian University of Science and Technology (NTNU), is studying whether or not Botox could be used as an alternative to treating morbid obesity, replacing costly and dangerous operations.

Tests on rats have shown that treatments with Botox injected into the vagus nerve in the stomach can lead to weight loss. When Johannessen and her colleagues injected rats with Botox, the animals ate less and lost 20-30 per cent of their body weight over five weeks. The treatment effectively paralyzes the vagus nerve, which

triggers the sense of hunger and controls the passing of food through the intestines.

Paralyzing the nerve paralyzes muscles in the stomach, which appears to slow the passage of food through the stomach. This effect might one day lead to treatments that cause people to feel fuller for longer.

EU project fights obesity

The hope is that the use of botox can be developed into an alternative to gastric bypass surgery. Johannessen and her research are part of the Experimental Surgery and Pharmacology research group, which is exploring alternatives to gastric surgery. The Botox treatment study is part of an EU project called Full4Health.

Botox is actually botulinum toxin, which when ingested in spoiled foods can lead to both paralysis and death. Nowadays Botox is used in the medical treatment of dystonias and spasms, as well for its more famous cosmetic use. If Johannessen and her colleagues succeed in their efforts, it might also become useful in giving people a healthier and less weighty life.

Clinical studies coming

Johannessen told the Norwegian Broadcasting Corporation (NRK) that her research team will start human clinical studies as soon as Norwegian medical ethics authorities give their approval.

"As a start, we will be inviting patients who are candidates for obesity operations but who, for one reason or

another, cannot undergo one," Johannessen told NRK.

Obesity is a growing problem across the globe. Being overweight can lead to severe diseases and conditions including diabetes and heart problems. The World Health Organization estimates that obesity is responsible for 2–8 percent of health care costs and 10–13 percent of deaths in different parts of Europe.

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NOK 100 million for pan-European carbon capture lab

(08.11.2013) The Norwegian Government has allocated NOK 100 million (€12 million) in its additional appropriation to the 2014 Norwegian budget to upgrade laboratories at the Norwegian University of Science and Technology (NTNU) for a European research project on carbon capture and storage.

"This is a happy day for both NTNU and the environment," said Kari Melby, Pro-Rector for Research at the university.

The European Carbon Dioxide Capture and Storage Laboratory Infrastructure (ECCSEL) is a joint European infrastructure project designed for carbon capture and storage (CCS) research. CCS is seen as one of the most important technologies available to combat climate change.

NTNU given responsibility

On behalf of Norway, NTNU has been given the responsibility to lead the planning and design of this

infrastructure. This effort is currently in full swing in partnership with 15 major research institutions from 10 European countries. The general meeting of this consortium decided this summer that the head office and operations centre for ECCSEL will be in Trondheim, with a planned start-up in 2015.

"It is a real commitment when NTNU - in close cooperation with and supported by SINTEF, the Ministry of Education and the Research Council of Norway - takes on this responsibility. We need to be able to offer modern and functional laboratories and other facilities at a minimum. This grant enables us to quickly get started with a badly needed renovation and upgrade of the Thermal Energy Laboratory. We will also then have a place for the equipment for which the Research Council of Norway recently allocated NOK 50 million," said Pro-Rector Melby.

"ECCSEL will be a modern pan-European infrastructure for research and development of second and third generation CCS technology. Carbon capture and storage is one of several key measures that can be used to reduce anthropogenic emissions of CO2. We need CCS to reduce carbon emissions quickly, but it will take a great amount of research and demonstration work to find the least expensive and most efficient technologies," says NTNU's Sverre Quale, who will be ECCSEL project director at its head office in Trondheim.

Norwegian University of Science and Technology

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Fred Kavli, philanthropist and entrepreneur with ties to NTNU, dies

(22.11.2013) Fred Kavli, a businessman, entrepreneur and philanthropist whose support for basic scientific research has had a major impact on the research landscape in three continents, has died at 86.

Kavli died peacefully in his home in Santa Barbara on Thursday November 21, according to the Kavli Foundation, the institution he founded in 2000 to support his philanthropic work.

"Fred Kavli was an extraordinary human being with special visionary qualities. We are proud to represent his alma mater, and happy that we can carry his vision forward through the work of the Kavli Institute," said Gunnar Bovim, Rector of the Norwegian University of Science and Technology in Trondheim.

Kavli graduated with a degree in applied physics in 1955 from the Norwegian Institute of Technology, one of NTNU's predecessors. His philanthropic work through the Kavli Foundation has had a substantial impact on NTNU, particularly when the university's Centre for the Biology of Memory was selected in 2007 to be the Kavli Institute for Systems Neuroscience.

"Fred has had an enormous impact on our lives. It is because of his vision that we have been able to conduct

science as we wanted to do, and it is because of Fred that the institute has grown and become so successful," said Edvard Moser, director of NTNU's Kavli Institute. "Fred's beliefs in long-term investments and the power of basic science were unmatched. We will do our best to carry on his vision. He has established a secure foundation for that, through the establishment of the institute as well as the enormous support we get through the Foundation. The support of the Foundation serves as a model for other philanthropic organizations."

"It was with great sadness that we received the news that Fred had passed away," said Stig Slørdahl, dean of the university's Faculty of Medicine. "Fred was a man with great vision, and even greater generosity, wisdom, creativity and a deep inner drive."

Moved to North America

After receiving his degree from NTH in 1955, Kavli moved to Canada and eventually the United States, where he became a naturalized citizen and established the Kavlico Corporation in Los Angeles in 1958. The company eventually became one of the world's largest suppliers of sensors for aeronautical, automotive and industrial applications. The company's products are found in such landmark projects as the SR-71 Blackbird and the Space Shuttle.

Kavli established the Kavli Foundation in 2000 after divesting his interests in Kavlico. Based in Southern

California, the Foundation today includes an international community of basic research institutes in the fields of astrophysics, nanoscience, neuroscience, and theoretical physics.

The Foundation has also established and supported an international program of conferences, symposia, endowed professorships, and other activities. This includes being a founding partner of the biennial Kavli Prizes, which recognize scientists for their seminal advances in three research areas: astrophysics, nanoscience, and neuroscience.

Kavli was awarded an honorary doctorate from NTNU in 2008. He is survived by two children, and nine nephews and nieces.

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Unlocking the secrets of marine carbon cycling

(04.012.2013) The discussion over the best ways to reduce greenhouse gas emissions and remove existing carbon dioxide from the atmosphere often includes measures that entail planting trees. But this discussion overlooks the contribution made by phytoplankton.

Microscopic marine phytoplankton play a critical role in regulating today's carbon cycles, yet not enough is known about the process.

These tiny organisms consume carbon dioxide from the atmosphere and move it to marine sediments in the deep ocean in a process called "the biological pump". Currently, more than 99 per cent of the Earth's carbon is bound up in these sediments, locked away in the depths of the ocean.

A new EU-funded project called "OCEAN-CERTAIN" has been created to improve our understanding of the biological pump, so that its significance in shaping future climate change is clearer. The project will be led by NTNU

researchers, and will examine and compare the situations in different ocean areas on the planet.

Researchers from three continents

"The marine ecosystem, from microorganisms up to fish, mitigates the accumulation of CO2 in the atmosphere through its activity, but there are major uncertainties about the importance of these processes and how they are affected by human activities," says Yngvar Olsen, a professor in NTNU's Department of Biology, and the project's coordinator.

"We are a broad group of scientists from Europe, Chile and Australia, which is important in seeing the challenge from a global perspective. We are both natural scientists who will work with the ecosystem and the biological

pump and social scientists who will study possible consequences for society, or people in general."

The biological pump as a process is well known to marine scientists, but there remains great uncertainty about how much carbon is bound up in ocean sediments annually, and how the process will be affected by changing climate, social and environmental conditions. This uncertainty has been problematic in predicting future climate change, and experts and politicians are eager to know more.

Information for scientists, policymakers

The project has the clear goal of providing more comprehensive and reliable information to climate scientists and politicians who must make decisions about climate actions. It will rely on collecting existing knowledge from databases and will generate new knowledge where gaps are identified.

A better understanding of the importance of the biological processes that enable the ocean to absorb carbon dioxide will have economic and social implications. The project will therefore address how changes in these processes will affect the tourism, aquaculture and fisheries sectors and how their responses may in turn affect these processes. In addition, it will address how this knowledge can be used to improve management

Strengthening the pump

In a world where carbon dioxide emissions have

increased, it is important that we have a sound understanding of the natural processes that can counteract climate change, so that future climate-related predictions are better, and perhaps more important, so that we manage the oceans in a way that strengthens, rather than weakens, the biological pump.

The OCEAN CERTAIN project has 11 partners from 8 European countries and Chile and Australia. The project will run for four years and has an overall budget of approximately €9 million, or approximately NOK 72 million. NTNU initiated the project and is the project coordinator. The University of Bergen is the other Norwegian partner.

OCEAN-CERTAIN - "Ocean Food-web Patrol – Climate Effects: Reducing Targeted
Uncertainties with an Interactive Network".

Partners

NTNU- Norwegian University of Science and Technology, Norway
UIB- University of Bergen, Norway
GEOMAR- Helmholtz Centre for Ocean Research, Kiel, Germany
VITO- Vlaamse Instelling voor Technologisch Onderzoek N.V. (The Flemish Institute for Technological Research), Belgium
DEU- Dokuz Eylul University, Turkey
UGOT- University of Gothenburg, Sweden

GRIFFITH- Griffith University, Australia
UACH- Austral University of Chile, Chile
CNR- The National Research Council, Italy
CEFAS- The Secretary of State for Environment, Food and Rural Affairs, UK
TALCA- University of Talca, Chile

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Hydro CEO Brandtzæg appointed NTNU chairman

(05.12.2013) Hydro President and CEO Svein Richard Brandtzæg has been appointed chairman of NTNU, effective 1 January 2014.

Former Member of Parliament Per-Kristian Foss is leaving the position, effective the same date, for a post in the Norwegian government as Auditor-General.

Brandtzæg has served has a board member with national and international companies and organizations,

including chairman of the European Aluminium Association and the International Aluminium Institute, which represent 60 percent of world production of bauxite, alumina and aluminum.

Svein Richard Brandtzæg was born in Haugesund in 1957. He holds a PhD in inorganic chemistry from NTNU and also has a business degree from the Norwegian Business School (BI). Brandtzæg has been associated with Hydro since 1986, as head of departments and business areas, and as President and CEO from 2009.

Rector Gunnar Bovim says he wishes Brandtzæg welcome as new chairman, and expresses gratitude to Foss for his efforts.

"During the months Foss has been chairman of the board at NTNU, he has left his mark. He has put in a significant effort for NTNU finance and strategic development. On behalf of the university, I thank him for that. At the same time, it is wonderful that the Ministry has now appointed a successor with the experience and expertise that will surely benefit NTNU for years to come," says Bovim, who is looking forward to collaborating with the new chairman.

Brandtzæg is looking forward to taking on the assignment.

"NTNU aims to be a sought-after partner for leading knowledge institutions and companies nationally and internationally. The university's academic breadth and

expertise provides unique opportunities to solve complex challenges. The interaction between society, culture, people and technology are part of my everyday life as head of Hydro and the key to the future of Norway. I look forward to contributing to NTNU's development in all areas," says Brandtzæg.

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May-Britt and Edvard Moser win 2013 Horwitz prize with mentor John O'Keefe

(06.12.2013) Edvard Moser, May-Britt Moser of the Norwegian University of Science and Technology (NTNU), and John O'Keefe, from University College London have been awarded the 2013 Louisa Gross Horwitz Prize for discoveries that have illuminated how the brain calculates location and navigation.

The Horwitz Prize is Columbia University's top honor for achievement in biology and biochemistry research. It is widely considered to be a precursor to a Nobel. Of the 91

Horwitz Prize winners to date, 43 have gone on to receive Nobel prizes.

The researchers' work, conducted in animal models, may lead to new treatments for Alzheimer's and other neurological disorders that affect the brain's spatial capabilities.

"How the brain records and recalls its trajectory through space is fundamental to understanding spatial memory," said Nobel laureate Eric R. Kandel, MD, who is University Professor & the Kavli Professor of Brain Science, co-director of the Mortimer B. Zuckerman Mind Brain Behavior Institute, and director of the Kavli Institute for Brain Science at Columbia University and senior investigator at the Howard Hughes Medical Institute.

"We are pleased to award our 2013 Horwitz Prize to Drs. Edvard Moser, May-Britt Moser, and John O'Keefe for the significant advancements they have made to the field of neuroscience," said Lee Goldman, MD, dean of the faculties of health sciences and medicine at Columbia University Medical Center and executive vice president for health and biomedical sciences at Columbia University.

Deeply honored

"We are deeply honored" said Edvard Moser. "The award recognizes the dedicated work and cooperation of many great scientists over several decades. It also highlights how basic science contributes pieces to solutions that yield cures for diseases."

"The Horwitz award is yet another acknowledgement of the scientific merits of May-Britt and Edvard Moser. Only the very best receive such an honor, and we at the Norwegian University of Science and Technology are very proud," said Stig Slørdahl, Dean of the Faculty of Medicine at the university.

"John O'Keefe's finding that part of the brain functions as a cognitive map was an important early milestone in the development of cognitive neuroscience, and the theoretical model of how the brain calculates its location —refined by Edvard and May-Britt Moser—is today a critical component of the study of hippocampal function," said Gerard Karsenty, MD, PhD, chair of the Horwitz Prize Committee and of the Department of Genetics and Development at Columbia University Medical Center.

"The contributions of these three scientists to neuroscience make them worthy recipients of the 2013 Horwitz Prize," said Michael Purdy, PhD, executive vice president for research, Columbia University. "Their theoretical insights—as well as the fact that John O'Keefe trained Edvard and May-Britt Moser in a research technique that became pivotal to their work—confirm the value of encouraging young scientists to connect with mentors in their field to learn technical skills and research strategies."

Computing cells

In 1971, Dr. O'Keefe discovered specific cells in the hippocampus that record location. These place cells, as they are called, register the locations of specific

landmarks, such as the laboratory, or the corner deli. While recording the firing of neurons in rats as they moved from one location to another, he found that each location was logged by its own unique set of nerve cells in the CA1 region of the hippocampus, suggesting that the cells form a virtual map of the animal's location. The firing location of each cell was stable over time, and moving the animal to another location caused it to form a new map, using some of the same cells, in addition to new ones. When the animal was returned to its original location, it replayed the initial map that it had formed.

In 1996, Drs. Edvard Moser and May-Britt Moser, longtime collaborators who are married to each other, worked with Dr. O'Keefe, who became their mentor, to learn how to record the activity of cells in the hippocampus.

Nearly a decade later, in 2005, the Moser team discovered cells in the entorhinal cortex region in the brains of rats that function as a navigation system. These grid cells, as they are called, are responsible for the animals' knowing where they are, where they have been, and where they are going; they are constantly working to create a map of the outside world. Constructed in the nervous system from tactile, visual, and other sensory input, grid cells have provided fundamental insights into how spatial location and memory are computed in the brain. The mapping information flows from the entorhinal cortex to the hippocampus and then back, and scientists are now working to understand how the grid cells inform place cells, and vice versa.

Because the entorhinal cortex, which contains the grid cell navigation system, is often damaged in the early stages of Alzheimer's disease, the work by the Mosers and Dr. O'Keefe on how memory and cognitive ability are lost has great potential significance for Alzheimer's research. Scientists think that these findings may explain why getting lost is frequently an early sign of Alzheimer's and why memory fails as the disease progresses. Dr. O'Keefe's group has already shown that the place cells in a mouse model of dementia are less accurate at identifying the animal's location and that the magnitude of neuronal impairment correlates with deficits in spatial memory, as well as the amount of neuropathological amyloid plaque.

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NTNU and Statoil sign education and research agreement worth as much as NOK 310 million

(10.12.2013) The Norwegian University of Science and Technology (NTNU) and Statoil signed an agreement Monday, 9 December, on a long-term research and education collaboration that will bring the university as much as NOK 310 million, or about €38 million, over the next eight years.

The funding goes to two distinct projects, and will finance 17 adjunct professors and two full-time research professors. It includes six research grants and publishing support for doctoral students, as well as support for geological fieldwork and field trips for students in petroleum and marine activities. It will also help support several research projects aimed at increasing the rate of recovery from gas and oil wells in the Norwegian Sea.

"NTNU is very pleased with this agreement, and that Statoil will continue to be the university's partner in both

education and research. The agreement enables us to think long term, including in new areas that are strategically important for NTNU," says Rector Gunnar Bovim, who signed the agreement on behalf of the university.

Academica agreement renewed

The first contract is a renewal of what is called the Academia agreement, with a value of NOK 60 million over five years.

"The renewal of the Academia agreement confirms the excellent cooperation between Statoil and NTNU, and ensures a long-term commitment to promote basic research, knowledge development and education. We are committed to working with the best in the world, and NTNU represents knowledge and research in the top class in key areas for Statoil," says Statoil's vice present for research Lars Høier, who signed the agreement on

behalf of the company.

The second agreement is for four years with an option to extend it an additional four years. This money will go to contract research on a wide range of petroleum-related projects. Based on past experience, it could be worth NOK 250 million over the full eight years.

"This is a recognition of the strong academic environment at NTNU. We look forward to continued innovation, relevant research and the high-quality education of students in the coming years," Høier said.

Increased oil and gas recovery

The money from the Academia agreement is focused on projects related to increasing the rate of recovery from gas and oil wells in the Norwegian Sea, where Professor Jon Kleppe at the Department of Petroleum Engineering and Applied Geophysics (IPT) is deeply involved. Other research groups will also benefit from the agreement.

Part of the money is intended for what is called the Norne Village, a project to improve recovery from the Norne oil and gas field by using Integrated Operations, sometimes called eFields. The Norne Field is located west of Sandnessjøen and is roughly 1,400 kilometres from the export pipeline landfall at Dornum in Germany. This project is led by Richard Wilfred Rwechungura, an assistant professor in the Department of Petroleum Engineering and Applied Geophysics.

The funding will also support the VR Village, which is a virtual reality project designed to help visualize large amounts of seismic and reservoir data. This project is being supervised by Professor Egil Tjåland, who is head of the Department of Petroleum Engineering and Applied Geophysics.

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NTNU student developed app Fun Run 2.0 released

(18.12.2013) It began as a dream and ended up as a games app – Fun Run has been downloaded 30 million times over the past year.

Last week, Dirtybit, the Norwegian company responsible for the game, launched Fun Run 2.0, which could rocket the game back to the top of the US App store's most downloaded games – again. The company, started by students at the Norwegian University of Science and Technology (NTNU), is the only app developer in the country that has managed to reach the number one spot for downloaded apps in the United States.

But this success has been hard won – several of the Dirtybit gang are still NTNU students in addition to working full time with the game that they created in their spare time.

More than 30 million times

You 've probably seen people sneak away from what they really should be doing to play Fun Run. Whether it's in a university reading room, on the bus, or even in meetings at work, these game addicts are not alone. Since Fun Run was launched in September of 2012, it has been downloaded more than 30 million times and has 10 million active users a month.

At the beginning, the app developers, all NTNU students, used a university reading room as their home base. That was until the game was downloaded more than 100,000 times a day, and overtook the big game giants on the US list of popular free apps.

"We then had to rethink things. It was ultimately impossible to manage and develop the game from a reading room when it took off the way it did," says business manager and Dirtybit co-founder, Nicolaj Broby Petersen. No wonder – when it was on the top of the US app list, Fun Run was being downloaded more half a million times a day.

Along with fellow student Erlend Børslid Haugsdal, Broby Petersen founded the company in 2011 when they were both computer science students at NTNU. Now the

company has eight employees and is located in the Teknobyen innovation centre in Trondheim. Half of the Dirtybit crew have finished their studies, while the rest will be finishing in the spring. Broby Petersen himself is in his last year of a master's degree at NTNU's School of Entrepreneurship.

Bloody bear traps

The rented office in Teknobyen is reminiscent of Google's offices in Mountainview, California, with separate rooms where you can unleash your creativity. The break room is home to a nice, soft sofa, a flat screen TV and cold beer that awaits the crew for when the workday is over and the game developers can play more together.

Dirtybit is the first company that has been successful with what are called real-time multiplayer games. Fun Run has been ranked as the # 1 app in ten different countries. Everything about the game has been created by the NTNU students on their own – from its development and programming to its design and marketing. Fun Run is a multiplayer racing game for up to four players, and is available as a free download for Android, iPhones and iPads.

The game can perhaps best be described as a mix between "Happy Tree Friends " and a Mario Race game, with the bloody humor of the Happy Tree Friends and the fun-packed features of a Mario Race game. The game involves cute little stuffed animals that race against each

other while trying to kill each other with lightning, bloody bear traps and spinning blades.

The world's most popular

While the game was a smash hit just months after it was first released, it was only a matter of time before interest in the game waned. But with the launch of the winter version of the game – Fun Run 2.0 – Dirtybit's game is now climbing up the charts again.

"It's really wild that we are on the rise again now, a year after we were on top, and still without spending a single penny on marketing. Not many people have managed this," said Broby Petersen.

The new update provides players with six new winter courses and the choice of two new characters – a penguin and a polar bear. The developers have also released other seasonal accessories, such as snowballs, gifts, skiing and snowboarding. Dirtybit has also made some technical changes to improve the gaming experience.

Money to be made

Although the game is free, there is still money to be made in games like Fun Run. The money comes from what are called in-app purchases, where users can choose to buy more accessories if they do not have the patience to win them by playing.

"As much as 70 per cent of the total revenue on the App Store is from the apps that have in-app purchases. This is where customers spend the most money, and that is something we have done well with from Fun Run. However, we are fully aware that it is difficult to predict developments in the games industry, which is very volatile and has lots of ups and downs," said Broby Petersen. He said that the company has now set some capital aside in case one of their next games doesn't succeed the way Fun Run has.

Although it is difficult to keep a game alive, since the lifetime of an app game is not usually more than two years, there is little evidence to suggest that students' success will stop with Fun Run. They also have a game called Drop in the Box, and next year they are planning to launch a new game. Here, the cute animal characters from Fun Run will be replaced with small monsters that you can train and play a more protracted game. Dirtybit hopes they can keep their dream jobs and live from creating games for years to come.

Big in the Middle East

Dirtybit says that a great deal of Fun Run's success is due to social media. The hashtag #funrun was widely used by people searching for game buddies, because players need to know the user names of the people that they want to play with so they can add them as friends.

That appears to be what made the game take off in popularity. Photos tagged with Fun Run on Instagram show that people play anywhere and anytime, and not just in the US, but also in Switzerland, Singapore, Israel and the Arab Emirates.

"We are experiencing huge growth, especially in Arabic - speaking countries, where the game has really taken off. They bake cakes with characters from the game, decorate water scooters and have even set up Fun Run musicals. It is very special, to say the least," says Broby Petersen, who added that because of the interest in the Middle East, the developers have translated the game into eight different languages, including Arabic.

But even while they have experienced solid growth due to their huge success, the NTNU students have also experienced the tough competition that characterizes the gaming industry. Fun Run has more than its share of copycats, the developers say.

"There are many games out there now that are either pure copies of Fun Run, or at least are clearly inspired by our game. It's great that we have helped to start a trend for this type of game, but at the same time, it clearly

shows that we have to constantly strive to stay ahead of the competition. We'll do this by adopting more innovative technologies and new concepts in the next game," Broby Petersen said.

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Unique runestone named to world heritage list

(08.02.2012) **A unique runestone that is the first to mention "Norway" as a country and that documents the establishment of Christianity in Norway has been named to a list of world heritage documents of international importance.**

The "Kuli Stone" is the oldest object to be included on the newly launched register of Norway's list of documents to be included in UNESCO's Memory of the World program. The program is an international register of documents that are seen as important aspects of our shared international heritage. The Norwegian version was launched on 8 February and lists documents that are especially important in Norway's history and to its cultural heritage.

The text on the Kuli Stone is the first known occurence and use of the term "Nóregi" – "Norway" - in the country it names. The stone has additional importance as it also dates the establishment of Christianity in the country in a

The Kuli Stone

Visit the NTNU Museum of Natural History and Archaeology to see the Kuli Stone and other medieval artefacts.

phrase that is often transcribed as "... twelve winters Christianity had been in Norway".

The Kuli Stone was originally raised on the island of Kuløy, outside Kristiansund on the Norway's northwestern coast. It is 1.90 meters tall, has a carved cross on one broad side, and two lines of runic inscriptions on one narrow side.

The runes have been written in the younger runic alphabet, which was in use about 800-1400 AD. Eighty runes are still visible, but breakage of the top of the stone suggests the text might have been longer.

The runestone came to what is now the NTNU Museum of Natural History and Archaeology in 1913. The runic inscription was all but invisible and forgotten until a chance discovery by curator Aslak Liestøl in 1956.

The Kuli Stone can be viewed in the museums' medieval exhibition. A copy of the stone has been erected at Kuløy, at the spot it is believed to have been placed originally. This makes it one of the more accessible objects on the new document register – in addition to being the oldest.

Downloadable photos

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Norwegian University of Science and Technology

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Norwegian Prime Minister opens brain research centre at NTNU

(28.02.2012) Prime Minister Jens Stoltenberg officially opened NTNU's Norwegian Brain Centre today as one of the largest research facilities of its kind in the world. Stoltenberg toured the new facilities and then gave a speech to students and staff.

The new centre is designed to be a hub for brain research worldwide. The university has invested NOK 42 million in the centre, which builds on the strength of the university's Kavli Institute for Systems Neuroscience/Centre for the Biology of Memory (KI/CBM).

Ten years of brain science

The Centre for the Biology of Memory (CBM) was established by NTNU in 2002 as a Centre of Excellence (CoE) with support from the Research Council of Norway for ten years.

Stoltenberg congratulates the new research centre

Prime Minister opens centre

In 2007, the centre was selected by the physicist, businessman, billionaire and philanthropist Fred Kavli as one of 15 prestigious Kavli Institutes. This resulted in adding a name to the centre: the Kavli Institute for Systems Neuroscience (KI). After 2012 the KI/CBM will "only" be a Kavli Institute.

NOK 80 million for research equipment

The KI/CBM is led by Professors May-Britt and Edvard Moser, who are highly respected and internationally recognized researchers in brain science.

In addition to the NOK 42 million invested by NTNU in the development of new laboratory facilities, the Research Council of Norway awarded a grant in 2011 of NOK 80 million for coordinated investment in state-of-the-art equipment for brain research equipment.

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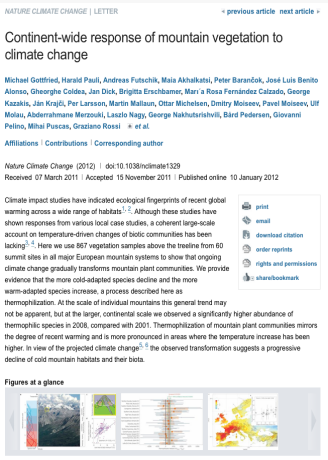
Warmer climate, warmer European mountains

(08.01.2012) The decade from 2000 to 2009 was the warmest since the initiation of worldwide climate measurements, and while localized studies have shown evidence of changes in mountain plant communities that reflect this warming trend, no study has yet taken a continental-scale view of the situation – until now.

With the publication of "Continent-wide response of mountain vegetation to climate change," as an Advance Online Publication (AOP) in Nature Climate Change on 8 January 2012, researchers from 13 countries report clear and statistically significant evidence of a continent-wide warming effect on mountain plant communities.

These results are "clearly significant," says Ottar Michelsen, a researcher at the Norwegian University of Science and

Want to read more? Click on the image below:



NATURE CLIMATE CHANGE | LETTER

Continent-wide response of mountain vegetation to climate change

Michael Gottfried, Harald Pauli, Andreas Futschik, Maia Akhalkatsi, Peter Barančok, José Luis Benito Alonso, Gheorghe Coldea, Jan Dick, Brigitta Erschbamer, Mari´a Rosa Fernández Calzado, George Kazakis, Ján Krajči, Per Larsson, Martin Mallaun, Ottar Michelsen, Dmitry Moiseev, Pavel Moiseev, Ulf Molau, Abderrahmane Merzouki, Laszlo Nagy, George Nakhutsrishvili, Bård Pedersen, Giovanni Pelino, Mihai Puscas, Graziano Rossi + et al.

Affiliations | Contributions | Corresponding author

Nature Climate Change (2012) | doi:10.1038/nclimate1329
Received 07 March 2011 | Accepted 15 November 2011 | Published online 10 January 2012

Figures at a glance

Technology (NTNU) and one of the article's co-authors. "You can find studies that have shown an effect locally, and where researchers try to say something more globally, but in this case, when you have so many mountains in so many regions and can show an effect, that's a big thing."

60 sites, 17 mountain areas

The article describes the results of a comprehensive effort to measure plant community changes in the mountains over the whole of Europe, with nearly a decade of time between the sampling efforts.

Researchers looked at 60 summit sites and 867 vegetation samples from 17 mountain areas across Europe in 2001 and then revisited the mountain sample sites in 2008. In Norway, a team of researchers including Michelsen and former NTNU researcher Bård Pedersen, now at the Norwegian Institute for Nature Research, studied mountain plots in the Dovre region in central Norway.

By comparing the vegetation found in the sample plots in 2001 and 2008, the researchers were able to see a clear shift in the species in the plots towards species that preferred warmer temperatures.

More specifically, the researchers assigned what they called an altitudinal rank to all 764 plant species included in the study. The rank reflects the temperature at which each species has its optimum performance. And because

altitude and temperature are directly correlated in each mountain area (the higher your altitude in the mountains, in general, the colder it will be) the location on the mountain where a plant is found reflects its response to the actual temperature at that location.

Ranking the plant mix

By summing the altitudinal ranks for the species in the plots, the researchers then used a mathematical formula to give each plot a "thermic vegetation indicator". The indicator was calculated for each plot for 2001 and 2008, and the change in the indicator over the 7 years between sample periods showed researchers whether the mix of plants in each plot had stayed the same or shifted on average to plant types that preferred either colder or warmer temperatures.

They then combined the data for the 17 mountain areas for the two time periods to get a continental-scale view of what kind of larger changes, if any, might be underway.

"The transformation of plant communities on a continental scale within less than a decade can be considered a rapid ecosystem response to ongoing climate warming," the researchers wrote. "Although the signal is not statistically significant for single mountain regions, it is clearly significant when data throughout Europe are pooled."

The finding is significant both because the shift in plant communities could be clearly detected over time, but

also because it suggests that plants adapted to colder temperatures that are now found in alpine plant communities will be subject to more competition, which "may lead to declines or even local disappearance of alpine plant species," the researchers note. "In fact, declines of extreme high-altitude species at their lower range margins have recently been observed in the Alps."

While the Nature Climate Change paper reports on European results, the overall effort is a part of a worldwide monitoring programme being coordinated out of the University of Vienna, Austria that extends over more than 90 mountain sites on 5 continents. The monitoring programme is called GLORIA, or the Global Observation Research Initiative in Alpine Environments. University of Vienna researchers and GLORIA coordinators Michael Gottfried and Harald Pauli are the paper's lead authors.

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Prevalence of acid reflux has increased by half over the past decade

(03.01.2012) The prevalence of acid reflux experienced at least once a week has increased by almost 50% over the past decade, NTNU researchers report in a long term study of almost 80,000 people published online in Gut.

Women seem to be more vulnerable to developing the condition than men, the figures show.

Acid reflux is associated with an increased risk of gullet (oesophageal) cancer, which is difficult to treat successfully and rates of which have been rising rapidly in developed countries.

30,000 people, 11 years

The researchers studied the digestive health of just under 80,000 people and tracked almost 30,000 people for an average of 11 years between 1995-7 and 2006-9.

All the participants were part of the Norwegian Nord-

Read more

Changes in prevalence, incidence and spontaneous loss of gastro-oesophageal reflux symptoms: a prospective population-based cohort study, the HUNT study

HUNT - the Nord-Trøndelag Health Study

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever

Trøndelag Health Study, which draws on regular health surveys of a representative sample of the population.

Between 1995-7 and 2006-9 the prevalence of any acid reflux (gastro-oesophageal reflux) symptoms rose 30%, while that of severe symptoms rose by 24%. And the prevalence of acid reflux symptoms experienced at least weekly rose by 47%.

The increases were seen in both men and women and across all age groups, although the rise in the most severe symptoms occurred mainly in the middle aged.

Medicine for severe symptoms

Almost all (98%) of those with severe acid reflux experienced symptoms and/or used medication to treat them at least once a week, compared with around one in three (31%) of those with mild symptoms.

The average annual incidence of any and severe acid reflux symptoms was just over 3% and 0.23%, respectively.

Women under 40 were the least likely to have acid reflux, but were more likely to develop symptoms the older they got. And those aged 60 to 69 were the most likely to have severe symptoms.

Acid reflux symptoms can spontaneously disappear without the aid of medication, but during the study period this happened to just over 2% of those with

undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies, along with biological samples from more than 75,000 individuals. Today, HUNT is a database with information about approximately 120,000 individuals, where family data and individual data can be linked to national health registries.

HUNT includes an associated biobank that stores whole blood and DNA from 200,000 individuals, serum and plasma samples from more than 100,000 individuals, along

symptoms each year.

Younger women and resolution of symptoms
Women under 40 were the most likely to find that their symptoms resolved of their own accord. And while this possibility diminished with age in both sexes, it was most evident among women.

The use of anti-reflux medication, or pregnancy, when acid reflux often occurs, could not explain these patterns.

The rise in prevalence of acid reflux may be partly explained by increasing rates of overweight and obesity, which are known risk factors for the condition, while the patterns seen in women might be down to the use of hormone replacement therapy, suggest the authors.

But they warn: "The increasing prevalence of [acid reflux] is alarming, because it will most likely contribute to the increasing incidence of adenocarcinoma of the oesophagus in the western population."

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with RNA tubes, cells, buffy coat, urine and na-heparin tubes for roughly 50,000 people. For more information, visit the HUNT home page.

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Sobered up using LSD

(09.03.2012) Forty years ago, LSD was used in the treatment of alcoholics - with good results. Perhaps it's time to look at it again?

In the 1950s, '60s and '70s, researchers in many places in the world experimented with LSD in the treatment of various disorders, including alcoholism. Not all experiments were scientifically tenable by today's standards, but some were. Now Teri Krebs and Pål-Ørjan Johansen, researchers at the Norwegian University of Science and Technology (NTNU), have taken a closer look at these experiments. Their results are being published in the Journal of Psychopharmacology.

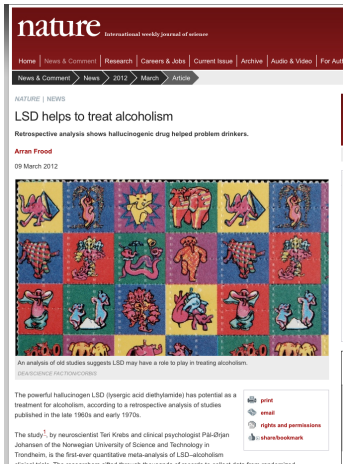
The results of all of the studies the pair examined pointed in the same direction, which Krebs and Johansen say is quite clear: A single dose of LSD, provided for treatment purposes, helped heavy alcoholics and made it less likely that they would relapse.

"There has long been a need for better treatments for addiction. We think it is time to look at the use of

In the news

BBC World News

Nature magazine



New Scientist

psychedelics in treating various conditions," the researchers say.

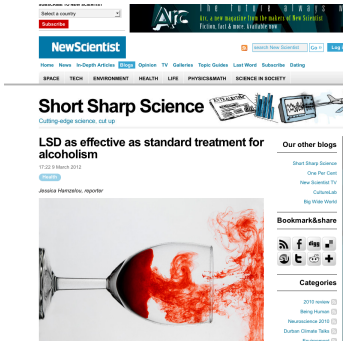
536 alcoholics

The Norwegian researchers found six different studies of LSD and alcoholism that were scientifically sound, in which patients were randomly assigned, as if by tossing a coin, to receive either LSD or a comparison treatment. They combined all the data from these studies, involving a total of 536 people – the first such rigorous quantitative analysis in the world.

All of the studies were conducted either in the U.S. or Canada between 1966 and 1970. The studies all involved individuals who were admitted to treatment for alcoholism and who voluntarily participated in the trials. Nearly all were men.

Within each of the studies all patients were given the same treatment programme. But on one treatment day some patients were given a single large dose of LSD, while control patients received a low dose of LSD or a stimulant drug - or nothing. In some studies, during the duration of the drug effects, patients talked with a therapist, while in other studies, patients received only brief reassurance if they wanted. But all were encouraged to reflect on their alcohol problem.

Neither patients nor the individuals who were treating them knew in advance who would get a full dose of LSD.



Read more

Read the review article here:


Lysergic acid diethylamide (LSD) for alcoholism: meta-analysis of randomized controlled trials

Teri S Krebs[1,2] and Pål-Ørjan Johansen[1,2]

Psychopharm

Clear improvements - greater opportunities
"In independent and standardized follow-up examinations, ranging from one to twelve months later, all of the studies showed that the patients who had received a full dose of LSD fared the best. On average, 59 per cent of full-dose patients showed a clear improvement compared with 38 per cent in the other groups," say Krebs and Johansen.

LSD patients were less likely to relapse into problematic alcohol use and had higher levels of total abstinence. In some studies their relatives also reported the same findings. Many of the patients said they had gained a new appreciation for their alcohol problem and new motivation to address it.

These patients also reported greater self-acceptance and openness, as well as greater faith in their ability to deal with future problems.

Affects the brain
"We do not yet fully know why LSD works this way," the researchers admit. "But we know that the substance is non-toxic and that it is not addictive. We also know that it has a striking effect on imagination, perception and memories."

The researchers explain that LSD interacts with a specific type of serotonin receptor in the brain.

"LSD may stimulate the formation of new connections

and patterns, and generally seems to open an individual to an awareness of new perspectives and opportunities for action," they say.

Not followed up

By 1971 LSD had been banned for non-medical use, and although the drug was and is still permitted as an experimental medical treatment, it became increasingly difficult to conduct clinical trials. Despite the promising studies, LSD was claimed to have no demonstrated medical use. There may be several reasons for this, the researchers explained.

"The earliest studies reported promising results but also had methodological problems. Many scientists expected unrealistically good results from a single dose, and tended to ignore effects that lasted less than a year. Importantly, many of the individual studies did not have enough patients to reach a conclusion by themselves."

"But when we combine studies that had sound methodology, the results are unambiguous. We can therefore safely conclude that a single dose of LSD had a positive treatment effect that lasted at least six months," Krebs and Johansen said.

Should offer repeated doses

The improvement was greatest during the first few months of treatment. As the months passed, the effect gradually decreased.

"It is unusual for psychiatric drugs to have an effect that lasts for several months after a single dose. We now better understand that alcoholism is a chronic, relapsing disorder that typically requires ongoing treatment. The next step should be to periodically provide additional doses of LSD in combination with modern evidence-based treatment programs," the researchers conclude.

The meta-analysis is being published in the Journal of Psychopharmacology.

The work was financed by the Research Council of Norway and conducted during a research stay at Harvard Medical School. Krebs and Johansen are currently affiliated with the Department of Neuroscience at NTNU.

Reference:
Teri S. Krebs and Pål-Ørjan Johansen: Lysergic acid diethylamide (LSD) for alcoholism: a meta-analysis of randomized controlled trials (Journal of Psychopharmacology)

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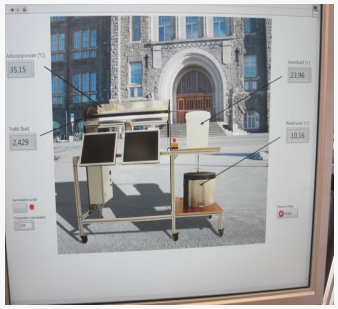
Twelve ice cubes and a trip to Rio

(18.04.2012) It took just 12 ice cubes for a team of NTNU science and engineering students to win a competition for a trip to the UN Rio +20 Sustainable Development Conference this June. But those 12 ice cubes were made by using the heat of the sun in a simple, commercially viable system that could be used in developing countries to help fishermen preserve their fish, for example, or doctors preserve vital medicines and vaccines.



The ice maker outside of NTNU's main administration building.

The four students, Halfdan Knudsen and Erik Storaas from the Department of Energy and Process Engineering, Aleksander Kolstad from the Department of Chemistry, and Thomas Emdal Loland from the Department of Materials Science and Engineering, were members of a team that competed with 16 other NTNU master's student teams for the chance to travel to Rio to present their idea. The competition was held in conjunction with the Technoport 2012 conference, "Sharing Possibilities".

"This is an exciting idea that has been transformed into a real product," said Johan Hustad, NTNU's Pro-Rector for Innovation and External Relations, as he announced the award winners during the last session of the Technoport conference. "They have made a prototype that works, and that has the potential to change daily life for people in developing countries. And it has potential for commercial development."

The solar ice cube maker uses a simple mix of ammonia and calcium chloride, which is warmed by the sun during the day and forced into a thermos flask. The freezing occurs at night when the ammonia "evaporates" in the closed system, thus drawing heat away from the water that is stored in ice cube trays in the thermos flask. The water freezes, and the system returns to equilibrium until the sun rises and heats up the ammonia/calcium chloride mix again.

The 17 student teams who competed for the prize were drawn from a mandatory student class called Experts in Teamwork, an interdisciplinary course that all first-year

master's students must take. The second prize winners, who will attend a green conference in Copenhagen, developed an online game about water use called "Wild for Water".

Knudsen, Storaas and Loland said they were excited to have won the trip to Rio, but that they had not yet had time to think more about possibly commercializing their idea. "We've had a bit of tunnel vision, just getting ready for the competition," Knudsen said.

You can see more pictures of the ice maker on NTNU's Facebook page.

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NTNU bloggers in English

Letizia Jaccheri
Professor in the Department of Computer and Information Science

Brita Fladvad Nielsen
NTNU PhD candidate at the Department of Product Design. "Design for Self-Reliance"

Ragnhild Green Helgås
Faculty of Medicine blog on palliative care.

Gary Love
Associate professor of British Social and Cultural Studies, blogging on modern British history and politics from the nineteenth century to the present.

Britt Sørlie
NTNU PhD candidate in the Faculty of Architecture blogs on a sustainable village building.

And many more in Norwegian

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NTNU among the winners in Technoport 2012 awards

(19.04.2012) NTNU academic staff, current students and graduates were among the recipients of the more than NOK 2 million in awards handed out at the Technoport 2012 conference, "Sharing Possibilities".

Silje Rabben, an NTNU graduate, was awarded the Technoport Young Innovation Award along with the company she heads, Kaliber Industrial Design. While a student at NTNU, Rabben worked with two other NTNU students to develop a unique method for cleaning up oil spills. The technology works like a vacuum cleaner that

blows bark on the oil and sucks up the whole mass. The NOK 200 000 prize is designed to support female researchers and inventors under the age of 40.

Professor Magne Runde, who holds a joint position at NTNU and at SINTEF, Scandinavia's largest independent research institution, was awarded NOK 200 000 with his colleague, Niklas Magnusson of SINTEF for the Hydro Green Aluminium Award. The award recognizes outstanding research that improves the ecological footprint of aluminium production.

Four NTNU engineering and science students were also selected as the winners of the Mission Rio competition for which they developed a solar ice maker. The competition was for first-year master's students in an interdisciplinary course who were invited to develop ideas to be presented by the Norwegian delegation to the UN Rio+20 Sustainable Development conference in Rio de Janerio in June. The winners were Halfdan Knudsen and Erik Storaas from the NTNU Department of Energy and Process Engineering, Aleksander Kolstad from the NTNU Department of Chemistry, and Thomas Emdal Loland from the NTNU Department of Materials Science and Engineering. The four will travel to Rio in June to present their idea.

The other awards and winners were:

- The Gunnerus Award: Kamaljit Bawa was selected for the first-ever grant of this NOK 1 million award, which recognizes outstanding research on sustainability

issues. The prize is sponsored by the Royal Norwegian Society of Sciences and Letters. in conjunction with SpareBank1 SMN and Technoport. Bawa, a biology professor from the University of Massachusetts, was recognized for his work on population biology in tropical forests.

- The Technoport Applied Technology Award: GasSecure AS was selected for the NOK 150 000 award for its development of the world's first wireless optical gas detector for industrial applications.
- Statoil Award for Outstanding Research: Eric Cayeux, from the University of Stavanger, was awarded NOK 200 000 for his work on the automation of petroleum drilling
- 2012 Technoport Design Award: Ole Petter Wullum was recognized with this NOK 150 000 award for his new concept for holiday homes and mountain huts, called SMÅHUS.
- Technoport Award for Innovative Environmental Technology: Cambi AS was recognized for their development of a thermal hydrolysis process (THP) which can be used to produce biogas from sewage and industrial sludge, as well as from wood, slaughterhouse and fish wastes. The award is for NOK 150 000.

Technoport is a consortium composed of NTNU, SINTEF, the Research Council of Norway, Statoil, HYDRO, NTE, The Royal Norwegian Society of Sciences and Letters, the municipality of Trondheim, Trøndelag county authorities, Innovation Norway and the savings bank Sparebank 1

SMN and partners such as IBM, SIEMENS, Kjeldsberg Eiendom, The Centre for Renewable Energy, the University of Oslo, IFE, Nordic Five Tech, Nordtek and ENOVA.

The consortium is working to develop a knowledge-sharing platform that involves key international stakeholders from science and technology, policy making and industry. The objective of this platform is to share the possibilities and stimulate the transition towards the green economy.

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Desperate fishwives

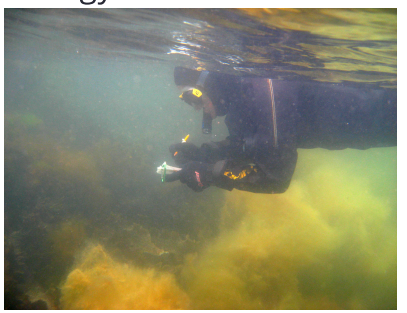
(27.04.2012) Breeding is on their minds as the mating season draws to an end. Guys drop dead by the hour, making goby girls go all out in their hunt for a mate to father their offspring.

We're often told that males are eager and females coy. But the story is not quite so simple if you are a two-spotted goby, researchers from NTNU's Department of Biology have found.

Two-spotted gobies are tiny fishes with a remarkable sex life amongst the seaweeds. Snorkelling in chilly Nordic waters, PhD candidate Lise Cats Myhre and her colleagues at NTNU followed several hundred female gobies as they played the fish version of the mating game. The team saw a complete change in sexual eagerness in the two sexes as the season progressed.

Whilst spring shyness was the rule amongst the fish ladies, mid-summer females were anything but coy: they almost always took the initiative in love affairs, and very rarely rejected a male mating offer. For goby boys it was it was exactly the opposite: they were eager to mate in the

The Norwegian coastline, where two-spotted gobies live. Click on the photo to download a larger version. Photo credit: Trond Amundsen, NTNU Department of Biology.



Researchers take notes while observing goby

cold spring waters, but seemingly had no interest in ladies and sex in high summer.

Changing the mating game

Gobies are the little fish you may have seen under the pier, or swimming around your feet while you are dipping them in salty water, if you've visited the coasts of Western Europe. These seemingly boring brownish fish live a hectic life, living for only one year. Up close the gobies are as glamorous as goldfish, clad in orange fish frocks and shiny bellies full of eggs. Think of them as the stars of "Fishteria Lane."

"Their need to breed is obvious," Myhre says. "They only have the one season to give birth. We saw up close how goby girls grew progressively more desperate, and less shy, as summer approached and the number of possible mates dropped."

The goby males are single parents and stay-at-home dads. The researchers don't quite know why, but the number of goby males drops fast during the spring and early summer.

"They may have a hard time defending their territory and at the same time caring for the eggs," Myhre explains. "Doing so may both exhaust them and make them more exposed to predators than the females which live a much more relaxed social life in schools."

When males are outnumbered the goby girls go gaga over guys.

behaviour. Click on the photo to download a larger version. Photo credit: Trond Amundsen, NTNU Department of Biology.

The female two-spotted goby shows off her red belly. Click on the photo to download a larger version. Photo credit: Trond Amundsen, NTNU Department of Biology.

"By mid-summer the mating game just changed completely," Myhre says. "Males were often surrounded by harems of willing females showing off their bellies nearly bursting of eggs. I never saw that early in the season."

Sex roles not fixed

The team of scientists, led by Professor Trond Amundsen at NTNU, studied the two-spotted goby, a small fish living in kelp forests along rocky shores of Scandinavia. These fishes experience dramatic changes in the ratio of mating-ready males to females over the breeding season, with males in majority early on but with much more females than males on the mating arena by the end of the season. The team has previously shown that the goby males prefer colourful females, and that the male to female ratio changes dramatically over the season.

The new research shows that when males are scarce, the female mating competition is strong. The males get picky about partners, whilst the goby girls offer their services to almost any male they meet and only rarely say "no". This results in a reversal of the sex roles, with progressively more coy males and very eager females in the high summer.

"It is time to realize that sex roles of animals are not fixed," Amundsen says. "Like us, animals adjust their sexual behaviours to competition and sexual opportunities. These dynamics cannot be overlooked if we want to understand how animal reproduction is regulated.

- **Full bibliographic information**
  American Naturalist, June 2012, page 8:
  Sex Roles and Mutual Mate Choice Matters during Mate Sampling

  Lise Cats Myhre (Norwegian University of Science and Technology), Karen de Jong (Norwegian University of Science and Technology), Elisabet Forsgren (Norwegian Institute for Nature Research), and Trond Amundsen (Norwegian University of Science and Technology)
  http://www.jstor.org/stable/10.1086/665651

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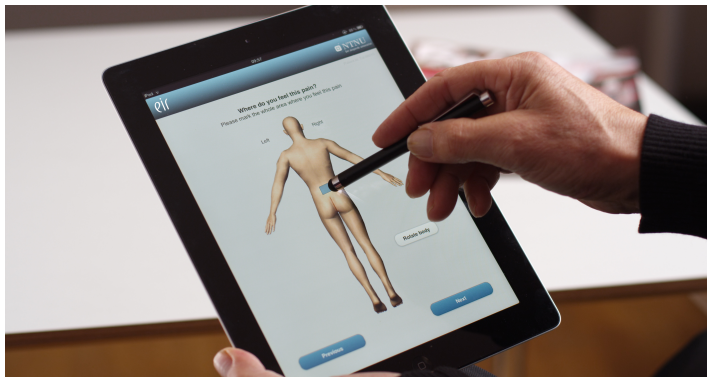
Palliative care congress showcases cutting edge technology

(06.06.2012) What happens when doctors cannot cure a disease? What is the best way to make patients comfortable and have the best quality of life possible in the time they have left? Researchers at the Norwegian University of Science and Technology (NTNU) have developed software that can be used with an iPad or other tablet to help record patient pain levels to help doctors in developing further treatment.



The software, called EIR, named after a Norse goddess or valkyrie associated with medical skill, will be presented along with other research at the 7th World Research

Congress of the European Association for Palliative Care (EAPC) in Trondheim, Norway from 7-9 June. Approximately 1100 participants are registered for the conference, which will showcase the latest research results in palliative care and is being organized in close collaboration with NTNU and St. Olavs Hospital, Trondheim University Hospital.

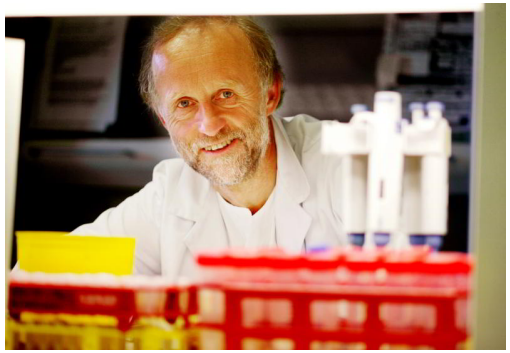
Prolonging life and improving quality of life

Palliative care is care that is offered to patients who are sick with diseases that cannot be cured. For doctors, palliative care means both prolonging life and improving the quality of what remains of the patient's life. This 7th congress will bring together top medical doctors, caregivers and scientists to discuss cutting edge research and other questions surrounding palliative care.

EIR originated with NTNU researcher Stein Kaasa, who is chair of both the European Association of Palliative Care Research Network (EAPC RN) and head of the European Palliative Care Research Centre (PRC), which is one of the largest palliative care research coordinators in Europe. He is also a member of the organizing committee for this year's world congress.

EIR's software combines the information entered by the patient with treatment guidelines, which are then available to the doctor before a patient consultation. The doctor is provided a summary of the patient's condition along with suggestions for further investigation and recommended treatment.

Pilot study underway



The system is designed to improve the diagnostic process, and assist the doctor in providing more targeted treatment based on each patient's needs. A pilot study on cancer pain is currently underway at the outpatient cancer clinic in Trondheim, and EIR will be further developed for use for other common symptoms in cancer patients. Approximately 50 patients have already signed up to test the new software. EIR will be on display during the Congress at stand 5 in the exhibition area, and has been developed in association with NTNU Technology Transfer (TTO).

The scientific programme for the Congress features leading palliative care experts, including Augusto Caraceni a neurologist and palliative care physician in charge of the palliative care unit at the National Cancer Institute in Milan. Caraceni is co-chair of the EAPC RN and Professor II at NTNU and is the first author of the new EAPC guidelines for the use of opioids for cancer pain that were published in Lancet Oncology earlier this year. Caraceni and his colleagues from the National Cancer Institute in Milan collaborate closely with the research group in Trondheim.

The other co-chair of the EAPC RN is Luc Deliens from Ghent, Belgium. Deliens is involved in large projects related to public health, health sciences and sociology and is one of the editors of a recently launched book entitled "A public health perspective on end of life care."

For more details regarding the scientific programme, please find the complete overview at www.eapcnet.eu/research2012.

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New online tool helps governments go green

(20.06.2012) As governments gather in Rio de Janerio for the United Nations Conference on Sustainable Development, a coalition of researchers from the EU has a handy tool that can be used to help a government go green.

From new cars to email messages, from bananas to home-grown tomatoes: everything we buy, produce or consume has an environmental cost that has come to be called a "footprint". And if you want to be a good global citizen, the Internet offers a range of tools that you can use to understand just how big your footprint is – or what your existing lifestyle is doing to the planet.

But what if you are a government decision maker and want know the impact of different policies on the environment? That's an infinitely more difficult calculation to make.

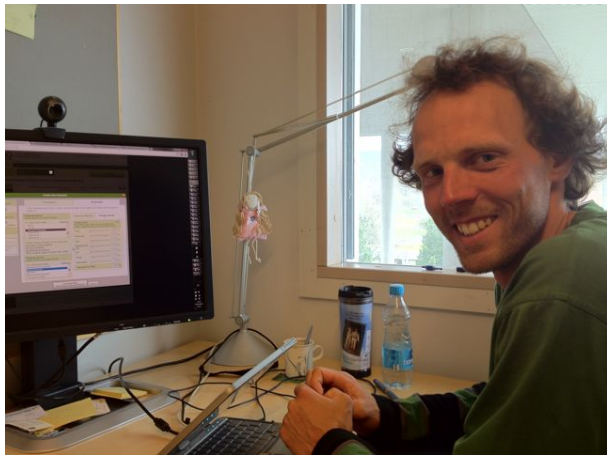
Easy to understand graphics

The online tool is called EUREAPA (for EU Resource and

A virtual crystal ball

Edgar Hertwich, director of NTNU's Industrial Ecology Programme, discusses the use of a new online tool that can help policy makers understand the environmental consequences of different government actions.

Energy Analysis Programme Application), and has been produced by a coalition of European researchers, including from the Norwegian University of Science and Technology (NTNU) in Trondheim. The EUREAPA tool can produce graphics that show how national consumption patterns affect land and water use, along with the production of greenhouse gases.



These three options – called the carbon footprint, the ecological footprint and the water footprint –give policy makers a chance to look at environmental pressures from three different perspectives so they can avoid shifting environmental impacts from one class to another.

Using the footprint perspective can also help policy makers avoid shifting environmental problems from one region to another – for example, by moving production sites into regions with less stringent environmental regulations, says Jan Weinzettel, a postdoctoral researcher at NTNU who has been involved in the tool development during the last two years. While moving production sites to other parts of the globe clearly

Expert list

Want to talk to more NTNU experts about sustainable development? Check out our Expert List on sustainability.

improves a country's own environment, it merely moves the actual impact of production somewhere else, so there is no real gain.

A crystal ball

But perhaps EUREAPA's biggest strength is that it can analyse future development scenarios. The user can enter different values into a range of fields, from population numbers to consumption patterns and expected economic growth, and the tool can calculate a future scenario that shows how the values entered will affect the three different footprints.

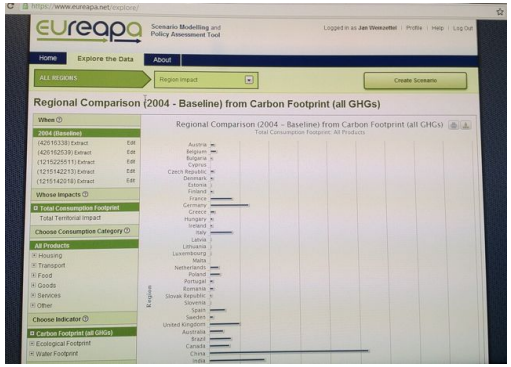
This allows policymakers to investigate how different possible government policies would change future environmental pressures, Weinzettel says.

The EUREAPA tool "helps you analyse the effects that might be promoted by different policies," he explained. "What would be the combined results of several policy changes?"

Looking for unintended results

For example, he said, consider this goal: a country tries to eliminate the carbon dioxide emissions from its electricity supply. Given the worrisome trends with greenhouse gas emissions and the warming of the planet, cutting the emissions of the biggest greenhouse gas, carbon dioxide, seems like a good idea.

But Weinzettel points out that this one big change might



have unexpected, and unwanted results. It could force other changes in land and water use that might in fact cause higher environmental impacts, while the resulting reduction in carbon footprint might be lower than expected.

Or it might have an effect on a neighbouring country that affects your country too, he added. "You can influence electricity production in your own country, but it may have important ramifications elsewhere," he said. With the EUREAPA tool, planners and policy makers can try out the idea, and see how it works.

Meeting environmental goals

Weinzettel's supervisor, Edgar Hertwich, who is director of the Industrial Ecology Programme at NTNU, says the tool has its origins in trying to clarify the best choice in situations where there is a conflict in environmental objectives.

Think of it as kind of like trying to find the answer to the paper or plastic question when it comes to deciding which kind of grocery bag to choose. Except in this case, the questions are on a much larger scale, and the individuals that are deciding may be making the decision

on behalf of a municipality, a county or even a country.

Another important aspect of a calculator like EUREAPA is that it gives policy makers a chance to keep track of the effects of different policy decisions they have made, and in doing so, to make sure that what they are doing will get them to where they want to be.

"You need to trace environmental impacts to see if you are going to meet environmental goals," Hertwich said. "If you don't have a way to track things, you don't know what is going on."

The details

So just what's in the EUREAPA model? Weinzettel says there are 57 economic sectors represented in the model for 45 regions around the globe. The economic sectors include items such as agriculture and manufacturing as well as transport, recreation, health and financial services.

The tool also allows you to look at the entire impact of one country, or at a per person impact, which lets you see if the numbers that are illustrated are due to high consumption per person, or if they are due to the sheer number of citizens of the country.

China is a good example of this: for some impacts – say carbon footprint linked to food consumption – China overall has among the highest footprints of any nation. Yet on a per person basis, China has some of the lowest

carbon emissions from food consumption of any country listed in the database.

EUREAPA thus allows the user to look at the "full supply chain impacts associated with the food people eat, the clothes they buy, the products they consume or the way they travel," the tool's website explains, and in doing so, the user gets a picture of "the impacts of consumption activities in the context of lifestyles or national differences."

An annual check

Hertwich says one place where EUREAPA could be particularly helpful is at the municipality level, where many decisions are made that can add up to significant impacts in the future.

"One specific application I would really like to see is if municipalities were to implement annual footprint measures, so they actually trace their own success in reducing their footprint," he said. "We usually say that what gets measured also gets worked on." That way, he said, calculating the different environmental footprints of a municipality becomes another kind of accounting that helps policymakers decide if what they are doing is working.

"If you don't measure your environmental indicators, you will not be able to reduce your footprints," he said. "But if you do measure them, and do trace them, it becomes part of the standard accounting and will be paid more

attention to in decision making."

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Identifying vulnerabilities in security tokens

(05.07.2012) A team of researchers, including an NTNU postdoc and scientists from Project-Team Prosecco, reports taking just 13 minutes to successfully attack security tokens that use vulnerable encryption standards made by RSA and other companies. The tokens may be used to encrypt a secret session key, which could be recovered as a result of the researchers' attack, demonstrating an important vulnerability in the tokens. Their results will be presented at the 32nd International Cryptology Conference CRYPTO 2012, Santa Barbara, California, in August.

The researchers, including NTNU postdoc Joe-Kai Tsay, reported their attack on five different kinds of cryptographic devices using something called a Bleichenbacher's attack, which is also known as a "million message attack."

"One of the main contributions of our work was the optimization of the Bleichenbacher attack," says Tsay. "Although the original Bleichenbacher attack against the

encryption standard still used in the tokens has been known since 1998, it was previously believed (by the manufacturers of the security tokens) that such attacks are inefficient."

The paper has caused a stir in the cryptographic world and has been reported by a number of US and international news outlets, including The New York Times, the Boston Globe, and die Süddeutsche Zeitung, a major German daily newspaper. You can read more about the technical details of what the team did in this online security news site, and you can also read the response of the major manufacturer of one of the keys, RSA, which says its devices are secure. The researchers themselves have posted an FAQ about the paper and have posted a copy of the paper for download.

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Kavli researcher wins competitive ERC grant

(11.07.2012) Lisa Giocomo, a researcher at NTNU's Kavli Institute for Systems Neuroscience/Centre for the Biology of Memory was selected to receive a highly competitive 'Starting Grant' from the European Research Council for her research project 'Cellular Mechanisms Underlying the Topographical Organization of Entorhinal Cortical Circuits.'

Her proposal calls for using the medial entorhinal cortex as a model system to advance our understanding of how cellular and molecular mechanisms organize cortical circuits and the impact this organization has on behaviour. The projects she proposed to fund with the grant will use state-of-the-art neurobiology technologies to bridge the fields of molecular, cellular and systems level neuroscience and uncover some of the fundamental principles of neuronal assembly and microcircuit operation in mammalian cortex.

Previously, Giocomo and her colleagues at the Kavli Institute have documented how the rat brain has a "zoom

button" that enables it to change the resolution of the internal maps that the brain creates to navigate. You can read more about her research here.

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Hidden secrets in Norway's rainforests

(18.07.2012) The word rainforest usually conjures up visions of brightly coloured birds and hyperactive monkeys swooping through a thick green canopy of leaves, vines and flowers. But rainforests are also found closer to the poles, in the northern or boreal region where temperatures are far cooler. And while there are no monkeys swinging through the trees here, these forests are every bit as endangered as their southern cousins, and highly diverse – if you know where to look.

Olga Hilmo knows. As a biologist and researcher at the Norwegian University of Science and Technology (NTNU), she has made it her business to better understand the treasure trove of genetic diversity that is protected in the tiny fragments of boreal rainforests that still remain. The key, she says, is realizing that this fantastic diversity is hidden in plain sight, in the organisms that drape tree branches in long tendrils of green or grow on bark and rocks in crusty or leafy patches of green or grey.

Genetic diversity in Norwegian rainforests

Read the abstract for Olga Hilmo's recent article in Molecular Ecology.

These organisms, called lichens, are actually two or more species living together in a symbiotic relationship, where a fungus provides the structure and an alga provides nutrients. In a study just published in Molecular Genetics, Hilmo and her colleagues from NTNU's Museum of Natural History and Archaeology and the Nord-Trøndelag University College report extremely high genetic diversity for individuals of one lichen species, Lobaria pulmonaria, that grow on the same tree.

Hilmo and her colleagues' findings are important because they show that genetic diversity can persist, even if the species in question is found only in tiny fragments of once plentiful habitat, like northern rainforests.

Surprising results

Lobaria pulmonaria grows to about the size and shape of a crinkly green leaf and is found throughout Europe, Asia,

North America and Africa in coastal areas with high rainfall. However, it is in decline and is considered an endangered species in many parts of Europe.

The lichen most often reproduces vegetatively, which means that it spreads via small fragments. Each fragment, if it blows or falls to a favourable spot, is capable of starting a new plant that is genetically identical to the "mother" plant that it came from. However, these little fragments, about the size of a coarse sugar grain, are relatively heavy, so you wouldn't expect them to spread very far.

That's why you would expect the lichens growing on the same tree to be genetically the same, or at least very similar – but they are not. That means that populations of Lobaria are either extremely old or that in some way or another the species is very good at spreading, Hilmo says.

Another surprising and counter-intuitive finding was that Lobaria populations in neighbouring rainforest fragments were actually fairly similar. "There appears to be limited genetic differentiation between the different populations of Lobaria, which means that there has been

some genetic exchange between the different fragments of rainforest," she says.

Even though these fragments of boreal rainforest may be somewhat far apart, there is clearly some kind of connection between them that enables Lobaria to share genetic material with its neighbors. "This is important in enabling populations of Lobaria to keep their genetic diversity and remain healthy," Hilmo says

Logging OK – but islands need protecting

Hilmo's findings matter because they provide us new information about a globally threated species that has somehow managed to survive in what's left of Norway's boreal rainforests. These rainforests are like small islands in a sea of tree plantations and harvested areas, with plantation trees cut every 70-80 years.

Less than 1 % of the productive forest area in Namdalen, an area in central Norway with some of the world's most northerly boreal rainforests, is still home to this rare habitat. Here, annual precipitation can top 1350 mm per year, and it rains on average about 230 days of the year. As a result, humidities are always very high and the forest canopy rarely dries out – making for a wholly unique habitat for humidity loving species such as Lobaria.

In spite of the favourable growing conditions, there are essentially no untouched boreal rainforests in Norway, Hilmo says. And changes in logging practices in Norway after WWII have reduced the area covered by natural

boreal rainforests, she says. "All these forests are affected by logging in one way or another. Before WWII there was selective logging, but after WWII they went to clear-cutting. Most natural stands have been left in ravines where it is too hard to log," she says.

33 fragments already protected

The good news is that species like Lobaria have managed to maintain high genetic diversity in these small fragments, and that logging around them does not appear to be having a negative effect on the rainforest fragments. Because of this, Hilmo and her colleagues hope that foresters and loggers in Norway can find ways to protect these remaining bits of forest, which are important reservoirs of diversity.

She also hopes that there will be more funding in the future to further explore the diversity of Norway's rainforests. "We need to know a lot more about the species that grow in these forests, particularly rare species such as Lobaria," she says. "If we want to establish targeted measures to protect these species, we need to know much more about them, both in terms of their ecology and population biology."

Local and regional authorities have recognized the value of the remaining forests, and 33 fragments have already been protected on a regional basis. Additionally, landowners who want to log in natural boreal rainforests must report their plans to the authorities, she says. Nevertheless, the more that people understand that there are these special forest fragments in central Norway, the better, she adds.

"These forests are fantastic," she says. "There are moss-covered logs all over the ground, and lichens draping tree trunks and branches, and pendulous lichens hanging down from the trees. It's fascinating and beautiful. Everyone should get to experience being in a rainforest like this, especially in the rain."

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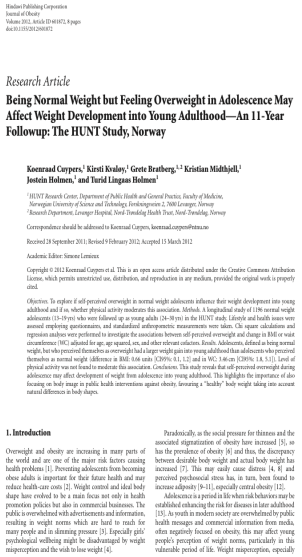
Can thinking that you are fat make you fat?

(08.08.2012) They're everywhere -- in magazines, on the Internet, on television—people with super-thin bodies who are presented as having the ideal body form. But despite the increasing pressure to be thin, more and more of us are overweight. Now, researchers from the Norwegian University of Science and Technology (NTNU) have found that normal weight teens who perceive themselves as fat are more likely to grow up to be fat.

"Perceiving themselves as fat even though they are not may actually cause normal weight children to become overweight as adults," says Koenraad Cuypers, a researcher at the Norwegian University of Science and Technology.

Cuypers and his colleagues at the Department of Public Health and General Practice in NTNU's Faculty of Medicine have looked at data from the Nord-Trøndelag Health Study (HUNT) to examine the obesity problem from a new angle: Theirs is the first study to look at the relationship between perceived weights and actual

Read more



Research Article

Being Normal Weight but Feeling Overweight in Adolescence May Affect Weight Development into Young Adulthood—An 11-Year Followup: The HUNT Study, Norway

Click on the image above to download a pdf of the paper.

weights in a longitudinal study of teenagers and young adults.

A perpetual struggle for the ideal body

There are likely many different, and complex, reasons that explain why thinking you are fat as a teen– even if you are not – may lead you to become fat when you are grown.

One explanation may be related to psychosocial stress, which can be associated with gaining weight around the waist. Under this scenario, the psychosocial stress related to having (or not having) an ideal body type, along with the perception of oneself as overweight, can result in weight gain.

"Another explanation may be that young people who see themselves as fat often change their eating habits by skipping meals, for example. Research has shown that dropping breakfast can lead to obesity," Cuypers says.

Additionally, following a diet that you cannot maintain over time will also be counterproductive, since the body strives to maintain the weight you had before you started the diet.

The researchers checked whether physical activity made a difference in the relationship between perceived and actual obesity. But they found that exercise could not compensate for the negative effect of feeling overweight at a young age.

Higher BMI, larger waist circumference

The health survey Young-HUNT1 was conducted from 1995-1997 and included 1196 normal weight teenagers of both sexes. Participants were later followed up in the Young-HUNT3 study, from 2006-2008, when they had grown to be between 24 and 30 years of age.

Half of the participants still had normal weights as adults. But among those who were overweight, the researchers found a clear difference:

The data showed that 59 per cent of the girls who had felt fat as a teen became overweight in adulthood, as measured using body mass index, or BMI. If waist circumference was used as the measure of obesity, then the percentage of teens who initially perceived themselves as fat and later became overweight as adults was 78 per cent.

In contrast, 31 per cent of the girls who did not consider themselves fat during adolescence were found in the follow-up study to be overweight as measured using BMI. That number was 55 per cent as measured by waist circumference.

Normal weight teens who rated themselves as fat in the initial HUNT study had a BMI in the follow-up HUNT study that was on average 0.88 higher than those who did not. They were also on average 3.46 cm larger as measured

around the waist.

Similar studies have previously been conducted in normal weight adult men and women. These studies have also shown an increase in weight over time in those who perceived themselves as too fat.

Simple measures for normal weight
The study also shows that normal weight girls were more likely than boys to rate themselves as overweight: 22 per cent of girls and nine per cent of the boys saw themselves as fat in the first HUNT survey.

One explanation for this gender difference may be that the media's focus on looks increasingly targets girls rather than boys.

"Girls thus experience more psychosocial stress to achieve the ideal body," Cuypers says. "Society needs to move away from a focus on weight, and instead needs to emphasize healthy eating habits, such as eating regular and varied meals and eating breakfast. Good sleep habits are also an advantage. And by reducing the amount that teens are transported to and from school and recreational activities, teens might also be able to avoid getting a ‘commuter belly'," Cuypers adds.

These kinds of measures can improve overall health, and can also be a help for teens who are in fact overweight, but who believe their weight is normal.

Role models, not super models

Cuypers believes that the relationship between a perception of being overweight and the development of overweight is something the school system and society as a whole must address in order to reverse the trend and reduce societal problems associated with obesity.

"The weight norms for society must be changed so that young people have a more realistic view of what is normal. In school you should talk to kids about what are normal body shapes, and show that all bodies are beautiful as they are. And, last but not least: The media must cease to emphasize the super model body as the perfect ideal, because it is not." Cuypers says.

Cuypers' results have been published in the Journal of Obesity:
http://www.hindawi.com/journals/jobes/2012/601872/

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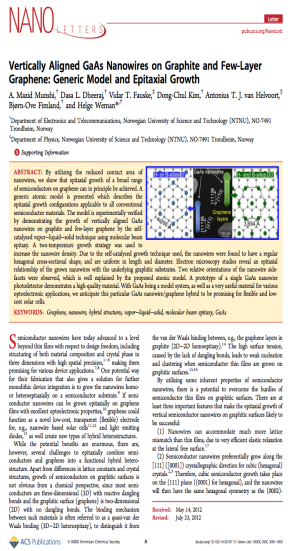
NTNU researchers commercialize semiconductors grown on graphene

(10.09.2012) NTNU researchers have patented and are commercializing GaAs nanowires grown on graphene, a hybrid material with competitive properties. Semiconductors grown on graphene are expected to become the basis for new types of device systems, and could fundamentally change the semiconductor industry. The technology underpinning their approach has recently been described in a publication in the American research journal Nano Letters.

The new patented hybrid material offers excellent optoelectronic properties, says Professor Helge Weman, a professor at NTNU's Department of Electronics and Telecommunications, and CTO and co-founder of the company created to commercialize the research, CrayoNano AS. "We have managed to combine low cost, transparency and flexibility in our new electrode," he adds.

Here's how they do it:

Read more:



NANO LETTERS

Vertically Aligned GaAs Nanowires on Graphite and Few-Layer Graphene: Generic Model and Epitaxial Growth

The patented method of growing semiconductor nanowires on atomically thin graphene uses MBE (Molecular Beam Epitaxy) to grow the nanowires.

"We do not see this as a new product," Weman says. "This is a template for a new production method for semiconductor devices. We expect solar cells and light emitting diodes to be first in line when future applications are planned."

Sunny outlook for nanowires

"Graphene is experiencing tremendous attention worldwide," Weman says. "Companies like IBM and Samsung are driving this development in the search for a replacement for silicon in electronics as well as for new applications, such as flexible touch screens for mobile phones. Well, they need not wait any more. Our invention fits perfectly with the production machinery they already have. We make it easy for them to upgrade consumer electronics to a level where design has no limits."

This invention is thus thought to be an enabler for a future platform for electronics and optoelectronics devices. One possible device with very large market potential is a nanowire solar cell. This type of solar cell has the potential to be efficient, cheap and flexible at the same time. The invention also makes it possible to imagine a future with self-powered nanomachines and advanced 3D integrated circuits built on graphene and semiconductor nanowires, enabling smaller and more efficient electronics.

Flexible future

Weman himself envisions flexible self-powered consumer electronics integrated into everything from clothes to notepads, and of course traditional cell phones, tablets and exercise accessories.

"Semiconductors grown on graphene could become the basis for new types of device systems, and could transform the semiconductor industry by introducing graphene as a preferred substrate for many applications," he says.

The research underpinning this development has been strongly supported by the Research Council of Norway since 2007. The project is embedded in the NTNU NanoLab, MBE Lab and Nano-Photonics Laboratory. The technology has been patented by NTNU Technology Transfer, of which CrayoNano is a spin-off company. The founders, Professor Helge Weman and Professor Bjørn-Ove Fimland, are both responsible for important research groups and labs at NTNU.

The article "Vertically Aligned GaAs Nanowires on Graphite and Few-Layer Graphene: Generic Model and Epitaxial Growth" was recently published in *Nano Letters*, which reports on fundamental research in all branches of nanoscience and nanotechnology.

For more information, see http://crayonano.com/

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Anne-Sophie Mutter and Trondheim Soloists start European tour

(24.09.2012) The violin virtuoso Anne-Sophie Mutter was formally awarded her honorary doctorate from the Norwegian University of Science and Technology (NTNU) on Sunday. At the same time Mutter started on a European tour with the Trondheim Soloists, an ensemble made up of current and former NTNU music students.

The Trondheim Soloists have collaborated with the violin virtuoso Anne-Sophie Mutter since 1997. They have toured together, and recorded CDs. On Sunday, however, their collaboration reached new heights, as the soloists and Mutter played the world premiere of a new violin concerto by André Previn in their opening concert in Trondheim. Afterwards, the musicians continue to concert venues in Germany, Switzerland, Denmark, Norway and Sweden.

NTNU's Rector, Torbjørn Digernes and Anne-Sophie Mutter meet before the celebratory dinner held for Mutter on Saturday evening in Trondheim.
Photo: Ole Morten Melgård

The world premiere of André Previn's newly written violin concerto required the Trondheim Soloists and Anne-Sophie Mutter to

Anne-Sophie Mutter has been an enormous inspiration both for the Trondheim Soloists and students in NTNU's music programme. Her commitment has brought the young musicians invaluable professional experience, whether during concert tours or in the recording studio. In recognition of this, NTNU awarded Mutter an honorary doctorate in 2010. But because of her busy concert programme, it is only now that Mutter was able to formally accept her degree, in conjunction with the opening of the European tour.

A recognition of the art

"What does it mean for you to receive an honorary doctorate?

"It is a great honour and recognition of the importance of music in general. I know that I am just one of many musicians who try to be useful to society. I am very

practice intensively before Sunday's concert in Trondheim. The concert inaugurated Mutter and the Trondheim Soloists' European tour.
Photo: Ole Morten Melgård

Even though Anne-Sophie Mutter and the Trondheim Soloists have played Vivaldi's "The Four Seasons" together many times, they are always looking for new ways to interpret this classic piece.Photo: Ole Morten Melgård.

Trine Knutsen, associate professor at the Department of Music (left), and Torbjørn Digernes, NTNU Rector, are delighted that Anne-

touched when one of us is given such wonderful recognition, because it shines a light on an often overlooked but important part of our existence: Spirituality, the opportunity to perform as an artist, and the ability to communicate across borders, languages and religion. For me, this recognition is recognition of the art in its entirety. I think many musicians are aware that they have a role in bringing light into people's lives."

Like "1001 nights"

One might ask how a world-class virtuoso and a chamber orchestra composed of music students and young musicians came to work together. Mutter has to search her memory a bit to find the answer: Back in 1997 Mutter and the Trondheim Soloists crossed paths while they were both on tour in Europe, and in a number of places, Mutter heard people praising the talented chamber orchestra. She was curious and contacted the group. That resulted in a tour two years later, which culminated in a recording of Vivaldi's "Four Seasons".

"I remember it like it was yesterday!" Mutter says. "It was in Copenhagen, it was fabulous."

The recording is treasured by music lovers and has sold 750,000 copies worldwide. But what is it about this particular recording and interpretation that makes it so popular?

"It's a bit like "1001 nights", it's like an everlasting fairy tale with many layers," Mutter says. "The work has so many details, so many colours, so much mystery in it that you

Sophie Mutter has chosen to give so much time and effor to the Trondheim Soloists and NTNU's music education programme.Photo: Ole Morten Melgård

The German ambassador, Dr. Alex Berg, Anne-Sophe Mutter and NTNU Rector Torbjørn Digernes discuss German-Norwegian cooperation in the arts and sciences.
Photo: Ole Morten Melgård

Anne-Sophie Mutter and the Trondheim Soloists play the world premiere of André Previn's newly written violin concerto in

explore it anew each time you open this musical book. It is never boring, either to listen to or to play."

"The Four Seasons" has become a signature piece for the Mutter and the Trondheim Soloists, and will also be a part of the tour programme this time. The tour also includes the premiere of a violin concerto by André Previn, specially written for Mutter and the Trondheim Soloists, on the occasion of the tour and the presentation of Mutter's honorary degree. Previn is Mutter's former husband, and both she and Trondheim Soloists are looking forward to touring with the newly written commissioned piece.

Success is not the goal

Story telling, giving music colour and content, is something that Mutter thinks about when she chooses the young musicians who will get help developing their talents through to the Mutter Foundation in Germany.

"I'm trying to find young musicians who have strong opinions and their own point of view. The danger is that people want to be loved, and so they follow a safe recipe for success. But success is not the goal. The goal should always be to get under your listener's skin, to ask questions, to be shocking rather than to be eager to please. That's what I consider to be storytelling. We need young musicians who dare to shake the audience out of their comfort zone. People can either love it or hate it. Nothing is worse than indifference," Mutter says.

Olavshallen Sunday night. Photo: Ole Morten Melgård

After the opening of the European tour on Sunday evening, NTNU Rector Torbjørn Digernes gave violin virtuoso Anne-Sophie Mutter the ring and diploma that are the formal proof of her honorary doctorate from NTNU. Photo: Ole Morten Melgård

A fruitful dynamic

But do the Trondheim Soloists include this kind of musician?

"They have the ability to make you sit on the edge of your seat," Mutter responds. "It's not always a comfortable experience, but it's good for the music! It's a good starting point. The main thing is that when we get together, there is always a high standard of musicianship. It is a fruitful collaboration, and they play in a fresh way. I like that," Mutter adds. "And the way the system works, where there is a constant flow of new people into the orchestra, makes it very dynamic with a good flow. As long as Øyvind (Artistic Director Øyvind Gimse) keeps a careful eye on who is admitted – and he does – the orchestra develops on its own."

As an honorary doctor at NTNU, Mutter is in the company of many well-known names who in various ways have brought inspiration and knowledge to the university. Some also give guest lectures, which raises the question as to whether Mutter herself will consider teaching in the future.

"If time permits, later in life, when I play less and have more time to talk – God knows when that will be! – I would love to come back," Mutter says.

Honorary Doctors at NTNU

NTNU has awarded an honorary doctorate every year since 1996. An honorary doctorate is given to individuals who have made exceptional efforts in research, or who through other activities have contributed to the development of NTNU or society at large. International relations are also considered when making the awards. It is the custom for newly appointed honorary doctors to thank the university for the recognition by giving a guest lecture, or in the case of a musician, by giving a concert.

As an honorary doctor in the arts, Anne-Sophie Mutter is in very good company. Other honorary doctors in the arts include:
Liv Ullmann, actor and director
Arve Tellefsen, violin
Chick Corea, jazz pianist and composer

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Shocking electric car news

(08.10.2012) Electric cars are often seen as an environmental saviour because they themselves emit no greenhouse gases. But a new paper in the Journal of Industrial Ecology, written by researchers from NTNU's Industrial Ecology Programme, led by Professor Anders Hammer Strømman, shows that the production of electric cars can have more environmental effects than the production of conventional vehicles.

Journalists from around the globe have reported on the story, including from the BBC, the Detroit Bureau, Gizmodo, Slashdot, and Fast Company. There's a particularly good back-and-forth about the issue on the website of Canadian newspaper, the Globe and Mail.

The bottom line? While electric cars that derive their electricity from low-carbon sources are good, electric cars whose power comes from coal-fired power plants are not good. And the manufacture of electric cars is currently so polluting that, as one of the co-authors of the report told the Globe and Mail, "because the production of an electric car causes roughly twice the climate impact of producing a comparable conventional

Read more

RESEARCH AND ANALYSIS

Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles

Troy R. Hawkins, Bhawna Singh, Guillaume Majeau-Bettez, and Anders Hammer Strømman

Keywords:

Summary

Introduction

car, it must run on rather clean electricity to ‘make up' for the initial climate impact." So the paper is a clear call to auto manufacturers that they need to find ways to cut the environmental impacts from electric car production.

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Four new Centres of Excellence

(12.11.2012) The Research Council of Norway has awarded NOK 2 billion over 10 years to 13 research groups to establish Norwegian Centres of Excellence starting in 2013. NTNU was awarded 4 of the new centres.

"This is a big day for NTNU. We are very happy and proud that all 4 of the NTNU applicants who were finalists were also selected in the end to be Centres of Excellence. This is an important recognition of the quality of the research that is conducted at NTNU," said Kari Melby, NTNU's Pro-Rector for Research. "We congratulate our researchers, with a special nod to the new centre leaders, who have

succeeded in an extremely difficult competition, where the best competed against the best. They have made an enormous effort to get to where they are today."

The award means the four new centres will receive a total of NOK 620 million over 10 years. All told, 139 different research groups applied to funding as a Centre of Excellence. The Research Council of Norway selected 29 finalists from this group, but just 13 of these were selected in the end after a detailed and demanding application process.

New centres

The four new NTNU centres are:

- Centre for Autonomous Marine Operations and Systems (AMOS)
- Centre for Molecular Inflammation Research (CEMIR)
- Centre for Neural Computation (CNC)
- Centre for Dynamics of Biological Diversity

Centre for Autonomous Marine Operations and Systems

The centre will strengthen Norway's already high standing in marine technology. Researchers will develop control engineering and marine technology for autonomous systems that can interpret data and take decisions without the need for human intervention. Annual award: NOK 17.5 million. Project leader: Professor Johan Asgeir Sørensen.

Centre of Molecular Inflammation Research

The centre will identify new diagnostic tools and therapeutic targets for inflammatory diseases. Research

activities will lead to a greater understanding of how the body's inflammatory responses to disease are triggered and how the immune system is activated. Annual award: NOK 16.5 million. Project leader: Professor Terje Espevik.

Centre for Neural Computation
The objective of this SFF centre is to pioneer the extraction of computational algorithms from the mammalian cortex. Understanding the brain at the algorithmic level may have far-reaching implications, from the diagnosis and prevention of many neurological and psychiatric diseases to applications in the IT industry. Annual award: NOK 17.5 million. Project leader: Professor May-Britt Moser.

Centre for Dynamics of Biological Diversity
The centre's researchers will study biosystems at the genetic, population and community levels. The objective is to identify general principles and patterns which can be used to predict changes in biological diversity, including the significance of human activities. Annual award: NOK 10.5 million. Project leader: Professor Bernt-Erik Sæther.

Read the Research Council of Norway's press release.

New research frontiers
The SFF scheme is one of the Research Council's primary instruments for promoting research of high scientific quality. A research group that is granted status as an SFF centre can look forward to ten years of stable funding. Generous, long-term funding allows the SFF centres to establish an organization designed to carry out targeted

research of top international calibre and develop new ways to collaborate and reach the international forefront of their respective fields. An important secondary objective is to enhance researcher recruitment.
The scheme was launched in 2003 with 13 SFF centres. In 2007 eight new SFF centres were established. The total annual budget for these 21 centres has been NOK 235 million.

The initial SFF centres are all drawing to a close at the end of 2012, while 13 new centres are being established. The total annual budget for the new centres is NOK 208 million.

"All our experience indicates that these 13 new centres will deliver research that makes a lasting impact for years to come," says Arvid Hallén, Director General of the Research Council. "They are already well-entrenched research groups; this long-term funding gives them the chance to make their mark in the forefront of international research." The director general is looking forward to seeing what this next generation of Norwegian Centres of Excellence will achieve.

Visit NTNU's Flickr page to download photos related to the new centres.

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NTNU first in Scandinavia on YouTube EDU

(14.11.2012) Lectures from NTNU are now being launched on You Tube's own channel for education.

"We are always on the lookout for improvements. YouTube EDU will increase accessibility to our video lectures, and contribute to spreading knowledge from NTNU to the rest of the world," says Knut Veium, Head of NNTU's Studies and Administrative Support Section.

NTNU is developing a video portal on its own website, and the same videos are now also being posted on You Tube EDU. The video lectures have also been available on iTunes U since 2009.

Video is a trend

"We think it will be valuable to have a presence on You Tube. Our videos are now even more accessible, and easier to find, when they are presented in multiple channels. We also have a young target group. Video lectures are a very distinct trend, and we think it is important to keep up to date," says Veium.

Members of the EDU club
It's been just a week since You Tube was opened to Nordic universities on EDU. "We are enjoying our new membership in the EDU club on You Tube, and we are pleased about being first among the Nordic universities," Veium says.
Veium says NTNU currently has about 300 videos available on the site, but that he expects the number will double soon. He also estimated that the number of viewings will increase rapidly when video lectures also are published on You Tube.

See video lectures from NTNU: http://www.youtube.com/NTNUopenVideo

Contact:
Head of Section, Knut Veium

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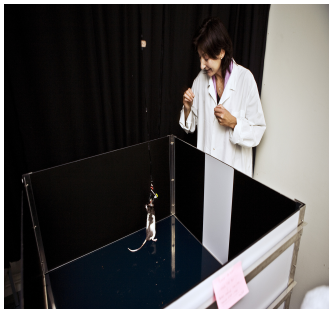
The many maps of the brain

(05.12.2012) Your brain has at least four different senses of location – and perhaps as many as 10. And each is different, according to new research from the Kavli Institute for Systems Neuroscience, at the Norwegian University of Science and Technology.

The findings, published in the 6 December 2012 issue of Nature, show that rather than just a single sense of location, the brain has a number of "modules" dedicated to self-location. Each module contains its own internal GPS-like mapping system that keeps track of movement, and has other characteristics that also distinguishes one from another.

"We have at least four senses of location," says Edvard Moser, director of the Kavli Institute. "Each has its own scale for representing the external environment, ranging from very fine to very coarse. The different modules react differently to changes in the environment. Some may scale the brain's inner map to the surroundings, others do not. And they operate independently of each other in several ways."

Visualizing location



Thinking outside of the box: May-Britt Moser next to a typical recording environment. In this square environment, the rat forages for cookie crumbles while signals from brain cells are recorded. Credit: CBM/Kavli Institute for Systems

This is also the first time that researchers have been able to show that a part of the brain that does not directly respond to sensory input, called the association cortex, is organized into modules. The research was conducted using rats.

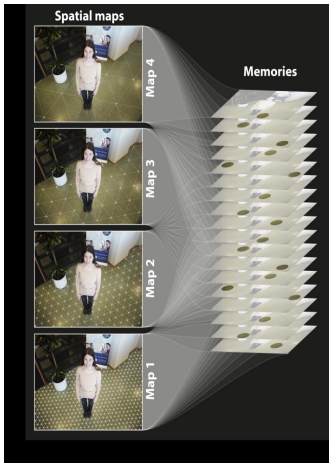
Technical breakthroughs

A rat's brain is the size of a grape, while the area that keeps track of the sense of location and memory is comparable in size to a small grape seed. This tiny area holds millions of nerve cells.

A research team of six people worked for more than four years to acquire extensive electrophysiological measurements in this seed-sized region of the brain. New measurement techniques and a technical breakthrough made it possible for Hanne Stensola and her colleagues to measure the activity in as many as 186 grid cells of the same rat brain. A grid cell is a specialized cell named for its characteristic of creating hexagonal grids in the brain's mental map of its surroundings.

"We knew that the 'grid maps' in this area of the brain had resolutions covering different scales, but we did not know how independent the scales were of each other," Stensola said. "We then discovered that the maps were organized in four to five modules with different scales, and that each of these modules reacted slightly differently to changes in their environment. This independence can be used by the brain to create new

Neuroscience Hi-res version.



Spatial location is closely connected to the formation of new memories. Until now, grid cells were thought to be part of a single unified map system. New findings from the Norwegian University of Science and Technology demonstrate that the grid system is in fact composed of a number of independent grid maps, each with unique properties. Each map displays a

combinations - many combinations - which is a very useful tool for memory formation."

After analysing the activity of nearly 1000 grid cells, researchers were able to conclude that the brain has not just one way of making an internal map of its location, but several.

Perhaps 10 different senses of location

Institute director Moser says that while researchers are able to state with confidence that there are at least four different location modules, and have seen clear evidence of a fifth, there may be as many as 10 different modules.

He says, however, that researchers need to conduct more measurements before they will have covered the entire grid-cell area. "At this point we have measured less than half of the area," he says.

Aside from the time and challenges involved in making these kinds of measurements, there is another good reason why researchers have not yet completed this task. The lower region of the sense of location area, the entorhinal cortex, has a resolution that is so coarse or large that it is virtually impossible to measure it.

"The thinking is that the coordinate points for some of these maps are as much as ten metres apart," explains Moser. "To measure this we would need to have a lab that is quite a lot larger and we would need time to test activity over the entire area. We work with rats, which run

particular resolution (mesh size), and responds independently to changes in the environment. A system of several distinct grid maps (illustrated on left) can support a large number of unique combinatorial codes used to associate new memories formed with specific spatial information (illustrated on right). The findings are published in the 6 December issue of the journal Nature and are a part of doctoral research conducted by Hanne Stensola (picture) and Tor Stensola at the Kavli Institute for Systems Neuroscience. Credit: Tor Stensola, CBM/Kavli Institute

around while we make measurements from their brain. Just think how long it would take to record the activity in a rat if it was running back and forth exploring every nook and cranny of a football field. So you can see that we have some challenges here in scaling up our experiments."

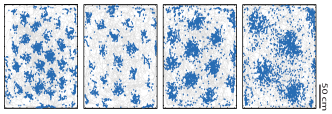
New way to organize

Part of what makes the discovery of the grid modules so special is that it completely changes our understanding of how the brain physically organizes abstract functions. Previously, researchers have shown that brain cells in sensory systems that are directly adjacent to each other tend to have the same response pattern. This is how they have been able to create detailed maps of which parts of the sensory brain do what.

The new research shows that a modular organization is also found in the highest parts of the cortex, far away from areas devoted to senses or motor outputs. But these maps are different in the sense that they overlap or infiltrate other. It is thus not possible to locate the different modules with a microscope, because the cells that work together are intermingled with other modules in the same area.

"The various components of the grid map are not organized side by side," explains Moser. "The various components overlap. This is the first time a brain function has been shown to be organized in this way at separate scales. We have uncovered a new way for neural network function to be distributed."

for Systems Neuroscience Hi-res version.



The entorhinal cortex is a part of the neocortex that represents space by way of brain cells that have GPS-like properties. Each cell describes the environment as a hexagonal grid mesh, earning them the name ‘grid cells'. The panels show a bird's-eye view of a rat's recorded movements (grey trace) in a 2.2x2.2 m box. Each panel shows the activity of one grid cell (blue dots) with a particular map resolution as the animal moved

through the environment. Credit: Tor Stensola, CBM/Kavli Institute for Systems Neuroscience Hi-res version.

A map and a constant

The researchers were surprised, however, when they started calculating the difference between the scales. They may have discovered an ingenious mathematical coding system, along with a number, a constant. (Anyone who has read or seen "The Hitchhiker's Guide to the Galaxy" may enjoy this.) The scale for each sense of location is actually 42% larger than the previous one.

"We may not be able to say with certainty that we have found a mathematical constant for the way the brain calculates the scales for each sense of location, but it's very funny that we have to multiply each measurement by 1.42 to get the next one. That is approximately equal to the square root of the number two," says Moser.

Maps are genetically encoded

Moser thinks it is striking that the relationship between the various functional modules is so orderly. He believes this orderliness shows that the way the grid map is organized is genetically built in, and not primarily the result of experience and interaction with the environment.

So why has evolution equipped us with four or more senses of location?

Moser believes the ability to make a mental map of the environment arose very early in evolution. He explains that all species need to navigate, and that some types of

memory may have arisen from brain systems that were actually developed for the brain's sense of location.

"We see that the grid cells that are in each of the modules send signals to the same cells in the hippocampus, which is a very important component of memory," explains Moser. "This is, in a way, the next step in the line of signals in the brain. In practice this means that the location cells send a different code into the hippocampus at the slightest change in the environment in the form of a new pattern of activity. So every tiny change results in a new combination of activity that can be used to encode a new memory, and, with input from the environment, becomes what we call memories.

The article is a part of doctoral research conducted by Hanne and Tor Stensola, and has been funded through an Advanced Investigator Grant that Edvard Moser was awarded by the European Research Council (ERC).

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Gunnar Bovim selected as new NTNU rector

(06.12.2012) Gunnar Bovim (52) was selected Thursday as NTNU's new rector. Bovim will formally take office on 1 August 2013, when the current rector, Torbjørn Digernes, completes his term of office.

Gunnar Bovim is currently chief executive officer of the Central Norway Regional Health Authority, a post he has held since 2009. He was vice-dean at NTNU's Faculty of Medicine from 1996-1998 and dean of the same faculty from 1999 to 2005. Beginning in 2005 he served as deputy managing director and in 2006 as chief executive officer at St. Olavs Hospital, the Trondheim University Hospital.

Both as Dean of the Faculty of Medicine and in his positions at at St. Olavs Hospital, Bovim had a central role in the development of the integrated university hospital. In his positions at the hospital and at the regional health authority, he has been a driving force in increasing cooperative research between the hospital and NTNU.

Bovim was educated as a medical doctor and as a specialist in neurology. He took his doctorate from the

Gunnar Bovim

Click for hi-res version

University of Trondheim in neurology (specializing in the study of headaches) in 1993, and served for ten years a professor at NTNU's Department of Neuroscience, with an additional post at the Department of Neurology at the then Regional Hospital in Trondheim (RiT) / St. Olavs Hospital.

Bovim has held a number of board positions, nationally and internationally, including as a member of the Executive Board and Head of the Division for Society and Health at the Research Council of Norway. He has served as the Norwegian delegate of the Association of Nordic Research Councils and the European Medical Research Council.

He has published numerous scientific articles and was awarded the 1993 Norwegian Migraine Society Research Award. As dean at NTNU, he was known as an advocate for the public dissemination of research, and as a mentor for promoting women in science.

Over the course of the next few months, NTNU will also engage new pro-rectors, new deans for all seven faculties and new department heads at a total of 52 departments. An important reason that the NTNU Board has decided to announce Bovim's hiring more than six months before the change of leadership formally takes place is that he will thus have the opportunity to influence the composition of the university's new management team.

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Six NTNU students, one real-time online game

(10.12.2012) It's a real-time, online multiplayer game. It's cross-platform, meaning that you can play it on your Android or your iPhone. It's free. And now, Fun Run, developed by six NTNU students, is number two on the US iTunes Top Free Apps list.

Released in September, the game enables you to virtually race (as a "forest critter") against three other friends or random opponents. While most smart phone or tablet games are turn-taking games, where you play and then send your move to your opponent, Fun Run is different because it is one of the first games available for your mobile phone or tablet that takes place in real time.

The future of mobile gaming

The students think this kind of real-time game is the future. It has also been a key to their success, says Nicolaj Broby Petersen, who with his fellow game developers was featured in an article in Dagens Næringsliv, Norway's largest daily financial newspaper.

"The thing that is new with this game is that people play in real-time, with their friends. So it's really the users that are marketing the game for us, because they recruit all their friends to play with them," Petersen told the newspaper.

The game really began to take off in the first week of December, when it averaged about 100,000 downloads per day.

"We're working pretty intensely right now," Petersen said. "We don't have much time to sleep."

Fun Run is free, but players can purchase add-ons to equip their avatars or change their appearance. The students also plan to add advertisements to the free version of the game. They told Dagens Næringsliv that it is difficult to estimate how much money they will eventually make from the game.

New company, awards and Christmas

Erlend Børslid Haugsdal, Martin Nybø Vagstad and Nicolaj Broby Petersen, all computer science students, created their own game company, dirtyBit, last year. Marius Giske, an industrial economics student, and Peder Aune and Martin Sangholt, both industrial design students came on board to help develop Fun Run.

In August, Fun Run won the "Best mobile game" and "Player's Choice" awards from the Norwegian Game Awards. The students hope to keep the game on the top of the iTunes App Store list right up to Christmas, when they know that many people will be given new mobile phones or tablets as gifts.

Now, while most students are studying for exams, the game developers are keeping an eye on their game and making sure that they have enough server capacity, both in Norway and in the USA.

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Beliefs battle hypertension

(23.12.2011) As you are weighing whether or not to go to church services this Christmas, consider this: Does a belief in God confer any health benefits? With the help of a large Norwegian longitudinal health study called HUNT, researchers from the Norwegian University of Science and Technology (NTNU) were able to find a clear relationship between time spent in church and lower blood pressure in both women and men.

The more time in church, the better

"We found that the more often HUNT participants went to church, the lower their blood pressure, even when we controlled for a number of other possible explanatory factors," says Torgeir Sørensen, a PhD candidate from the School of Theology and Religious Psychology Centre at Sykehuset Innlandet (Inland Hospital).

"This is the first study of its kind in Scandinavia. Previous research from the United States has shown that there is a possible link between people who attend church and blood pressure. However, large religious and cultural differences between the US and Norway make it difficult

HUNT - the Nord-Trøndelag Health Study

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies, along with biological samples from more than 75,000 individuals. Today, HUNT is a database with information about

to transfer these findings to the Norwegian context," says Sørensen.

About 90% of the population of the county of Nord-Trøndelag, where the HUNT study was conducted, are members of the Norwegian state church, while Americans show a much broader distribution in their religious and ethical preferences.

"About 40% of the US population goes to church on a weekly basis, while the corresponding figure in Nord-Trøndelag County is 4%. For that reason, we did not expect to find any correlation between going to church and blood pressure in Nord-Trøndelag. Our findings, however, are almost identical to those previously reported from the United States. We were really surprised," Sørensen said.

The Bible and blood pressure

"Since this is a cross-sectional study, it is not possible to say whether it was a health condition that affected the participants' religious activity, or whether it was the religious activity that affected the state of participants' health," says Professor Jostein Holmen from NTNU's Faculty of Medicine, and one of the authors of the study.

A cross-sectional study says something about a group of people at a given time, but can say nothing about causation. "In order to determine what causes the

approximately 120,000 individuals, where family data and individual data can be linked to national health registries.

HUNT includes an associated biobank that stores whole blood and DNA from 200,000 individuals, serum and plasma samples from more than 100,000 individuals, along with RNA tubes, cells, buffy coat, urine and na-heparin tubes for roughly 50,000 people. For more information, visit the HUNT home page.

effect, we need new studies that look at the same people at different times," says Holmen.

For this study, church attendance was selected as a variable to represent religious activity, and blood pressure was selected as a variable that gives an indication of overall health with respect to a variety of diseases and conditions. The study found that the variable used to measure religious activities (church time) had a significant relationship to the variable used to measure health (blood pressure). In other words, those who were religiously active were healthier than those who were not religiously active.

"The study of the relationship between religion and health has rarely focused on other religions, such as Judaism and Islam. It is therefore difficult to say anything about whether or not this same association can be found in these communities," says Sørensen.

Humor, culture and faith

The residents of Nord-Trøndelag County have participated in three HUNT surveys since 1984. These studies have not only examined risk factors for disease and death, but have also evaluated factors that might contribute to good health. The second survey, HUNT 2, which was conducted in 1995-97, included questions about the participant's sense of humor in the overall questionnaire. The HUNT 3 study (2006-08) included questions about participation in cultural activities and religious beliefs in the questionnaire that was used as a part of the survey.

All told, the HUNT databases contain information about approximately 120,000 people, and make it possible to integrate family data and individual data that then can be linked to Norway's national health registries.

"These factors have been poorly investigated in previous studies of different populations. The research into lifestyle and health issues mainly comes from the United States, while information from Europe and Scandinavia is very limited," says Holmen, who was one of the initiators of the first HUNT study in the early 1980s.

Earlier HUNT studies have shown a positive correlation between humor and good health, and participation in different cultural activities and good health.

"It would appear that the data we have been recording in the HUNT studies about religious beliefs is actually relevant to your health, and this is interesting in itself," Holmen says.

"The fact that churchgoers have lower blood pressure encourages us to continue to study this issue. We're just in the start-up phase of an exciting research area in Norway," he said.

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A different kind of immigrant problem

(26.12.2011) The Harlequin ladybeetle, Japanese knotweed and the American lobster – while this trio of creatures may have friendly sounding names, they are all introduced species in Norway, and may be anything but friendly to the Norwegian environment. But determining exactly how damaging introduced species may be in their new environment has always been something of a challenge for biologists and land managers – until now.

A coalition of researchers from the Norwegian University of Science and Technology (NTNU) and staff from the Norwegian Biodiversity Information Centre have created a unique quantitative method that enables researchers and others to assess the environmental risks posed by non-native species. While the method is tailored to the Norwegian environment, it can easily be adapted to other countries, and fills a vital need internationally for a quantifiable, uniform approach to classifying and assessing alien species, the developers say.

"This provides an objective classification of these species'

potential impact on the Norwegian environment. We relied on much of the same principles as are used in the preparation of the 'Red List' of endangered and threatened species," says Professor Bernt-Erik Saether at NTNU's Center for Conservation Biology (CCB), who has spearheaded the development of the new methodology with the help of a coalition of other Norwegian scientists and Biodiversity Information Centre staff.

Rating risks

The method classifies species according to their reproductive ability, growth rate, individual densities, population densities, prevalence and their effect. This information allows the researchers to plot the risks posed by each species on two axes, one which shows the likelihood of the species' dispersal and ability to establish itself in the environment (along with its rate of establishment, if applicable) and the other shows the degree to which the alien species will affect native species and habitats.

Based on the combined values of the two axes, the species can be placed in one of five risk categories:

• Very high risk species that can have a strong negative effect on the Norwegian environment;
• High risk species that have spread widely with some ecological impact, or those that have a major ecological effect but have only limited distribution;
• Potentially high risk species that have very limited dispersal ability, but a substantial ecological impact or vice versa;
• Low risk species, with low or moderate dispersion and moderate to limited ecological effect;
• Species with no known risk factors that are not known to have spread and have no known ecological effects.

Black-listed species

Norway's first official foray into evaluating the risks posed by invasive species was with the publication of the 2007 Norwegian Black List, which described the risks posed by 217 of the 2483 alien species then known in Norway.

With the publication of a new list of alien species in the summer of 2012, the number of species that will be thoroughly evaluated by scientists will climb to roughly 2600, says project manager Lisbeth Gederaas, with the Norwegian Biodiversity Information Centre. The 2012 Black List will employ the new evaluation method.

"The results from this work will give the Norwegian community a better knowledge base with which to evaluate alien species," she said. "We want to provide answers to the following questions: Who are these

species, when did they come to Norway, where do they live, how do they behave and what risks do they pose to the Norwegian environment?"

Recent immigrants

Most of the alien species evaluated in the 2007 Black List had come to Norway only in the last 150 years – in fact, only 10 per cent were introduced to the country prior to 1850.

And compared to countries such as the United States, which is swimming in a soup of alien species that have taken over whole landscapes, Norway is actually in reasonable shape. But Gederaas says that situation is rapidly changing, as Norwegians travel more and their ability to accidently or unintentionally introduce species increases. "We in Norway don't have the same problem as bigger countries, but it may be just a matter of time," she observed.

Beautiful flowers – but damaging effects

In some cases, for example, alien species are escapes from home gardens, such as the garden lupine, Lupinus polyphyllus, which was first reported from the Oslo Botanical Garden in 1831. Its beautiful pea-type flowers made it a popular planting, but by 1940, it had escaped and now colonizes road corridors and riverbanks. Because it is a legume, it has special nitrogen-fixing nodules on its roots that enable it to colonize even poor soils, and it produces copious amounts of seeds that spread and either sprout or form a nearly indestructable

seed bank in the soil. The spread of this beautiful plant is so substantial that it is altering the habitat along riverbanks and waterways, which in turn changes river habitats and thus the ability of different fish species to thrive, Gederaas says.

First Norway, then the world?

Gederaas said that she and her colleagues were surprised in 2007 by the extent to which the 2007 Black List was used by different communities across Norway. The Biodiversity Information Centre (www.biodiversity.no) also offers the existing list in a searchable, electronic version, along with detailed fact sheets for some of the most common or problematic species.

The plan calls for translating the new classification scheme into English, she said. Currently, there is no commonly agreed-upon international approach to quantitatively assessing risks from alien species – which leaves a gap that the Norwegian approach could fill.

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Resting heart rate and cardiovascular risk

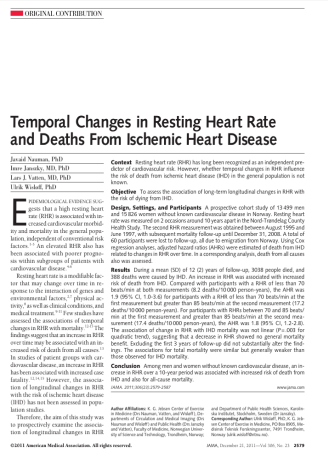
(20.12.2011) In a study that enrolled nearly 30,000 apparently healthy men and women, those who had an increase in their resting heart rate over a 10-year period had an increased risk of death from all causes and from ischemic heart disease, according to a study in the December 21 issue of the Journal of the American Medical Association, or JAMA.

Some evidence indicates that a high resting heart rate (RHR) is associated with increased cardiovascular disease and death in the general population, independent of conventional risk factors. However, whether changes in RHR over time influence the risk of death from ischemic heart disease (IHD) is not known, according to background information in the article.

NTNU's Javaid Nauman, PhD and colleagues, including Ulrik Wisløff, director of the university's **K.G. Jebsen Center for Exercise in Medicine** conducted a study to examine the association of changes in RHR with the risk of death from IHD in a population-based group consisting

KG Jebsen Centre of Exercise in Medicine

Want to read the JAMA article for yourself? Click on the paper below.



ORIGINAL CONTRIBUTION

Temporal Changes in Resting Heart Rate and Deaths From Ischemic Heart Disease

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Learn more about the **KG Jebsen Center**

of 13,499 men and 15,826 women without known cardiovascular disease. Resting heart rate was measured on two occasions around 10 years apart, with the second RHR measurement taking place between August 1995 and June 1997. There was follow-up until December 2008. A total of 60 participants were lost to follow-up due to emigration from Norway.

Increased heart rate, increased risk

During an average of 12 years of follow-up, a total of 3,038 people died. Among all deaths, 975 were caused by cardiovascular disease and 388 were due to IHD. The researchers found that compared with participants with a RHR of less than 70 beats/min at both measurements, participants with a RHR of less than 70 beats/min at the first measurement but greater than 85 beats/min at the second measurement had a 90 percent increased risk of death from IHD. Participants with RHRs between 70 and 85 beats/min at the first measurement and greater than 85 beats/min at the second measurement had an 80 percent increased risk.

Decreased RHR showed no general benefit with IHD mortality

The researchers also found that the association of changes in RHR with all causes of death were similar to those observed for IHD mortality, but the estimates of effect were generally weaker.

Analysis also suggested that a decrease in RHR showed no general benefit in relation to IHD mortality.

for Exercise in Medicine.

4x4 Interval Training

"As expected from the good general health of the study participants, the observed moderate-to-strong increases in relative risk corresponded to small risk increases in absolute terms. However, it is not clear to what extent we can extrapolate our findings to less healthy individuals in whom the underlying risk is likely to be higher," the authors note.

"Our findings provide further support for the hypothesis that RHR may be an important prognostic marker for IHD and total mortality. Information on RHR and its time-related changes are easy to obtain and follow-up and may be useful in identifying asymptomatic people who could benefit from measures of primary prevention, but further study in this area is warranted.

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Try not to lose sleep over it: insomnia is bad for your heart

(02.11.2011) A new study published in Circulation shows that chronic insomnia may increase the risk of heart attack. NTNU researchers Lars E. Laugsand, Lars J. Vatten, Carl Platou and Imre Janszky worked with data from the Nord-Trøndelag Health Study, which enabled them to follow more than 52,000 subjects for more than 11 years. Compared to people who didn't have sleep problems, those who had trouble falling asleep had a 45 per cent increased relative risk of heart attack.

The issue has been written about by The New York Times, USA Today , Newsday, CBS News, the Huffington Post, TIME magazine, the Daily Mail, and the Times of India, among many others.

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Cheating Father Time

(11.10.2011) Middle-aged exercise buffs who might be discouraged by the effects of ageing on their overall fitness can take heart in research from NTNU's K.G. Jebsen Center of Exercise in Medicine. Activity is far more important than age in determining fitness levels – and an active 50-year-old can be every bit as fit as a sedentary 20-year-old, says Ulrik Wisloff, Jebsen Center director and principle investigator of the study.

The study shows that by increasing the intensity of your exercise, you can beat back the risk of metabolic syndrome, the troublesome set of risk factors that can predispose people to type 2 diabetes, stroke and cardiovascular problems.

"Physical condition is the most important factor in describing an individual's overall health, almost like a report card," says Stian Thoresen Aspenes, who was recently awarded his PhD by NTNU for his research conducted at the K.G. Jebsen Center.

Largest fitness database in the world

Aspenes' thesis, *"Peak Oxygen Uptake Among Healthy Adults: Cross-sectional descriptions and prospective analyses of peak oxygen uptake, physical activity and cardiovascular risk factors in healthy adults (20-90 years)"* used information from 4631 healthy men and women from Norway's biggest health database, the Nord Trøndelag Health Study (HUNT) to examine fitness in adults from all age classes.

HUNT participants underwent laboratory tests in 2007-2008 to check their peak oxygen uptake, called VO2peak, which is used as a measure of overall fitness. This collection of information represents the largest database in the world of objectively measured VO2peak in healthy men and women aged 20-90 years old.

The detailed information from the database enables researchers to compare measures of fitness with cardiovascular risk factors and other assessments of overall health, giving them the statistical power to confirm what previous studies have suggested – that youth isn't everything when it comes to being fit. Their data also show how those who were least fit also had the worst measures of cardiovascular health, such as higher blood pressures and higher cholesterol levels.

Age and fitness

The underpinnings of the K.G. Jebsen Center's research go back in time and far away in place, to Dallas in 1965, when researchers selected five healthy 20-year-olds to spend three weeks in bed, for what has become one of the most famous fitness studies of all, the Dallas Bed Rest and Training Study. Predictably, the five 20-year-olds lost fitness after their three weeks of bed rest – with their measure of maximum oxygen uptake, VO2 Max, dropping by a whopping 27 percent. But it was what happened 30 years later, when researchers followed up on the study and retested these same men, which delivered the biggest surprise.

Time had not been so charitable to these men. On average, they had gained 23 kg, and their body fat percentage had doubled -- so they were far from fit. But when researchers tested their peak oxygen uptake, it had dropped by only 11 percent as compared to their 20-year-old healthy selves.

Intensity more important than duration

Research from the K.G. Jebsen Center goes well beyond the Dallas findings, and shows that fit 50-year olds can be as fit as 20-year olds who don't exercise much. But exercise – how much, and how intense – is the key to maintaining this fitness. When the Jebsen Center researchers looked at the importance of the intensity of exercise versus the duration, intensity was far more important than duration in determining peak oxygen uptake.

They have also looked at the benefits of high intensity exercise in the form of interval training – where four or more short periods (typically 4 minutes) of very high intensity exercise are followed by a similar number of short periods of lower intensity exercise. This approach, called 4x4 interval training, is a quick way to increase your overall fitness, research from the Jebsen Center has confirmed.

Cardiovascular risks

Exercise buffs will naturally be interested in the Jebsen Center's research, but their findings apply to anyone who wants to reduce their risk of cardiovascular disease.

For example, the researchers found that women whose fitness values were below the median VO2peak (<35.1 mL kg-1 min-1) were five times more likely to have a cluster of cardiovascular risk factors compared to those in the highest quartile of VO2peak (40.8 mL kg-1 min-1).

For men below the median (<44.2 mL kg-1 min-1), the risk was even higher – they were fully eight times more likely to have a cluster of cardiovascular risk factors compared to those in the highest quartile of VO2peak (50.5 mL kg-1 min-1). Even small differences in VO2peak were found to be associated with worsening cardiovascular risk profiles.

Keeping active is critical

The center's research shows that maintaining some level of physical activity is important. The benefit from having been active when young is small if you are inactive now.

"Even if you were highly active at a young age, you have to keep being active to get the health benefits from it," says Professor Wisloff.

So how do K.G. Jebsen Center researchers stay fit, given all that they know? Many incorporate exercise into their daily routines. Aspenes – a 33-year-old father of three, with a full time job now at the Norwegian Directorate of Health – is lucky because he can ride his bicycle to and from work, which in hilly Trondheim, means that at least part of the ride is up some pretty steep hills. That's an advantage for interval training, he says, because "I ride like hell up the hills."

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Millisecond memories

(28.09.2011) An experiment published in the 28 September issue of Nature in which rats are "teleported" shows how memory is organized into discrete 125 millisecond-long packets, enabling a smooth transition between one memory and the next.

You're rudely awakened by the phone. Your room is pitch black. It's unsettling, because you're a little uncertain about where you are – and then you remember. You're in a hotel room.

Sound like a familiar experience? Or maybe you've felt a similar kind of disorientation when you walk out of an elevator onto the wrong floor? But what actually happens inside your head when you experience moments like these?

In an published in this week's edition of the journal Nature, researchers at the Norwegian University of Science and Technology's Kavli Institute for Systems Neuroscience describe exactly how the brain reacts in situations like these, during the transition between one

Theta-paced flickering between place-cell maps in the hippocampus

LETTER

Theta-paced flickering between place-cell maps in the hippocampus

Click on the image above to download a pdf of the Nature article, or visit the publication's website

memory and the next. The study employed a method that allowed them to make measurements right down to the millisecond level. The research was conducted in the laboratory of May-Britt and Edvard Moser, co-director and director respectively of NTNU's Kavli Institute, by first author Karel Jezek.

to see the online version.

Memory quanta

Their findings show that memory is divided into discrete individual packets, analogous to the way that light is divvied up into individual bits called quanta. Each memory is just 125 milliseconds long – which means the brain can swap between different memories as often as eight times in one second.

"The brain won't let itself get confused," says Professor May-Britt Moser, co-director of the university's Kavli Institute. "It never mixes different places and memories together, even though you might perceive it that way. This is because the processes taking place inside your head when your brain is looking for a map of where you are take place so fast that you don't notice that you are actually switching between different maps. When you feel a little confused, it is because there is a competition in your brain between two memories. Or maybe more than two."

Beam me up, Scotty

Brain researchers Edvard and May-Britt Moser are trying to understand exactly how the brain works. Their approach is to meticulously monitor electrical activity in different parts of the rat brain, while the rats explore different mazes. It's a painstaking approach that provides them ever more pieces to the puzzle that is the workings of the brain.

To explore the question of whether the brain mixes memories together, the researchers created a special box for their laboratory animals that effectively enabled them to instantaneously 'teleport' a rat from one place to another -- without the help of the Starship Enterprise. Then, they tested how the brain handled the memory of place when the experience of that place suddenly changed from one location to another.

"Teleportation" with light

"We tricked the rats," May-Britt Moser explains. "They're not really teleported of course, but we have an approach that makes them believe that they have been. The features of the box, which give the rats a sense of where they are, are actually ‘constructed' out of different lighting schemes. So we can switch from one group of location characteristics to another with the flick of a light switch."

The rats were trained over a long time to believe that the various lighting schemes represented different rooms.

The researchers can tell that the rats truly believe that they are in different places because of their brain activity. "Once we turn on one lighting scheme, we can read a very specific pattern of activity in the cells in the part of the rat's brain that creates maps," May-Britt Moser says. "And when we switch to the other lighting scheme, the map pattern in the brain is completely different."

When the researchers 'teleport' the rats from one place to another by flipping the light switch from A to B, the rats experience exactly the kind of confusion you feel when you momentarily don't know where you are. "But the mind doesn't actually mix up the maps," she says. "It switches back and forth between the two maps that represent rooms A and B, but it is never in an intermediate position. The brain can ‘flip' back and forth between the two different maps, but it is always either or, site A or site B."

The contours of the mind

May-Britt and Edvard Moser have previously discovered the location of the brain's sense of place, shown how the brain works to make memories distinctively different, and have found that the brain has a mechanism to switch between experiences through the use of senses and images stored as memories. Now the researchers have also shown how the brain switches between individual memories, and how long the brain lingers on the different bits of memory.

"We are beginning to get a glimpse of the contours of the

mechanisms that make up the world of our thoughts," says May-Britt Moser.

Earlier this year May-Britt and Edvard Moser were awarded the Louis-Jeantet Prize for Medicine. In October, the couple will receive the 2011 Anders Jahre's Award for Medical Research. The award, which includes a NOK 1 million (€ 128,000) prize, is considered among the most prestigious of medical research awards in the Nordic countries.

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Translators of a far-away time

(23.09.2011) **Their two countries are hemispheres apart, but Norwegian and Argentinean archaeologists are using the similarities between their countries to compare early man's marine settlements.**

Norway's rugged coast has perhaps no better analogue than the glacially scoured shoreline of Patagonia, 13,000 kilometres away and a hemisphere apart. Their similarities, isolated from each other, make the two locations perfect natural laboratories for archaeologists interested in how early man lived in and adapted to marine environments.

Archaeologists from the two countries involved in a cooperative project called "Marine Ventures" met in Norway this summer in search of clues to the past.

Worlds apart – but almost the same

"Our project, Marine Ventures, gives us a valued opportunity to explore similarities and differences in both landscapes and marine pioneers between the two countries," says Professor Hein Bjerck, from the Norwegian University of Science and Technology's

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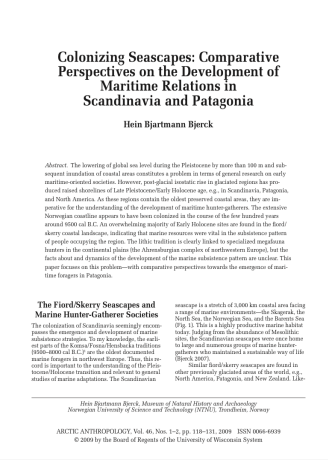

Colonizing Seascapes: Comparative Perspectives on the Development of Maritime Relations in Scandinavia and Patagonia

Hein Bjartmann Bjerck

Abstract. The lowering of global sea level during the Pleistocene by more than 100 m and subsequent inundation of coastal areas constitutes a problem in terms of general research on early maritime-oriented societies. However, post-glacial isostatic rise in glaciated regions has produced raised shorelines of Late Pleistocene/Early Holocene age, e.g., in Scandinavia, Patagonia, and North America. As these regions contain the oldest preserved coastal areas, they are imperative for the understanding of the development of maritime hunter-gatherers. The extensive Norwegian coastline appears to have been colonized in the course of the few hundred years around 9500 cal B.C. An overwhelming majority of Early Holocene sites are found in the fjord/skerry coastal landscape, indicating that marine resources were vital in the subsistence pattern of people occupying the region. The Ertebøl tradition is clearly linked to specialized megaloma hunters in the continental plains (the Ahrensburgian complex of northwestern Europe), but the facts about and dynamics of the development of the marine subsistence pattern are unclear. This paper focuses on this problem—with comparative perspectives towards the emergence of maritime foragers in Patagonia.

The Fjord/Skerry Seascapes and Marine Hunter-Gatherer Societies

The colonization of Scandinavia seemingly encompasses the emergence and development of marine subsistence-strategies. To my knowledge, the earliest parts of the Komsa/Fosna/Nemoka-ka traditions (9500–9000 cal B.C.) are the oldest documented marine foragers in northwest Europe. Thus, this record is important to the understanding of the Pleistocene/Holocene transition and relevant in general studies of marine adaptations. The Scandinavian seascape is a stretch of 3,000 km coastal area facing a range of marine environments—the Skagerak, the North Sea, the Norwegian Sea, and the Barents Sea (Fig. 1). This is a highly productive marine habitat today. Judging from the abundance of Mesolithic sites, the Scandinavian seascapes were once home to large and numerous groups of marine hunter-gatherers who maintained a sustainable way of life (Bjerck 2005).

Similar fjord/skerry seascapes are found in other previously glaciated areas of the world, e.g., North America, Patagonia, and New Zealand. Like-

Hein Bjartmann Bjerck, Museum of Natural History and Archaeology Norwegian University of Science and Technology (NTNU), Trondheim, Norway

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A 2009 article in Arctic Anthropology by Hein Bjerck provides additional information about early man in Scandinavia and Patagonia.

(NTNU) Museum of Natural History and Archaeology in Trondheim.

His Argentinean colleague, Lic. Ernesto Piana from Centro Austral de Investigaciones Cientificies – CONICET in Ushiaia, Tierra del Fuego, says that the two research groups can build on each other's strengths. "As archaeologists, we are translators of what people did in the past," he says. "Now, in bringing our knowledge together, we can be better translators. We in Argentina have more experience with organic material, while here in Norway there's a greater understanding of landscapes. "

Locations in Norway, organic material in Patagonia

Bjerck notes that the coasts of the two countries are extremely similar because of their history of glaciation during the Pleistocene. In this region, early man had to be dedicated to the sea. Despite the similarities between the

two countries, however, they have very different physical characteristics, which affects archaeological remains.

"The main difference is that we have 1000 known localities in Norway from the early Mesolithic era (9500-8000 BC), but we don't have any organic material," Bjerck says. "In Patagonia, however, they have few very early locations, but much more information on the sites: tools, organic material, and food remains, like seal and mussels."

"We're looking at 30 years of research on the Mesolithic period. Putting it all together, both the Norwegian and the Argentinean, gives us a broader perspective on the dynamics of early marine adaptations," Piana says.

Coastal landscapes

The glacial erosion of Patagonia and Scandinavia produced a characteristic coastal landscape with abundant skerries, islands, channels and fiords.
This seascape constitutes highly productive marine habitats – and sheltered seas that are optimal for maritime foragers.
"Tierra del Fuego is like a slightly sanded down version of Norway," says Piana.

Scientific advantages

Patagonia and Northern Norway are situated on different continents – thus excluding all kinds of cultural contacts prior to the European visitors during the Historical periods.

"This is one of the obvious scientific advantages that allows us to study how human beings have adapted to their environmental, material and social surroundings in two different, yet similar settings," the researchers say.

They note that the Norwegian record on adaptation to marine environments is solely archaeological, but this type of livelihood lasted in Patagonia until the European colonization of the region.

As such, there is written source material about how local people lived in these marine environments, as well as in their collective memory and identities.

The archaeological project "Marine Ventures" is a comparative assessment of human approaches to adaptation to seascapes of Tierra del Fuego and Norway, and is funded by the Research Council of Norway

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Feed your genes

(19.09.2011)What should we eat? Answers abound in the international media, from Time Magazine to the New York Times Magazine to best-selling authors, all of which rely on their interpretation of recent medical literature to come up with recommendations for the healthiest diet.

But what if you could answer this question at a molecular level – what if you could find out how our genes respond to the foods we eat, and what this does to the cellular processes that make us healthy – or not? That's precisely what biologists at the Norwegian University of Science and Technology (NTNU) have done.

The answer researchers have come up with may surprise you: the best diet, from a gene's standpoint, is one-third protein, one-third fat and one-third carbohydrates. That's what the research shows is the best recipe to limit your

risk of most lifestyle-related diseases.

Food affects gene expression

NTNU researchers Ingerid Arbo and Hans-Richard Brattbakk have fed slightly overweight people different diets, and studied the effect of this on gene expression. Gene expression refers to the process where information from a gene's DNA sequence is translated into a substance, like a protein, that is used in a cell's structure or function.

"We have found that a diet with 65 per cent carbohydrates, which often is what the average Norwegian eats in some meals, causes a number of classes of genes to work overtime," says Berit Johansen, a professor of biology at NTNU. She supervises the project's doctoral students and has conducted research on gene expression since the 1990s.

"This affects not only the genes that cause inflammation in the body, which was what we originally wanted to study, but also genes associated with development of cardiovascular disease, some cancers, dementia, and type 2 diabetes -- all the major lifestyle-related diseases," she says.

Common dietary advice and chronic disease

These findings undercut most of the underpinnings for the diets you've heard will save you. Dietary advice abounds, and there is a great deal of variation as to how scientifically justified it is. But it is only now that

researchers are figuring out the relationship between diet, digestion and the effect on one's health and immune system – so they can now say not only what kinds of foods are healthiest, but why.

"Both low-carb and high-carb diets are wrong," says Johansen. "But a low-carb diet is closer to the right diet. A healthy diet shouldn't be made up of more than one-third carbohydrates (up to 40 per cent of calories) in each meal, otherwise we stimulate our genes to initiate the activity that creates inflammation in the body."

This is not the kind of inflammation that you would experience as pain or an illness, but instead it is as if you are battling a chronic light flu-like condition. Your skin is slightly redder, your body stores more water, you feel warmer, and you're not on top mentally. Scientists call this metabolic inflammation.

The body's arms race

Johansen argues that diet is the key to controlling our personal genetic susceptibility to disease. In choosing what we eat, we choose whether we will provide our genes the weapons that cause disease. The immune system operates as if it is the body's surveillance authority and police. When we consume too many carbohydrates and the body is triggered to react, the immune system mobilizes its strength, as if the body were being invaded by bacteria or viruses.

"Genes respond immediately to what they have to work

with. It is likely that insulin controls this arms race," Johansen says. "But it's not as simple as the regulation of blood sugar, as many believe. The key lies in insulin's secondary role in a number of other mechanisms. A healthy diet is about eating specific kinds of foods so that that we minimize the body's need to secrete insulin. The secretion of insulin is a defense mechanism in response to too much glucose in the blood, and whether that glucose comes from sugar or from non-sweet carbohydrates such as starches (potatoes, white bread, rice, etc.), doesn't really matter."

Avoid the fat trap!

The professor warns against being caught up in the fat trap. It's simply not good to cut out carbs completely, she says. "The fat/protein trap is just as bad as the carbohydrate trap. It's about the right balance, as always."

She says we must also make sure to eat carbohydrates, proteins and fats in five to six smaller meals, not just for the main meal, at dinner.

"Eating several small and medium-sized meals throughout the day is important. Don't skip breakfast and don't skip dinner. One-third of every meal should be carbohydrates, one-third protein and one-third fat. That's the recipe for keeping inflammatory and other disease-enhancing genes in check," Johansen explains.

Change is quick

Johansen has some encouraging words, however, for those of us who have been eating a high carbohydrate diet.

"It took just six days to change the gene expression of each of the volunteers," she says, "so it's easy to get started. But if you want to reduce your likelihood of lifestyle disease, this new diet will have to be a permanent change."

Johansen stressed that researchers obviously do not have all the answers to the relationship between diet and food yet. But the trends in the findings, along with recent scientific literature, make it clear that the recommendation should be for people to change their dietary habits.

Otherwise, an increasing number of people will be afflicted with chronic lifestyle diseases.

The new food balance sheet

Most of us think it is fine to have foods that you can either eat or not eat, whether it comes to carbohydrates or fats. So how will we know what to put on our plates? Do we have to both count calories and weigh our food now?

"Of course you can be that careful," says Johansen. "But you will come a long way just by making some basic choices. If you cut down on boiled root vegetables such as potatoes and carrots, and replace the white bread

with a few whole meal slices, such as rye bread, or bake your own crispbread, you will reduce the amount of bad carbohydrates in your diet quite significantly. Furthermore, remember to eat protein and fat at every meal, including breakfast!"

Salad also contains carbohydrates

Johansen explains that many of us do not realize that all the fruits and vegetables we eat also count as carbohydrates – and that it's not just sweet carbohydrates that we should watch out for.

"Salad is made up of carbohydrates," says Johansen. "But you have to eat a lot of greens to get a lot of calories. Steamed broccoli is a great alternative to boiled potatoes. Fruit is good, but you have to be careful not to eat large quantities of the high-glycemic fruits at one time. Variety is important."

The best is to cut down on potatoes, rice and pasta, and to allow ourselves some of the good stuff that has long been in the doghouse in the refrigerator.

"Instead of light products, we should eat real mayonnaise and sour cream," Johansen says, "and have real cream in your sauce, and eat oily fish. That said, we should still remember not to eat too much food, either at each meal or during the day. Fat is twice as calorie-rich as carbohydrates and proteins, so we have to keep that in mind when planning the sizes of our portions. Fat is also different. We shouldn't eat too much saturated animal

fat, but monounsaturated vegetable fats and polyunsaturated marine fats are good."

Spread your calories out

Then there was the issue of six meals a day. Should we eat the same amount at every meal? Is an evening snack OK again? And is breakfast still the most important meal?

"It is better to spread your calories out over the day's meals rather than to cram in a huge dinner," says Johansen. "And both an evening snack and breakfast are good. It is obviously not good to go to sleep when you are stuffed full, but the body needs to refuel after dinner, too. So that means three main meals a day and 2-3 snacks, all balanced."

Johansen explains that one of the main findings of her study was that spreading one's calorie intake out over the day had a beneficial effect on health.

A powdered diet

Johansen and her colleagues conducted two studies. The first was to determine what type of research methods they would use to answer the questions they had. In the pilot study (28 days) five obese men ate real food, while in the second study, 32 slightly overweight men and women (mainly students) ate specially made powdered food.

Participants in the latter study were randomly assigned to go six days on a diet with 65 percent of calories from carbohydrates, with the rest of the calories from protein

(15 percent) and fat (20 percent), then a week with no diet. Then came the six days on a diet with half the carbs and twice as much protein and fat as in the first diet. There were blood tests before and after each dieting period.

The amount of food each person ate was calculated so that their weight would remain stable and so that equal portions were consumed evenly over six meals throughout the day.

The researchers had help developing diets from Fedon Lindberg, a medical doctor who specializes in internal medicine and who promotes low-glycaemic diets, Inge Lindseth, an Oslo dietician who specializes in diabetes, and Ann-Kristin de Soysa, a dietician who works with obese patients at St. Olavs Hospital in Trondheim.

"We wanted to know exactly what the subjects were getting in terms of both macro- and micronutrients," says Johansen, -"A tomato doesn't contain a consistent amount of nutrients, or antioxidants, for example. So make sure we had a handle on the health effects, we had to have accurate accounting of nutrients. That's why we chose the powdered diets for the main study."

Solving the control problem

Diet studies that compare different diets with different amounts of fat are often criticized with the argument that it is difference in the amount of omega-3 fatty acids that causes the health effects, not the rest of the food intake.

The researchers addressed this problem by having the same amount of omega-3 and omega-6 in both diets, although the amount of fat in general was different in the diets that were tested. The researchers also avoided another common problem: the natural variation in gene expression between humans.

"Each of our study subjects was able to be his or her own control person, " Johansen says "Every subject was allowed to go on both diets, with a one-week break in between the diets, and half began with one diet, while the rest started with the other diet."

Blood tests were conducted before and after each diet period. All of the measurements of changes in gene expression were done so that each individual's difference in gene expression was compared with that person alone. The results were then compiled.

Johnson says the studies resulted in two important findings. One is the positive effect of many meals throughout the day, and the details about the quality and composition of components in an optimal diet, including omega-3 and omega-6 fatty acids. The second is that a carbohydrate-rich diet, regardless of whether or not a person overeats, has consequences for genes that affect the lifestyle diseases, she says.

A way to measure genetic temperature

Throughout the study, researchers surveyed the extent

to which various genes were working normally or overtime. An aggregate measure of the results of all of this genetic activity is called gene expression. It can almost be considered a measurement of the genetic temperature of the body's state of health.

"We are talking about collecting a huge amount of information," says Johansen.
"And it's not like there is a gene for inflammation, for example. So what we look for is whether there are any groups of genes that work overtime. In this study we saw that an entire group of genes that are involved in the development of inflammatory reactions in the body work overtime as a group."

It was not only inflammatory genes that were putting in overtime, as it would turn out. Some clusters of genes that stood out as overactive are linked to the most common lifestyle diseases.

"Genes that are involved in type 2 diabetes, cardiovascular disease, Alzheimer's disease and some forms of cancer respond to diet, and are up-regulated, or activated, by a carbohydrate-rich diet," says Johansen.

Johansen is not a cancer researcher, and is not claiming that it is possible to eliminate your risk of a cancer diagnosis by eating. But she thinks it is worth noting that the genes that we associate with disease risk can be influenced by diet.

"We're not saying that you can prevent or delay the onset of Alzheimer's if you eat right, but it seems sensible to reduce the carbohydrates in our diets," she suggests.

"We need more research on this," Johansen adds. "It seems clear that the composition and quantity of our diets can be key in influencing the symptoms of chronic disease. It is important to distinguish between diet quality and quantity, both clearly have very specific effects."

Fountain-of-youth genes

Some genes are not up-regulated, but rather the opposite – they calm down rather than speed up, Johansen's study shows.

"It was interesting to see the reduction in genetic activity, but we were really happy to see which genes were involved. One set of genes is linked to cardiovascular disease. They were down-regulated in response to a balanced diet, as opposed to a carbohydrate-rich diet," she says. Another gene that was significantly differently expressed by the diets that were tested was one that is commonly called "the youth gene" in the international research literature.

"We haven't actually stumbled on the fountain of youth here," Johansen laughs, "but we should take these results seriously. The important thing for us is, little by little, we are uncovering the mechanisms of disease progression for many of our major lifestyle-related disorders."

The work is supported by NTNU and Central Norway Regional Health Authority. Other key partners have been Mette Langaas, a statistician and associate professor of mathematics at NTNU, Dr. Bard Kulseng of the Regional Center for Morbid Obesity at St Olavs Hospital, and Martin Kuiper, a professor of systems biology at NTNU.

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Centre for Conservation Biology professor wins international Balzan Prize

(06.09.2011) Russell Lande, an adjunct professor at the Norwegian University of Science and Technology's Centre for Conservation Biology, has been awarded the prestigious Balzan Prize.

The prize of 750,000 Swiss Francs (CHF), or $950,000 US, was awarded to the researcher in the category of Theoretical Biology or Bioinformatics, "for pioneering contributions to the development and application of theoretical population biology, including the modern development of the theory of quantitative genetics, and the study of stochastic population dynamics".

Two decades of cooperation with NTNU

Centre for Conservation Biology

The Centre for Conservation Biology at NTNU conducts interdisciplinary research into dynamic changes in biological diversity at different organismic levels (genes, populations and communities), based on a common theoretical framework.

Professor Lande, 59, is an American who is based at Imperial College, London. His association with NTNU spans two decades; as an adjunct professor, he holds a part-time, 20% position with the university.

"We are delighted, and we think it's great that the prize has gone to research that we are doing today. That is quite unusual when it comes to these kinds of awards," NTNU Professor Bernt-Erik Saether, who is head of the Center for Conservation Biology, told Adressavisen, the local newspaper.

Modelling long-term viability of species

The award is given to researchers who are international leaders in their scientific discipline. Lande was selected for the award because of his contributions in quantitative genetics and population dynamics.

More specifically, Lande has developed models to calculate the long-term viability of species that have large population swings. It is especially in this area that he has worked for years with his NTNU colleagues.

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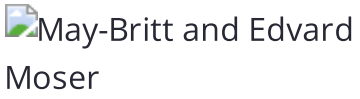
NTNU researchers win medical research prize

(25.08.2011) NTNU Professors May-Britt and Edvard Moser have been selected for the 2011 Anders Jahre's Award for Medical Research. The award, which includes a NOK 1 million (€ 128,000) prize, is considered among the most prestigious of medical research awards in the Nordic countries.


May-Britt and Edvard Moser

The Mosers were recognized for their groundbreaking discoveries and new insights into the brain's structure and function. In making its selection, the committee highlighted the couple's discovery of grid cells, which are neurons that store spatial information and memory, and noted that the researchers' findings have provided the international scientific community a better understanding of how the brain works.

Kavli Institute for Systems Neuroscience/Centre for the Biology of Memory

The scientific goal of the Kavli Institute for Systems Neuroscience is to advance our understanding of neural circuits and systems. By focusing on spatial representation and memory, the investigators hope to uncover general principles of neural network computation in the mammalian cortex.

"We see this prize as a recognition of 15 years of hard work by a large group of people," Edvard Moser said. "The work is also a product of the favourable working conditions provided by NTNU."

New brain centre to be established

Edvard and May-Britt Moser are director and co-director respectively of NTNU's Kavli Institute for Systems Neuroscience/Centre for the Biology of Memory, which is a Centre of Excellence recognized by the Research Council of Norway.

The successes of the Institute and Centre over time led NTNU earlier this year to pledge NOK 42 million to build an expanded research centre for the group, to be called the Norwegian Brain Centre. Upon its completion, the new centre for brain research may become the world's largest laboratory for the measurement of electrical activity in large groups of brain cells called neural networks. The centre will continue NTNU's long-term commitment to brain research, with the Kavli Institute for Systems Neuroscience/ Centre for the Biology of Memory at the forefront. In addition to conducting research, the Norwegian Brain Centre will host PhD candidates and researchers from Norway and abroad who need training in the latest technology focused on the brain.

The centre will both accommodate and develop the best technology for studying networks in the brain. One of the newest methods, which is under rapid development,

NTNU's Kavli Institute is the only one in the Nordic countries and is one of just four devoted to neuroscience. The other three Kavli Institutes for neuroscience are in the United States, at Yale University, the University of California San Diego and Columbia University.

NTNU's Kavli Institute coexists with the Centre for the Biology of Memory (CBM) but the scope of the Institute is broader and more long-term. CBM is part of the Centre of Excellence scheme of the Research Council of Norway.

For more information, visit the

involves using virus-based techniques to switch activity in specific neurons on and off, as well as new technology for measuring microscopic signals in the cells.

research group's main website.

Other recognition

The Jahre prize is the second major research prize awarded to the Mosers in 2011. Earlier this year the Mosers were awarded the 2011 Louis-Jeantet Prize for Medicine. The award recognized the Mosers, along with a German biologist, Stefan Jentsch, a director at the Max-Planck Institute of Biochemistry.

The Jahre Prize is awarded by a committee of scientists selected from across the Nordic region, and is based at the University of Oslo. The prize is named for Anders Jahre (1891-1982), who made his fortune from shipping and whaling. In 1953 Jahre donated NOK 1 million to the University of Oslo, which the university used to establish the "Anders Jahre Fund to promote science." The Jahre prize was first awarded in 1960 and is now comprised of the main award of NOK 1 million, with a second award of NOK 400000 to young scientists.

This is the second time an NTNU researcher has been selected for this award. In 2004, Professor Hans Krokan was awarded the prize for his research on DNA repair. He shared it then with Erling Seeberg at the University of Oslo.

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New underwater robotics lab established

(23.08.2011) With the snip of a underwater robot claw, Norway's Minister of Trade and Industry cut the ribbon for a new underwater robotics laboratory at the Norwegian University of Science and Technology (NTNU).

Environmental monitoring of the ocean, marine research and the offshore oil and gas industry all demand strong technical expertise and advanced engineering solutions. In response to this demand, NTNU has newly established the Applied Underwater Robotics Laboratory (AUR Lab).

The lab brings together experts from cybernetics, control engineering, marine biology, marine archaeology, electrical engineering and telecommunications, and underwater technology to produce new scientific results that would otherwise be difficult to achieve.

Applied Underwater Robotics Laboratory

Here is a list of research areas for the AUR Lab:

-- Development of technology for guidance, navigation and control of underwater vehicles (ROVs and AUVs)
-- Environmental monitoring and mapping at sea surface, water column, and sea bed
-- Operations under ice in the arctic

"NTNU would like to consolidate its position as a leading university where links between science and technology strengthen our ability to conduct cutting edge research and develop new innovative approaches. Building on these connections puts NTNU in a unique position to explore the ocean," said Kari Melby, Pro-Rector for Research at NTNU during the opening ceremony for the laboratory on 23 August.

An underwater snip

Trond Giske, Norway's Minister of Trade and Industry, formally opened the laboratory by cutting an underwater ribbon using Minerva, one of the university's remote underwater minisubs.

"The AUR Lab will strengthen NTNU's position as a world-leading centre of expertise in subsea technology. Top-quality research and education in this field will be decisive in the ability of several of Norway's most important industries to create jobs and add value to the country's economy in the future," said Giske as he remotely cut the underwater ribbon. Also in attendance were Pro-Rector Melby and Ivar O. Grytdal, who is director of Statoil's Subsea North division, which will also be an important player in the new laboratory.

"By bringing together research groups in areas such as marine biology, underwater technology and marine archaeology, all of which are areas where NTNU has a very high level of expertise, we will produce scientific

-- Study of any object of interest (biogeochemical studies)
-- Inspection/surveillance for environmental agencies, oil industry, ecotoxicology
-- Evaluation of seabed properties and habitat
-- Underwater acoustic communication
-- Deepwater archaeology
-- Deepwater ecology research
-- Complex deepwater underwater operations including inspection and intervention
--Deepwater mineral extraction

results that were previously unattainable," Melby said. "We will tackle the challenges posed by the ocean – whether in environmental monitoring, marine research or the offshore oil and gas industry -- to contribute to sustainable and environmentally robust solutions."

Important in the High Arctic

Melby noted that research at the laboratory will also play a role in Norway's and management efforts in the High North and the Arctic, and will have major societal implications, particularly related to the oil and gas industry.

The laboratory is also a step forward in the university's overall strategy to strengthen its ocean research programme and is part of a larger commitment to build an "Ocean Space Centre", planned as an integrative, comprehensive research centre on the Trondheim waterfront that would provide researchers the facilities needed to study an array of marine and maritime topics, from ship design to renewable energy production to fish farming of the future. The University has already allocated 4.5 million to the centre, which will go to new infrastructure and the funding of several research positions and an operating engineer.

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Creating a "perfect eavesdropper" for computer security

(14.06.2011) Researchers in Singapore and Norway have implemented a "perfect eavesdropper" that illustrates an overlooked loophole in secure communications technology in an effort to make quantum cryptography truly secure.

Quantum key distribution (QKD) is an advanced tool for secure computer-based interactions, providing confidential communication between two remote parties by enabling them to construct a shared secret key during the course of their conversation.

QKD is perfectly secure in principle, but researchers have long been aware that loopholes may arise when QKD is put into practice. Now, for the first time, a team of researchers at the Centre for Quantum Technologies

The Quantum Hacking Group at NTNU

The Quantum Hacking group at the Norwegian University of Science and Technology works in the field of quantum cryptography, with the main goal to make quantum cryptosystems secure in practice. This is done by playing the role of the evil eavesdropper, and hacking practical systems by exploiting imperfections. Using

(CQT) at the National University of Singapore, the Norwegian University of Science and Technology (NTNU)and the University Graduate Center (UNIK) in Norway have created and operated a "perfect eavesdropper" for QKD that exploits just such a loophole in a typical QKD setup.

Impossible to detect

As reported in the most recent issue of Nature Communications, this eavesdropper enabled researchers to obtain an entire shared secret key without alerting either of the legitimate parties that there had been a security breach. The results highlight the importance of identifying imperfections in the implementation of QKD as a first step towards fixing them.

Cryptography has traditionally relied on mathematical conjectures and thus may always be prone to being "cracked" by a clever mathematician who can figure out how to efficiently solve a mathematical puzzle, aided by the continual development of ever-faster computers.

Quantum cryptography, however, relies on the laws of physics and should be infinitely more difficult to crack than traditional approaches. While there has been much discussion of the technological vulnerabilities in quantum cryptography that might jeopardize this promise, there have been no successful full field-implemented hacks of QKD security – until now.

Highlights areas for more attention

these results, the group proposes modifications to the systems and new security proofs which take imperfections into account.

"Quantum key distribution has matured into a true competitor to classical key distribution. This attack highlights where we need to pay attention to ensure the security of this technology," says Christian Kurtsiefer, a professor at the Centre for Quantum Technologies at the National University of Singapore.

In the setup that was tested, researchers at the three institutions demonstrated their eavesdropping attack in realistic conditions over a 290-m fibre link between a transmitter called "Alice" and a receiver called "Bob". Alice transmits light to Bob one photon at a time, and the two build up their secret key by measuring properties of the photons. During multiple QKD sessions over a few hours, the perfect eavesdropper "Eve" obtained the same "secret" key as Bob, while the usual parameters monitored in the QKD exchange were not disturbed – meaning that Eve remained undetected.

Off-the-shelf components were used

The researchers were able to circumvent the quantum principles that in theory provide QKD its strong security by making the photon detectors in Bob behave in a classical way. The detectors were blinded, essentially overriding the system's ability to detect a breach of security. Furthermore, this technological imperfection in QKD security was breached using off-the-shelf components.

"This confirms that non-idealities in the physical implementations of QKD can be fully and practically

exploitable, and must be given increased scrutiny if quantum cryptography is to become highly secure," says Vadim Makarov, a postdoctoral researcher at the University Graduate Center in Kjeller, Norway and a member of NTNU's Quantum Hacking group. "We can not simply delegate the burden of keeping a secret to the laws of quantum physics; we need to carefully investigate the specific devices involved," says Kurtsiefer.

The open publication of how the "perfect eavesdropper" was built has already enabled this particular loophole in QKD to be closed. "I am sure there are other problems that might show that a theoretical security analysis is not necessarily exactly the same as a real-world situation," says Ilja Gerhardt, currently a visiting scholar at the University of British Columbia in Vancouver, Canada. "But this is the usual game in cryptography – a secure communications system is created and others try to break into it. In the end this makes the different approaches better."

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Journal reference: Ilja Gerhardt, Qin Liu, Antía Lamas-Linares, Johannes Skaar, Christian Kurtsiefer, and Vadim Makarov, "Full-field implementation of a perfect eavesdropper on a quantum cryptography system," Nature Communications 2, 349 (2011).

NTNU's partner research institutions for this study were:

National University of Singapore
A leading global university centred in Asia, the National University of Singapore (NUS) offers a global approach to education and research, with a focus on Asian perspectives and expertise. The University has 15 faculties and schools, with over 36,000 students from 100 countries. NUS has three Research Centres of Excellence (RCE), 22 university-level research institutes and centres, and it is also a partner for Singapore's 5th RCE. The University is well known for its research strengths in engineering, life sciences, medicine, social sciences and natural sciences. More at www.nus.edu.sg

Centre for Quantum Technologies at the National

University of Singapore
The Centre for Quantum Technologies (CQT) was established as Singapore's inaugural Research Centre of Excellence in December 2007. It brings together quantum physicists and computer scientists to explore the quantum nature of reality and quantum possibilities in information processing. CQT is funded by Singapore's National Research Foundation and Ministry of Education and is hosted by the National University of Singapore (NUS). The CQT's Quantum Optics group has developed a complete quantum key distribution system based on entangled photon pairs, which has resulted in a few firsts in the field, including providing complete open source information for the hard- and software involved in this research. More at www.quantumlah.org

University Graduate Center in Kjeller, Norway
The University Graduate Center in Kjeller (UNIK) educates master's and PhD candidates in selected technological subjects. UNIK students are usually enrolled at the University of Oslo or NTNU, but other students are also welcome. UNIK was founded in 1987 and collaborates with special and highly qualified research communities in the Kjeller area.

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NTNU takes second place in Shell Eco-Marathon

(30.05.2011) A winning combination of dedicated students and a top flight car, the DNV Fuel Fighter, brought a solid second place to NTNU's entry in the 27th Annual Shell Eco-Marathon, an international competition designed to encourage today's students to develop cutting-edge designs for tomorrow's vehicles. The competition was held at the EuroSpeedway in Lausitz, Germany, from 26-28 May.

NTNU's team, led by Uwe Schindler from the university's Department of Industrial Economics and Technology Management, managed to travel 99 km/kwh with their hydrogen fuel cell car, which is the equivalent of travelling nearly 1,000 km using just 1 litre of petrol.

The NTNU team had high hopes of breaking a previous record set by NTNU's 2009 version of the DNV Fuel Fighter, which in its year set a world record of travelling the equivalent of 1246 km on a single litre of petrol. That record still stands -- the winners of the class in which NTNU competed, the "Urban Concept" class, were a Dutch team that travelled 104 km/kwh, just slightly over NTNU's second place finish and not nearly enough to break the 2009 record.

NTNU team member Silje Owrenn also won the prestigeous Shell Communications and Marketing Award for her expert management of the team's communications strategy in Norway, which included coverage of the team's efforts in the Norwegian national media.

Different disciplines, different expertise

NTNU's 2011 team consists of 19 members, of which 9 are "core members" from different university disciplines, including project management, mechanical engineering and cybernetics.

In addition to Schindler and Owrenn, the core team members are: Håkon Jenserud, Mats Hoel, Tim Mjellem Stockfleth, Aksel Qviller, Alexander Welland, Sigri Halsteinsild Bleie, and Jardar Sølna Øverby.

Overall, this year's competition attracted 3,000 competitors on 212 teams from 27 countries.

Master's thesis project

The 9 core students who participated in the project write a master's thesis about their work, which involves building the car, competing in the Shell Eco-Marathon, and writing a comprehensive report on the process. The remaining team members work with design, PR and media, and sponsor contact. DNV (Det Norkse Veritas) is the team's main sponsor, and is the reason for the vehicle's name, DNV Fuel Fighter.

The Shell Eco-Marathon competition had its origins in a 1939 in an argument between employees of Shell Oil's research laboratory in Wood River, Illinois, as to whose car got better fuel mileage.

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A magic number for heart health

(30.05.2011) Imagine being able to calculate one number that would tell you just how fit you are – and what that means for your heart health. Researchers from the Norwegian University of Science and Technology (NTNU) has managed exactly that: they have developed a model that can help doctors – and individuals – determine just how fit an individual is, and what that means for overall health.

Scientists at NTNU's newly established KG Jebsen Centre of Exercise and Medicine, led by Professor Ulrik Wisløff, have assembled the largest dataset of its kind in the world on fitness in healthy women and men. Using the database, the researchers were able to develop a model that enables the calculation of maximum oxygen uptake (VO2max), which is the single best way to measure physical conditioning and cardiac health.

5000 Norwegians provide data

Until now, there has been relatively little information to describe the levels of fitness that could be expected in a healthy adult population. That led Wisløff and his

Calculate your own VO2 Max

You can try the KG Jebsen Centre's VO2 Max calculator here.

Read more

Here are links to summaries of scientific publications describing the Jebsen Centre research:

1. **Estimating VO2peak from a Non-Exercise Prediction Model; the HUNT Study,**

colleagues at the Jebsen Centre to look at how fitness is related to traditional risk factors, by testing approximately 5000 healthy Norwegians aged 13-90 years.

The researchers found that women's and men's fitness (oxygen uptake) was 35 mL / kg / min and 45 mL / kg / min, respectively. This figure dropped by about 5% for each decade of increasing age for both sexes. For example, women in their 20s had a VO2max on average of 45 mL / kg / min, by the time a woman reaches her 50s, that number was closer to 34 mL / kg / min.

Women and men who had lower fitness (regardless of age) than the average for their gender were respectively 5 and 8 times more likely to have many risk factors for cardiovascular disease compared with those who had fitness values higher than average.

Conditioning a continuous measure of health status
The researchers also found that conditioning seems to reflect a continuous measure of health status, and that just a 5 mL / kg / min decrease in oxygen consumption was associated with an approximately 60% higher chance of having a collection of several risk factors for cardiovascular disease. The study confirms that a person's physical condition is even more important for heart health than previously thought.

The research group is now pursuing the cellular, molecular and genetic causes of good and poor

Norway. Nes BM, Janszky I, Vatten LJ, Nilsen TI, Aspenes ST, Wisløff U.
Med Sci Sports Exerc. 2011 Apr 14. [Epub ahead of print]

2.**Physical Activity as a Long Term Predictor of Peak Oxygen Uptake: The HUNT-Study.**
Aspenes ST, Nauman J, Nilsen TI, Vatten L, Wisløff U.
Med Sci Sports Exerc. 2011 Feb 28. [Epub ahead of print]

3.**Peak oxygen uptake and cardiovascular risk factors in 4,631 healthy women and men.** Aspenes ST, Nilsen TI, Skaug EA, Bertheussen GF, Ellingsen O, Vatten L, Wisløff U.
Med Sci Sports Exerc.

conditioning. Since conditioning has such an effect on an individual's overall health, researchers believe that identifying these factors may lead to new approaches for new and more effective medicines in the treatment of lifestyle diseases such as cardiovascular disease, obesity and diabetes. The researchers believe that based on a single blood sample, it could be possible to design effective exercise program that suits an individual's genetic make-up and that makes it possible to prevent or delay the development of cardiovascular disease.

One workout a week is enough to start

"It could be the same as just writing a prescription for medicine, except in this case it could be number of workouts per week," Wisløff says. "And what is even more encouraging is that our research shows that the workouts don't have to be onerous to have an effect. For people who are in poor shape, just one 15 minute workout per week is enough to make a difference. Even parents with children should be able to manage that."

The key, however, is that that one workout must involve a high intensity session of 4 minutes where the heart is working at up to 90 per cent of its capacity, Wisløff's research has shown. A 10-minute warmup should precede this high-intensity portion of the workout session, and the high-intensity session should also be followed by a 3 minute cool down.

Scientists at the K.G. Jebsen Centre of Exercise in Medicine are currently conducting clinical trials of this

2011 Jan 11. [Epub ahead of print]

approach in many different patient groups. The group was the first in the world to have clearly isolated heart cells from humans and has contributed to the mapping of cellular and molecular characteristics of heart cells from individuals with and without heart failure. This has led to the discovery of new mechanisms behind heart disease. The researchers are now conducting animal studies to examine how altering these mechanisms might reduce the rate of cardiovascular complications in individuals with heart disease.

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More migraines for no apparent reason

(21.03.2011) Migraine rates in a comprehensive Norwegian health study have climbed by 1% in a decade, researchers from the Norwegian University of Science and Technology report.

That may not sound like much, but in the Norwegian context, it means 45,000 more migraine sufferers -- and if the trend were to hold for the European Union, that would be an additional 5 million more people plagued by migraines.

Mystery migraines

The findings, published in the latest issue of Cephalalgia, a medical journal, compare data from a survey conducted in the mid-1990s to data collected in 2006-2008, shows that people aged 20-50 years are more prone to migraines now than in the mid 1990s.

The numbers are derived from the second and third phases of the Nord-Trøndelag Health Study, called HUNT 2 and 3 after their Norwegian acronyms, which represent

HUNT - the Nord-Trøndelag Health Study

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies, along with biological samples from more than 75,000 individuals. Today, HUNT is a database with information about

one of the largest comprehensive health studies in the world. HUNT 2 involved the collection of a health history during 1995-1997 from 74,000 people, with the collection of blood samples from 65,000 people. The follow-up, called HUNT 3, involved 48,289 people, many of whom were represented in the earlier study.

The findings showed that while 12 per cent of the population met the medical criteria for migraine in the HUNT 2 survey, 13 per cent of the HUNT 3 respondents met the migraine criteria.

While that 1 per cent increase "may not sound dramatic, in the context of the population as a whole, that represents an increase of roughly 45 000 Norwegians," says Professor Knut Hagen, one of the NTNU researchers working with the data. "Those are real numbers and give some cause for concern. The increase has also occurred over a relatively short period of time."

Increase greatest in young to middle-aged adults

The increase is most marked in the age group 20-50 years, but is also found in older age groups. Hagen does not have data for people younger than 20.

The most puzzling aspect of the finding is that it has no obvious scientific explanation, Hagen says. Diagnostic criteria were the same in the 1990s as they are today, and the level of self-reported migraine did not increase.

The number of migraines caused by medicines has also not increased between the HUNT 2 and HUNT 3

approximately 120,000 individuals, where family data and individual data can be linked to national health registries.

HUNT includes an associated biobank that stores whole blood and DNA from 200,000 individuals, serum and plasma samples from more than 100,000 individuals, along with RNA tubes, cells, buffy coat, urine and na-heparin tubes for roughly 50,000 people. For more information, visit the HUNT home page.

databases, he said. "This last finding is really good news because the use of pain relievers has risen sharply since these drugs have been available for sale without a prescription in stores," says Hagen.

Not mobile phones

A more likely explanation for the increase of the migraine is change in the external environment, Hagen says.

"From experience we know that visual impacts, such as flickering screens, can trigger migraines. Measurements of the neurophysiological activity in the brain with EEG shows that migraine patients are more susceptible to light stimulation. It is tempting to believe that the increase in migraines is due to the increase in these kinds of stimuli during the 11 years between the two HUNT surveys," Hagen says. "But this is speculation that we have no scientific evidence for."

But Hagen was clear that one possible candidate – radiation from mobile devices – was not a cause of the increase, based on the results of a previous NTNU study, which found no evidence that radiation from mobile phones contributed to an increase in headaches.

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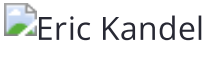
Eric Kandel, Kjetil Trædal Thorsen named honorary doctors

(23.04.2011) Neuroscientist and Nobel laureate Eric R. Kandel and Kjetil Trædal Thorsen, an award-winning architect whose work is featured at the 9/11 Museum Pavilion at Ground Zero in New York City, have been selected by the NTNU board as the university's 2011 honorary doctors.



The awards will be made at the university's annual celebration of its newly minted PhDs on Tuesday, 24 May. This year, the university will award 289 PhDs.

Professor Kandel (born November 7, 1929 in Vienna) is one of the word's most renowned brain researchers and currently works at Columbia University in New York. In 2000 he was awarded the Nobel Prize in Physiology or Medicine together with Paul Greengard and Arvid Carlsson for his discovery of signal substances in the nervous system.

Kandel showed that learning and memory result from

the strengthening and weakening of the contact points between nerve cells, called synapses. This breakthrough in memory research came , early in the 1960s, after Kandel decided to use the sea snail Aplysia Californica to understand the mechanisms of memory. Much of what we know about learning and memory today is rooted in Kandel's research in the 1970s and1980s.

Kjetil Trædal Thorsen (born 14 June 1958 on the Norwegian coastal island of Karmøy) is an Oslo-based architect who is co-founder of Snøhetta, an architetural firm. He and his firm are perhaps best known for their work on the 9/11 Museum Pavilion at Ground Zero in New York, scheduled to open in September, 2012. Their work also includes the new National Opera House in Oslo and the Alexandria, Egypt library , the Seventh Serpentine Gallery Pavillion in London, the Norwegian Embassy in Berlin and an art museum in Lillehammer designed for the Winter Olympics in 1994. He has been previously honoured as a Commander of the Royal Norwegian Order of St Olav.

The company has gained a number of international awards for its projects, including the 2009 European Union Prize for Contemporary Architecture / Mies van der Rohe Award, the European Prize for Public Space and the Global Award for Sustainable Architecture for the

Opera House in Oslo, and in 2010 the Norwegian American Trade Award for their Ground Zero project. In 2011 Snøhetta received the Mario Pani Award.

The university is working with Snøhetta and Thorsen through the FME Research Centre on Zero Emission Buildings (ZEB). Snøhetta is one of the major industrial partners in ZEB, and is strongly focused on research as an integrated part of the company's design development and architectural practice. while Dr. Kandel's connection to NTNU is through the Centre for the Biology of Memory/Kavli Institute for Systems Neuroscience.

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The Norwegian University of Science and Technology, met.no buy new supercomputer

(24.06.2011) The Norwegian University of Science and Technology (NTNU) and Silicon Graphics International Corp (SGI) today signed a contract for a new supercomputer to be installed at NTNU by the end of 2011.

The new machine will be jointly owned by NTNU and the Norwegian Meteorological Institute (met.no), and will be used for research at NTNU and for mumerical weather prediction by met.no. The contract value is 35 MNOK. The new SGI system will deliver more than 10 times the capacity of the university's current high performance computer (HPC), which is called "Njord", after the Norwegian god who is the protector of seafarers and fishermen and who sends favourable winds and calm seas.

The new system

The new system will include the new generation Xeon

Intel processors, and can perform 275 teraflops. This is almost twelve times the capacity of Njord.

Further technical details will be released next week.

Cooperation between met.no and NTNU
NTNU and met.no have worked together for more than 20 years on investments in and operations of HPC systems for research and numerical weather prediction. In 1988 met.no started using the Cray X - MP at NTH (now NTNU) for operational forecasts, and met.no has continued to use the HPC systems at NTNU ever since. The two institutions have decided to name the new system "Vilje," which according to Nordic mythology is what gave humans the ability to reason and to move.

NTNU's HPC goals
As Norway's primary institution for educating the country's engineers and scientists, it is important for NTNU to have a modern system for High Performance Computing. The university's research and educational efforts are designed to serve the needs of society, in particular to maintain Norwegian industrial interests. HPC is also vital to all of the university's Centers of Excellence, which are

- Centre for Biology of Memory (CBM)
- Centre for Quantifiable Quality of Service (Q2S)
- Centre for Ships and Ocean Structures (CeSOS)

Researchers at these centers use HPC for a range of different tasks, such as modelling signaling in the brain,

stress - testing crypto algorithms, and modelling flow in or around pipelines. Researchers at these Centers of Excellence will benefit greatly from the more than 10 - fold increase in computing capability, which will be critical to enabling them to stay competitive at an international level.

This next generation of HPC should be able to simulate atomistic volumes of a size that can be reproduced in laboratories such as NTNU Nanolab. Phenomena detected in the lab can be simulated using the HPC system and vice versa, which will lay the foundation for important scientific breakthroughs.

Met.no's computing goals

The new HPC system from SGI will allow met.no to use fine scale operational atmospheric and oceanographic models with the aim of improving weather forecasting for Norway and the adjacent seas. met.no will be able to run operational atmospheric models with 2.5 km resolution or better. The new machine will also allow the institute to increase the usage of satellite observations in its models.

The SGI system will be essential in the establishment of a ground - breaking production chain for numerical weather prediction jointly operated by met.no and the Swedish Meteorological and Hydrological Institute (SMHI), which will be operational from 2014.

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2011 Student Peace Prize to Roma educator

(26.11.2010) The Croatian student Duško Kostić has been awarded the 2011 Student Peace Prize for his efforts to improve the civil rights of the Roma through education. Kostić, 36, is himself of Roma origin, and is the first European student to receive the prize.

"The achievements of Kostić's work are impressive," says Eirik Vikum, a student at the Norwegian University of Science and Technology (NTNU) and director of the Student Peace Prize Secretariat. The secretariat is linked to the International Student Festival in Trondheim (ISFiT), organized by a coalition of student volunteers from NTNU and other Trondheim educational institutions.

Grassroots effort

In a Roma population that is troubled by high levels of school dropouts, Kostić's grassroots effort has shifted the trend through home visits and close follow-up of both children and parents. Ninety-four percent of the school children taking part in his projects complete primary education, and several have started higher education.

Student Peace Prize 2011

Duško Kostić - 2011 Student Peace Prize winner

Kostić's work is an inspiration to minorities in all of Europe, as well as in Norway, Vikum says. "Kostić is an everyday hero in his local environment. He shows that the struggle for the civil rights of the Roma is not only about fighting racism and discrimination, but also about encouraging role models and spokespersons from within," Vikum says.

Duško Kostić has been elected to the City Council of his hometown of Beli Manastir, which lies on the border of Croatia, Serbia and Hungary. There he represents the local Roma population and has initiatied projects for social change. Through his political work, Kostić strongly contradicts stereotypes.

Roma deserve to be treated with dignity
"This award says two things. It is a protest against a modern Europe that is still failing to treat the Roma with dignity. At the same time it says that change for the Roma must also come from within," says Vikum.

The Roma are a widely discussed ethnic minority that has been subjected to persecution and discrimination for centuries. The Roma continue to be Europe's most vulnerable minority, and recent waves of expulsions in France and Italy indicate that their conditions in Europe are worsening. In March 2010 Croatia was sentenced by the European Court of Human Rights for the segregation of Roma children in schools. Duško Kostić's own education was postponed by the war between Serbia and Croatia, which broke out while he was still in high school.

The Student Peace Prize

For more than a decade the Student Peace Prize has been a way to support students all over the world who are doing important work to promote peace and human rights. The Prize originates from the International Student Festival in Trondheim (ISFiT) and was first awarded in 1999. To this day, six students and student organizations from Burma, East Timor, Zimbabwe, Colombia and Western Sahara have received the prize. Volunteer student representatives from the Norwegian University of Science and Technology (NTNU), Sør-Trøndelag University College (HiST), the Foundation for Student Life in Trondheim (SiT) and the Student Society in Trondheim are active in promoting the festival and administering the Student Peace Prize.

This year's committee consists of four experts; former chairman of the Nobel Peace Prize committee Ole Danbolt Mjøs, news editor Gro Holm, general-secretary of Red Cross Norway Børge Brende and chairman of the Norwegian national commission for UNESCO, Vigdis Lian. Four students on the committee represent the National Union of Students in Norway (NSO), and the committee chairman is Runar Myrnes Balto, president of the Norwegian Students' and Academics' International Assistance Fund (SAIH).

The Student Peace Prize 2011 will be awarded at a peace prize ceremony during the International Student Festival in Trondheim (ISFiT) in February 2011.

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NTNU professor wins Fridtjof Nansen Award

(27.04.2011) The Fridtjof Nansen Award for outstanding research in science and medicine in 2011 has been given to NTNU Professor Odd Magnus Faltinsen, of the Department of Marine Technology, for his work in marine hydrodynamics.

Faltinsen is an expert on the hydrodynamics of high-speed vessels and sloshing dynamics and has published three scholarly texts on these subjects. His work involves the development of theoretical and numerical methods for explaining how ships, high speed vehicles, and offshore structures behave in waves. A method he developed with two other researchers more than 40 years ago on estimating wave-induced movements and loads on ships is still in use today.

The Fridtjof Nansen Award is given annually to two researchers, one for outstanding research in science and medicine, and the other for research the humanities and

The Fridtjof Nansen Award

Fridtjof Nansen is perhaps Norway's most honored and respected explorer, scientist and diplomat. He was awarded the Nobel Peace Prize in 1922 for his extensive humanitarian aid efforts, but is probably best known in Norway for his

social sciences. Each winner is awarded an NOK 150 000 prize, along with a medal and a diploma. An associated award of NOK 50 000 is made to a selected young researcher of the year. All three annual awards are made from the Nansen Fund and six associated funds.

The Nansen Prize can be awarded to Norwegian researchers or to researchers resident in Norway, who have provided scientific contributions of international significance at the very highest level. The prizes will be awarded at the Norwegian Academy of Science and Academy's Annual Meeting on 3 May 2011.

first-ever crossing of the Greenland ice sheet in 1888, and his attempts to let ocean currents carry him to the North Pole by freezing his ship, the Fram, into the Arctic ice pack.

His adventures always had a scientific component -- the Fram expedition, for example, resulted in six volumes of meteorological, biological and oceanographic information and observations. Nansen himself was educated as a neuroscientist, but his subsequent oceanographic expeditions led to his appointment as a professor of

oceanography at the University of Oslo.

The Fridtjof Nansen Fund (in Norwegian) for scientific advances was created with voluntary private contributions in 1897 after the return of the Fram in 1896. In subsequent years, it has been supplemented by 6 other private funds, but the goal of the Nansen Award has always been to recognize internationally significant research.

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Batteries for the future

(21.04.2011) One of the most important decisions facing designers of plug-in electric or hybrid vehicles is related to battery choice. Now, researchers at the Norwegian University of Science and Technology (NTNU) have used a life cycle analysis to examine three vehicle battery types to determine which does the best job of powering the vehicle while causing the least amount of environmental impact during its production.

Their results, published in the latest edition of the scientific journal Environmental Science and Technology, show that on a per-storage basis, the nickel metal hydride (NiMH) battery had the most environmental impact, followed by the nickel cobalt manganese lithium-ion (NCM) and iron phosphate lithium-ion (LFP) batteries for all impacts considered, except ozone depletion potential. The researchers also found higher life cycle global warming emissions than have been previously reported.

The researchers, Guillaume Majeau-Bettez, a PhD candidate in NTNU's Industrial Ecology Programme; Troy

R. Hawkins, a researcher in the programme; and Anders Hammer Strømman, an associate professor in the programme, conducted a life cycle analysis of the three battery types and looked at 11 different types of environmental impacts from their production. These impacts included everything from greenhouse gas emissions to freshwater ecotoxicity, freshwater eutrophication and human toxicity.

The researchers were surprised to find that except for ozone depletion potential, the NiMH battery performed significantly worse than the two Li-ion batteries for all impact categories. The researchers attributed this difference to the greater use phase efficiency of Li-ion relative to NiMH, and the fact that each kilogram of Li-ion battery is expected to store between 2 to 3 times more energy than the other battery types over the course of its lifetime.

"The NCM and LFP batteries contain at least an order of magnitude less nickel and virtually no rare earth metals," the researchers also observed. "Among Li-ion batteries, our analysis points to overall environmental benefits of LFP relative to NCM, which can be explained by a greater lifetime expectancy and the use of less environmentally intensive materials."

For all three batteries, the energy requirements for their manufacture were a major cause of greenhouse gas emissions. One component of the analysis demonstrated the environmental significance of using

polytetrafluoroethylene as dispersant/binder in the electrode paste. Its production was responsible for more than 97% of the ozone depletion potential of all three batteries, along with 14 -15% of the greenhouse gas production from the two Li-ion batteries, mostly due to the halogenated methane emissions. The final shipping and the production of the cell containers, module packaging, separator material, and electrolyte contribute relatively little to causing environmental damage, with collectively less than 10% of any impact category.

The researchers also point out the importance of the choice of the functional unit for the life cycle analysis. While the production of NiMH causes the least greenhouse gas emissions impact per kilogram, its lower energy density makes it score worst both relative to its nominal energy capacity and the researchers' storage-based functional unit. Similarly, the greenhouse gas impacts of LFP and NCM production are roughly equal for a given mass or nominal energy capacity, but the greater life expectancy of LFP confers a net environmental advantage to this type of battery for a per-energy-delivered functional unit.

"A shift from NiMH to Li-ion may thus be viewed positively," the researchers concluded. "Though associated with important uncertainties, our results point to a higher than expected level of environmental impacts for the production and use of traction batteries. This inventory and life cycle analysis provide a basis for

further benchmarking and focused development policies for the industry."

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Mobile phones, not guns, are the best weapons

(04.03.2011) After having studied the media landscape in 137 countries, NTNU professor Indra de Soysa is convinced that enabling open lines of communication, such as mobile phone capability, is the best contribution to ensuring more democracy in the world.

The establishment of Telenor, a Norwegian telecommunications company, in a country where there is a dictatorship will have much more of an effect in promoting democracy, for example, than if the Minister of Development Cooperation, Erik Solheim, has repeated meetings with the dictator, says de Soysa, who is a professor of political science at the university.

As the revolutionary wave in the Middle East and North Africa continues unabated, de Soysa has published an article entitled "The Blog vs. Big Brother" in the scholarly publication the International Journal of Human Rights.

Eyewitness accounts

"TV is especially bad for human rights, because the government can feed propaganda to the population," de

Soysa says. "The Internet and mobile phones have the opposite effect. And social media is different because it gives people free access to a channel of communication."

"In Egypt, Google's marketing manager would have never managed to mobilize so many demonstrations without social media," he adds. "The authorities cannot monitor what people read on the Internet, and society becomes more transparent."

De Soysa points to the many eyewitnesses who have sent pictures from mobile phones to large media organizations such as BBC and CNN. "The authorities can no longer get away with attacking their own people. In Burma the authorities can still shoot a man in the street, and get away with it. But there are beginning to be fewer and fewer countries where that is still the case," he says.

In Africa, mobile phones are spreading like a virus, which also means that Africans will be connected to the world in a completely different way than before. The world is becoming flatter because people communicate horizontally, he said.

Started with Saddam Hussein

De Soysa is the director of NTNU's globalization program. While globalization as a concept has almost become a buzzword, from a historical perspective, it is actually nothing new.

He points out that the British Empire once reigned

supreme, and that there were major waves of immigration to the United States, Latin America and Australia. What is new in this current period of globalization, he says, is information technology. The upshot is that today's youths perceive themselves as citizens of the world, he adds, and no longer believe that old men should dictate how they should live.

De Soysa says the start of the latest wave of revolutionary unrest in the Middle East and North Africa began with the fall of Saddam Hussein in Iraq.

"The human cost was high, and many died. But it was an important symbol that encouraged people in other repressive regimes to believe that it is possible to get rid of a dictator," he says. "I would not say that George Bush should get the Peace Prize, but in retrospect this was a very important event in initiating the change that is now rolling across the Middle East."

The reference for de Soysa's article is: Muoza & de Soysa: The blog versus big brother: new and old information technology and political repression, 1980-2006, *The International Journal of Human Rights*, published online 08 December 2010, doi: 10.1080/13642987.2010.518729.

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The brain's zoom button

(17.11.2011) Everybody knows how to zoom in and out on an online map, to get the level of resolution you need to get you where you want to go. Now researchers have discovered a key mechanism that can act like a zoom button in the brain, by controlling the resolution of the brain's internal maps.

In the November 16 edition of Cell, Lisa Giocomo and colleagues at NTNU's Kavli Institute for Systems Neuroscience describe how they "knocked out", or disabled, ion channels in the grid cells of the brain. Grid cells are equivalent to a longitude and latitude coordinate system in the brain, with the grid cell firing at the cross-point where the longitude and latitude lines meet. This network enables the brain to make internal maps. Ion channels mediate signals between the inside and the outside of the cells.

Changing the brain's resolution

When the researchers knocked out the ion channels, they found that the resolution of the maps created by the brain became coarser, in that the area covered by each

Kavli Institute for Systems Neuroscience/Centre for the Biology of Memory

The scientific goal of the Kavli Institute for Systems Neuroscience is to advance our understanding of neural circuits and systems. By focusing on spatial representation and memory, the investigators hope to uncover general principles of neural network computation in the mammalian cortex.

grid cell was larger.

"If grid cells are similar to a longitude and latitude coordinate system, what determines the distance between the coordinate points of this internal map?" Giocomo asks. "When we knocked out the HCN1 ion channel, the scale of the innate coordinate system increased. It's like losing longitude and latitude lines on a map. Suddenly you can't represent a spatial environment at a very fine scale."

In a normal brain, the ion channels function as they should, and the brain is able to generate the precise resolution for the map that it needs. But if the ion channels don't work – as was the case in the experimental set up – then the map isn't at the right resolution.

Spatial memory and navigation

Future research will aim at determining what effect this might have on spatial memory and navigation. Giocomo says her findings could prove useful for future research on Alzheimer's and related diseases, "particularly because the area that is damaged in Alzheimer's is the area that we are investigating. Also, one of the first things to go wrong with Alzheimer's is that you suddenly start to lose your sense of direction. Of course, we don't know if there is any connection yet, but it might be worth looking into."

The article in Cell is being published simultaneously with

NTNU's Kavli Institute is the only one in the Nordic countries and is one of just four devoted to neuroscience. The other three Kavli Institutes for neuroscience are in the United States, at Yale University, the University of California San Diego and Columbia University.

NTNU's Kavli Institute coexists with the Centre for the Biology of Memory (CBM) but the scope of the Institute is broader and more long-term. CBM is part of the Centre of Excellence scheme of the Research Council of Norway.

For more information, visit the

a companion article in Neuron, authored by researchers at the Kavli Institute for Brain Science, at Columbia University in New York. The two Kavli Institutes decided to work cooperatively on the topic, says Edvard Moser, director of the Kavli Institute at NTNU.

"We believe that this is a great example of collaborative research instead of neck-and-neck competition. We got our knock-out mice from (Eric) Kandel's lab (at Columbia), and they sent a post-doc over here to work with us. We discussed and debated our findings of course, gave each other feedback and input," Moser says.

Linked research data

The collaborative approach enabled the two institutes to publish linked research data from two interconnected areas of the brain, the entorhinal cortex and the hippocampus. Both sets of data show the effect of removing ion channels in grid cells and place cells.

Place cells are thought to base their spatial response based on the calculations of the grid cells, so finding this close correspondence in research results is "very rewarding," Moser says. "It's great that we can find two pieces of evidence that show how scale is represented in our brain, and that we can publish these results at the same time.

Lisa Giocomo and Edvard Moser presented their findings at "Neuroscience 2011," the annual meeting of the Society for Neuroscience, which was held from 12-16 November

research group's main website.

in Washington, DC. The DOI for the paper is: 10.1016/j.cell.2011.08.05.

[Edited June 30, 2020. Updated broken link.]

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Crafts, churches and charcoal

(11.04.2011) Norway's more than 1,000 year-old-city and historical capital, Trondheim, was a beehive of activity in medieval times. Recent archeological research in the city's popular public forest, "Bymarka", has uncovered more than 500 charcoal pits, tell-tale signs of substantial medieval metal working activity.

For centuries, Trondheim – or Nidaros as it was then called – was home to the Archdiocese of Norway, and also for the Faeroe Islands, the Orkney Islands, the Isle of Man, Iceland and Greenland. Nidaros Cathedral, the city's gothic cathedral, held reliquaries from St. Olaf and thus attracted thousands of pilgrims.

And the cathedral was not the only church in town. While just two of the many churches erected in the town center in medieval times still stand, 25 stone churches were built

Museum

NTNU's Museum of Natural History and Archaeology was selected as Norway's Museum of the Year in 2010. The museum develops and operates a number of Norway's oldest and largest natural and cultural history collections.

during the Middle Ages in the countryside around Trondheim.

"This charcoal production is most probably directly linked to major historic events and processes occurring in central Norway at the beginning of the Middle Ages. One obvious explanation is the Church's impact on economic growth and production as well as its demand for building materials," explains archeologist Ragnhild Berge a PhD candidate, based at the Museum of Natural History and Archaeology, a unit of the Norwegian University of Science and Technology (NTNU) in Trondheim.

Weapons, wars, and urbanization

Civil wars were common in central Norway during the 12th century, which likely drove a demand for weapons. This in turn would have resulted in increased iron smelting and metal forging during the period. Excavations in the medieval parts of Trondheim have found large areas used for metal refining dating from the end of the 12th century to the middle of the 14th century.

"It can't be a coincidence that the charcoal production in Trondheim coincides with periods of great economic growth, mobilization and power struggles and also with increasing craft and trading activities. Urbanization and the creation of new governing entities in Norwegian medieval society, along with the founding of the archdiocese in 1152-1153, all created an environment that attracted power and resources, thus stimulating both local and regional production," says Berge. "The many types of metal working and craft production which

took place in the town centre will have driven a huge demand for charcoal as fuel."

"But still – it did surprise us that most of the traces of use at Bymarka are from the production of charcoal. We also found a furnace used for the production of iron during the Viking Age. Charcoal and iron are products usually associated with rural wooded and mountainous areas. What we had expected to find was evidence of agriculture," Berge said.

Two-thousand-year-old fields

"Until quite recently, most towns had pastures and areas for agricultural purposes close by, to ensure a stable supply of dairy products and other agricultural goods. So finding five hundred charcoal pits in this area was quite a surprise," Berge explains.

"It's unlikely that you could produce charcoal and have agricultural activity in the same areas. The assumption has been that residents imported charcoal from more rural areas."

Another new find was that the area had first been settled much earlier than previously believed. "It had been assumed that Bymarka was settled from the Middle Ages, but we found agricultural traces dating back to the Merovingian period of 600-700 B.C. We also found traces of fields being worked about two thousand years ago."

Unparalleled, but perhaps not unique

The many building endeavors in Nidaros needed

materials, which would explain the prevalence of the charcoal pits.

But Berge is reluctant to say that the large number of pit remains are unique to Trondheim: "While our finds of charcoal pits at Bymarka in Trondheim are essentially unparalleled in Scandinavia, the primary reason is most probably the lack of archaeological excavations in the outskirts of other cities."
Bymarka today is protected from development, and is a recreational area for the residents of Trondheim and habitat for wildlife.

"One of the reasons the research in Trondheim is so unique is that few Scandinavian cities have preserved areas of the medieval surrounding countryside to the same extent as Trondheim – meaning that traces of these types of activities are likely to have been erased," Berge notes.

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Heart attack deaths decrease

(18.03.2011) Life was hard in occupied Norway during WWII, but the occupation had one surprising result: deaths from heart attacks dropped precipitously, because Norwegians ate less fat, smoked less and were more physically active.

Now, in the last half of the 20th century, Norway has seen a similar precipitous drop in heart attack deaths, but this time due to focused prevention programmes and improved treatment, reports a researcher at the Norwegian University of Science and Technology (NTNU).

Writing in the latest issue of the Journal of the Norwegian Medical Association, NTNU Professor Kaare Harald Bønaa notes that the percentage of deaths due to heart disease and cardiovascular disease dropped from 50 per cent in 1975 to 33 per cent in 2009 in Norway, and that deaths from heart attacks alone dropped to levels that were last seen during WWII. Bønaa is a professor of heart and cardiovascular disease epidemiology at NTNU, and is chief physician in charge in intervention cardiology at St Olavs Hospital in Trondheim.

Risk factors down, treatment improved

"Overall, there is solid evidence that the decline in mortality from heart attacks is due to changes in risk factors and treatment," Bønaa writes.

There are many reasons that explain the numbers, Bønaa says. Reductions in cholesterol levels, smoking and high blood pressure can explain between 50 and 75 percent of the reduced mortality, he says. The remainder is explained by better medical treatment, where drugs have had the greatest impact, whether statins, beta blockers or other medicines.

Bønaa believes changes in cholesterol levels and smoking habits have contributed significantly to reducing the Norwegian heart attack epidemic. "From the 1970s, cholesterol levels have been reduced by about 10 percent, while the proportion of smokers has been halved," he says.

More women die

But Bønaa warns that the battle against heart disease has not been won. In one study in Tromsø, in northern Norway, the incidence of a first time heart attack in young- and middle-aged women actually increased over the period from 1974 to 2004, while in the same age groups of men, it decreased.

Another surprising trend in Norway is that more women than men in the 16-74 age group smoke, which has resulted in an increased incidence of lung cancer and

COPD in this age group of women, as well as an increase in heart attack risks.

Increases elsewhere, and an ageing populace

Elsewhere, lesser developed countries are actually seeing a massive increase in cardiovascular disease, while in Norway, the reduction in risk has leveled off, and 70 percent of the population still has cholesterol levels that are too high.

And, Bønaa adds, as the Norwegian population ages, the medical community must anticipate an increased number of heart attacks in the older segments of the population and an increasing number of patients with chronic heart disease.

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World premiere performance by Anne-Sophie Mutter

(04.10.2011) The internationally renowned violin virtuoso Anne-Sophie Mutter and the composer and pianist André Previn have an artistic partnership that spans nearly a decade. Now, Previn is at work on a new composition for Mutter and the Trondheim Soloists, which will have its world premiere at the Trondheim Chamber Music Festival in Norway on 23 September 2012.

In 2010, Mutter was awarded the Doctor Honoris Causa

by NTNU in recognition of her long standing relationship with the Trondheim Soloists and the university. The award was especially significant because it was made on the occasion of the university's centennial celebration.

"Anne Sophie Mutter is a terrific ambassador for all of the values that NTNU stands for: international excellence, global reach, top quality and engagement in the world," said Torbjørn Digernes, NTNU Rector. "I look forward to welcoming her to Trondheim, and to actually giving her the honorary doctorate that she was awarded last year during our centennial celebration."

The composition being written by Previn has been commissioned by the Trondheim Chamber Music Festival and the Trondheim Soloists, in cooperation with NTNU. Tickets for the world premiere are now on sale.

Both Mutter and Previn have a special relationship with Trondheim and Norway. Mutter has worked with the Trondheim Soloists for a number of years, with their joint recording of Vivaldi's Four Seasons with Deutsche Grammophon in 1999 garnering international recognition, including the Amadeus Music Award 2000 and Golden Harmony Award 2000. The Trondheim Soloists and Mutter also released a recording of Bach violin concertos in 2008 and have toured together internationally.

Previn's career as a pianist, composer and conductor spans nearly seven decades, and his work with Mutter

has won widespread praise. He served as director of the Oslo Philharmonic Orchestra (the Oslo Filharmonie) from 2002-2006 and has previously written four world premiere works specifically for Mutter. Previn's work has won several Grammy awards for recordings, including the CD of his violin concerto "Anne-Sophie" and Bernstein's Serenade featuring Mutter together with the Boston and London Symphony orchestras.

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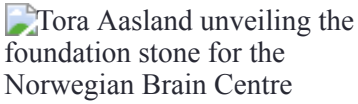
Minister of Research promises continued funding


Tora Aasland unveiling the foundation stone for the Norwegian Brain Centre

(10.01.2011) **NTNU has pledged NOK 42 million to further research on understanding how the brain works. The Minister of Research and Higher Education, Tora Aasland, today laid the foundation stone for the Norwegian Brain Centre (NorBC).**

The new centre for brain research may become the world's largest laboratory for the measurement of electrical activity in large groups of brain cells called neural networks. The centre will continue NTNU's long-term commitment to brain research, with the Kavli Institute for Systems Neuroscience (KI) / Centre for the Biology of Memory (CBM) in the forefront.

As well as conducting research, the Norwegian Brain Centre will host PhD candidates and researchers from Norway and abroad who need training in the latest

technology focused on the brain. The centre will both accommodate and develop the best technology for studying networks in the brain. One of the newest methods, which is under rapid development, involves using virus-based techniques to switch activity in specific neurons on and off, as well as new technology for measuring microscopic signals in the cells.

"With well over 4000 m^2, our facilites will be almost ten times large than they are now, and the standard will be upgraded. Now we are creating a centre that will cover a wide range of methodological approaches to understanding how the networks of the brain function: everything from theoretical studies in physics to microscopic studies of connections between neurons and imaging studies of the brain in action. The brain is such a complex puzzle that many approaches are needed to crack the code."

The Ministry will safeguard future development
The Minister, Tora Aasland, praised NTNU for giving priority to its brain research environment.

"I am delighted to inform you that the Ministry has decided to ensure stable and favourable conditions for this outstanding research community in the years ahead. We want to be involved in making sure that this centre is developed further," she added.

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Antibiotics use in babies may increase childhood asthma risks

(26.01.2011) When babies are given antibiotics, their risk of developing asthma by age 6 may increase by as much as50 percent.

The relationship between antibiotic use in babies less than six months old and risk of developing asthma has been clearly documented in a study conducted by Norwegian University of Science and Technology (NTNU) researcher Kari Risnes.

The research was conducted while Risnes was a visiting researcher at Yale University, and the recent online publication of the article in the American Journal of Epidemiology has received considerable attention in the United States.

“Asthma is a very common disease. At the same time, about one-third of infants in our study were treated with antibiotics by the time they were six months old. This proportion is about 30 per cent in other Western countries,” says Risnes.

The Yale study followed 1400 children and mothers from the beginning of pregnancy until the children were six years old. “We found that the risk that children would have asthma as six year olds was 50 per cent higher when they had been given antibiotics as a baby. That is a significant increase,” she says.

While previous research has suggested an association between asthma and antibiotics, those studies may have been biased because antibiotics are used to treat respiratory tract infections that could themselves be early symptoms of asthma.

The study sought to eliminate this bias by excluding children who were treated for respiratory infections from the study. The study also considered a long list of other risk factors - such as whether or not the mother, father or a sibling had asthma. That aspect also brought a surprise, Risnes said.

“We actually found that the relationship between antibiotic use in the first six months of life and asthma was particularly strong in children from families without a history of asthma,” said Risnes. “What we think is that antibiotics interfere with the beneficial bacteria found in the gut. These bacteria aid in helping the baby's immune system to mature. When the bacteria are affected, it can cause the child to have an "immature" immune system, which in turn leads to allergic reactions,” says Risnes.

She believes that the results should remind doctors and policymakers of the consequences of overuse of

antibiotics. While in Norway, for example, the policy is to limit the prescription of antibiotics, “this is an additional reminder to doctors and parents that we should avoid unnecessary use whenever possible,” she said.

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Secrets in stone

(31.01.2011) It looked to be a routine excavation of what was thought to be a burial mound. But beneath the mound, archaeologists from the Norwegian University of Science and Technology's Museum of Natural History and Archaeology found something more: unusual Bronze Age petroglyphs. "We believe these are very special in a Norwegian context," says museum researcher and project manager Anne Haug.

The excavation in Stjørdal, just north of Trondheim, was necessitated by the expansion of a gravel pit. Given that project archaeologists didn't anticipate that the dig would be very complicated, the museum researchers dedicated just three weeks to the effort.

Petroglyphs under a cremation site

Then came the surprises. First, it turned out that mound builders had used an existing hill as a starting point - which of course saved them time and effort. The hill itself made the burial mound even larger and more monumental than it might have otherwise been.

But researchers suspected there might be another reason for the choice of the hilltop when they uncovered the remains of two cremations, or rather a fire layer that also contained bits of bone. Underneath they found many petroglyphs, including eight drawings showing the soles of feet, with cross hatching. There were also five shallow depressions, Haug says.

Two boat drawings and several other drawings of feet soles with toes were also found just south of the burial mound.

LInk between burial mound and drawings unclear

“This is a very special discovery, and we are not aware of other similar findings from Trøndelag County,” she says. “The tomb might have been deliberately constructed over the petroglyphs, probably as part of funeral ritual. Based on the type of characters and especially the drawings of the foot soles, we have dated the artwork to the Bronze Age, about 1800 - 500 BC.”

“Why there are foot sole drawings beneath the tomb is a puzzle. But if we interpret the find in terms of a fertility cult, it may be that the soles represent God and life-giving power. That means that you can have both life and death represented in one place,” she says.

Unique in a Norwegian context

Haug says that there was a similar discovery in Østlandet, an area called Jong in Bærum, where petroglyphs illustrating foot soles were found under a tomb that

dates back to the Bronze Age. In a Nordic context, this phenomenon is more common, and there are several examples where burials were combined with rock art, particularly petroglyphs of foot soles from Bohuslän, a World Heritage site in Sweden.

It's not yet clear if the grave was put in place the same time as the petroglyphs, Haug says. The dig began in September, 2010 and extended through the end of October, but the analysis is ongoing.

The scientists have found about 900 grams of burned bone, probably from one or more individuals; they hope to be able to carry out C-14 dating of the material and conduct more analyses so they can determine more about the gender and the age of the individuals in the grave.

"Currently, we have found several human teeth, as well as what may be remains of human ribs. We also found an animal tooth that suggests that one or more animals may have been laid in the tomb along with whoever is buried there," she says. There were very few objects found in the tomb, but a flat corroded metal object was found in the burnt layer. It's hard to say what this was, but the object will be X-rayed for analysis.

Remains of a larger burial ground?
It is unclear whether the original burial site contained two grave mounds, or whether there was just one large burial area.

A burial ground in the area was first described in 1818 by Lorentz D. Klüwer, and archaeologist Karl Rygh also described the site in 1879. It is likely that the graves that have been excavated in the most recent dig are the last remains of this burial ground.

The rock art found at the site is a type called South Scandinadivan agriculture carving and is dated to the Bronze Age, from 1800 - 500 BC. The tomb probably dates to the transition between the Bronze Age and Iron Age, from 500 BC up to the year 0.

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Mercury mystery in the Arctic

(31.01.2011) More mercury is deposited in the Arctic than anywhere else on the planet. NTNU researchers think one explanation for this may lie in the meteorological conditions in the Arctic spring and summer.

The concentration of mercury in humans and animals that live in polar regions is on the increase. Polar bears and humans that eat marine mammals are the most affected. But why is there more mercury in the Arctic than elsewhere?

Scientists have been puzzling over this question since the beginning of the 1990s. Their first breakthrough came when it was discovered that under certain meteorological conditions, mercury from the air is deposited on the snow and ice in polar areas. The phenomenon occurs when the sun rises over the horizon in the spring, after a long polar night.

Now new research from NTNU PhD candidate Anne Steen Orderdalen and Professor Torunn Berg at the Department of Chemistry and the Norwegian Institute for Air Research (NILU) shows that this process also occurs in

Understanding the Arctic

NTNU researchers have a series of projects designed to investigate the mysteries of the Arctic, from polar bear health to the fate and transport of mercury. For information about polar bear research, contact Bjørn Munro Jenssen, and for information about mercury research, contact Torunn Berg.

the summer as well as in the spring. In a series of publications, the researchers have documented the types of mercury found over the Arctic and are tracking its fate and transport. Essentially, far more mercury is deposited in the Arctic than initially thought, which may be due to the extended time period during which it can be transformed and deposited. Scientists still don't know exactly why and how the process occurs. But sunlight appears to be an important factor.

A dangerous transformation

Most of the anthropogenic mercury emissions come from industry. However, natural sources such as erosion and volcanic eruptions also contribute to atmospheric mercury. All the air around us contains gaseous mercury that is not that reactive and thus not harmful, either to animals or to humans, at normal concentrations.

Concentrations worldwide are fairly similar. But it appears that a reaction between sea salt, sunlight and atmospheric mercury transforms the less hazardous gaseous mercury in the air into more reactive mercury. When this more reactive type of mercury is deposited on the ground, it can be converted into toxic methylmercury - which then can poison the entire food chain.

Accumulates in the food chain

When mercury enters the food chain, it is taken up by microorganisms, and then by ever larger organisms. Marine mammals, polar bears and humans are the top of the food chain in the Arctic, and thus are subject to the

most contamination, because the farther up the food chain you go, the higher the concentration of mercury becomes.

Mercury is stored in the body and there is much evidence that the contaminant damages the nervous system. Mercury can also have a serious effect animal health, but also threatens people who largely live off marine mammals. Some studies of children in the Faeroe Islands have shown learning disabilities which are suspected to be linked to high mercury concentrations in the food that they eat.

Long-term air measurements

The discovery may help to explain the high levels of mercury found in marine mammals and polar bears, because the mechanism would enable significant amounts of mercury to be carried into the ocean during snowmelt. In addition, climate change can play a role.

The findings are based on air measurements at Svalbard, where a series of field studies have been undertaken at the air station in Ny-Ålesund on Svalbard. The measurement station records the concentration of mercury and other substances continuously throughout the year. Only Canadians have a longer record of mercury measurements than those that are available from the station in Ny-Ålesund.

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Earthquake in Japan

(16:30, 15 March, 2011)

Rector halts travel to Japan

NTNU has instituted a stop to all trips to Japan, and is recalling all staff and students who are already in the country.

Torbjørn Digernes, NTNU's rector, made the decision Tuesday afternoon. The decision is in line with the latest advice from the Norwegian Ministry of Foreign Affairs, which has advised Norwegian citizens not to travel to or stay in Japan. Norwegian citizens who are currently in Japan are encouraged to follow the advice of local authorities and look for updated information on the website for the Norwegian Embassy in Tokyo.

The actions are a result of the continuing unsettled situation at nuclear power plants that were damaged by the recent earthquake and tsunami in Japan.

The rector said that exemptions to the ban would be handled on a case-by-case basis if there are compelling

reasons for NTNU students or staff to travel to Japan,.

NTNU has an agreement for travel booking with VIA Travel, which has been alerted to the situation and is ready to handle bookings for NTNU students and staff. Customers who want assistance with travel out of Japan should contact VIA Travel as soon as possible. To avoid long waits for booking the company recommends that people should phone during Norwegian daytime hours, but the agency also has a 24-hour service that can be reached outside of normal working hours.

(21:00, 12 March, 2011)

All from NTNU confirmed safe after the tsunami

All NTNU students and staff presently staying in the Pacific Rim area are reportedly in good condition after the earthquake in Japan and the ensuing tsunami.

Contact was finally made on Saturday with the last of the four NTNU students studying in Japan. He was found to be on holiday in Vietnam. Another of the NTNU students is presently at home in Norway. The last two are to be found in the earthquake-stricken country, but have reported they too are doing well.

The same can be said of the 31 NTNU employees participating in the Kyoto International Forum for Environment and Energy (KIFEE). Kyoto was little affected

by the earthquake. Many in the NTNU KIFEE delegation are from the Faculty of Science and Technology (NT).

All reported in good condition

In all, NTNU has registered that 382 students and 40 employees currently reside in the Pacific Rim area. According to emergency response team at NTNU, the university has worked intensively these last days to achieve either direct contact, or to confirm through other sources that all are in good condition.

Assistance from NTNU

Should students or employees in the Pacific Rim area desire assistance from NTNU, the university can be contacted at + 27 47918978. NTNU's emergency contact number is + 47 800 80 388.

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(18:15, 11.03.2011)

Message to all staff and students in the Pacific area

NTNU sends the following message to students and staff in the areas that are, or may be, affected by the tsunami.

This applies to the tsunami alert that has gone out to the area in which you are staying. We ask that you keep yourself informed about the situation with the

information and counsel from local authorities, the Norwegian Embassy, and the Norwegian Ministry of Foreign Affairs (MFA) — and that you act in accordance with the information you are provided.

General assistance

Contact the Norwegian Foreign Service mission that serves the country where you are for assistance, information and legal help. Websites by country: Norwegian Foreign Service missions

Emergency assistance

The Ministry of Foreign Affairs' emergency telephone service (open 24 hrs): + 47 22 24 36 00.

Questions

Anyone who has questions regarding the earthquake / tsunami can also call the Foreign Ministry's public service telephone: 47 23 95 23 95

Other assistance

The Norwegian Seaman's Church is NTNU's acting representative on site and can be contacted for assistance and psychosocial services. They can be reached at + 47 951 19 181.

If there is something NTNU can assist with, please let us know. Contact NTNU at + 47 918 978 27.
NTNU's emergency telephone contact number: + 47 800

80 388.

Contact your relatives

We also ask that you please get in touch with your relatives at home.

A dedicated response team at NTNU is following the situation closely.

—

(13:00, 11.03.2011)

Seminar delegation is safe

The 31 NTNU employees attending the KIFEE seminar in Kyoto, have reported that they are have not been affected by Japan's earthquake and are well. Currently, NTNU has four registered students in Japan. One is at home in Norway, and two have reported that they are doing well. As of yet, there has been no contact with the fourth student.

A tsunami warning has been issued for much of the Pacific Rim, and NTNU is also working to obtain an overview of staff and students in the affected areas.

The Norwegian Foreign Office has established a dedicated phone number for relatives. That number is 23 95 23 95; their website is www.utenriksdepartementet.no. Additional updates concerning the situation are continuously available via traditional media

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Saving soldiers' lives with Norwegian technology

(03.05.2011) What at first glance looks like a road grader is actually a sophisticated piece of equipment that is saving the lives of U.S. soldiers in Afghanistan by detecting roadside bombs and land mines.

Now 3d-Radar, which grew out of a PhD dissertation at the Norwegian University of Science and Technology (NTNU), has been nominated for a prestigious Norwegian technology award. When Egil Eide, CEO of 3d-Radar, and associate professor II at the university, wrote his PhD dissertation at NTNU on the radar a decade ago, there was almost immediate international interest in the technology, he says.

In addition to detecting land mines, the radar can also be used for archaeological excavations, road work or to find

pipelines. The company was first spun off from NTNU in 2001, and the marketplace for the technology is rapidly expanding.

Since 2007, the company's turnover has grown nearly seven-fold, while employee numbers have quadrupled. Last year, the company sold NOK 34 million worth of equipment. In 2008 3d-Radar was purchased by the American firm Curtiss-Wright, a company that has its roots in the Wright Brothers and their historic first aeroplane from 1908.

Earlier this year, the company was given the 2010 Innovation of the Year award by the Trøndelag office of the Confederation of Norwegian Enterprises (NHO Trøndelag) and was short-listed for the Technoport Applied Technology Award, which will be given out at the Technoport ceremony on 10 May.

Technoport is an association of Norwegian businesses and research institutions that is committed to sharing knowledge and technologies to help in the transition towards a green economy. The Technoport Awards are designed to recognize the outstanding achievements of those who are blazing a new trail in technology.

3d-Radar maintains its research offices in Trondheim, and Eide continues to work on developing the technology. "I have never gotten too big to stop playing in the sandbox," he says. "This is where we conduct part

of our research. We have a technological advantage against our competitors that we intend to keep."

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World's first university with indoor navigation app

(31.08.2011) Imagine a navigation system that works where GPS signals don't. With its new "Campus Guide", the Norwegian University of Science and Technology (NTNU) is now the first university in the world where you can navigate from inside a building using a mobile phone.

Both students and visitors often get lost on the university's Gløshaugen campus, which at 350,000 m2 is the size of a small town. But now, a beta version of the university's innovative "Campus Guide" will show people where to go and how to get there. The service will go live on 31 August and will be available free for iPhone and Android users, and on the Web.

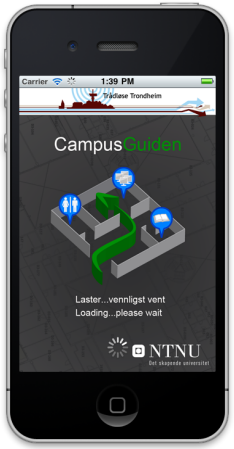
These types of indoor location-based services are expected to command a large market globally, because of the rapid spread of smart phones and wireless networks.

Find your way indoors, too

What's special about this new advanced app is that it serves as a guide both outside and in. The system can

locate your indoor position with an accuracy of up to 5-10 metres using NTNU's well-developed Wi-Fi network, which has more than 1,800 wireless routers. The system uses standard GPS positioning when the user is outdoors, which provides approximately the same precision as the indoor system.

Both visitors and regulars at NTNU need help now and then to find their way on the Gloshaugen campus, which consists of nearly 60 buildings and a total of 13,000 rooms, and covers an area of about 350,000 m^2. That's more than twice the size of the terminal building at Gardermoen, the Oslo Airport.



Began as a student project

With a smart phone, a tablet or a laptop, you can use the Campus Guide to find auditoriums, meeting rooms, cafeterias - or the nearest toilet. The service shows you the way to the right building, floor and room inside the building. You also have the opportunity to add your own locations or content that you think should be included.

The Campus Guide is the result of a research and development project conducted by Wireless Trondheim AS and NTNU. It began as a student project at the Department of Computer and Information Science in 2008. The application has been further developed by Wireless Trondheim AS and NTNU since then.

Puts the user in the driver's seat

"We have been working systematically with user testing of the Campus Guide in all phases of the project right from the start. This process is called ‘user-driven innovation'," says NTNU Professor John Krogstie, who is also head of the Wireless Trondheim Living Lab.

The app is still under development, but the service is now good enough that it is being released for users to try out. This means in essence that everyone who wants to can use the app.

Will commercialize the approach

GPS services sell on the global marketplace for billions. However, GPS signals do not penetrate ceiling and walls, which creates a bottleneck, since 70-80 per cent of all mobile phone use takes place indoors. Indoor navigation is thus predicted to have great potential, but so far, these kinds of services have only been tested in a few places.

"In recent years, the sales of smart phones have gone through the roof, and NTNU is not the only university with large and complex building structures. With the Campus Guide, you have the key to the campus in your pocket. We are convinced that users will use smart phones to find locations at other universities, major shopping centres, hospitals and exhibition halls," says Thomas Jelle, who is managing director of Wireless Trondheim.

The creation of Wireless Trondheim in 2006 ensured that Trondheim was one of the first cities in Europe with widely available high-speed wireless broadband. Now wireless and mobile broadband services are becoming widely available everywhere. The next step in this evolution is to offer services such as the Campus Guide, Jelle says

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Cultural activities are good for you

(24.05.2011) Does going to the theatre make you feel good? Or perhaps you love to volunteer in creating exhibits and displays for the local library? A new study shows that participating in different cultural activities – whether in schools, at church, or in the community at large -- is more than just good for your friends and neighbours – it is also good for your health.

Researchers from the Norwegian University of Science and Technology (NTNU) analysed information about participation in cultural activities and health from a population-based study called HUNT that involved more than 50 000 participants from 2006-2008. The analysis -- conducted by Koenraad Cuypers, Steinar Krokstad, Turid Lingaas Holmen, Margunn Skjei Knudtsen, Lars Olov Bygren and Jostein Holmen, showed a surprising link between participation in different kinds of community

HUNT - the Nord-Trøndelag Health Study

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies, along with biological samples from more than 75,000 individuals. Today, HUNT is a database with information about

cultural activities and good health.

"Take two theatre tickets and call me in the morning"
In fact, being involved in either receptive cultural activities (such as attending a theatre performance or viewing an art show) or creative culture activities (where participants themselves are active in the creative process) was found to be related not only to good health, but to satisfaction with life, and low levels of anxiety and depression.

"Up to now physical activity has been recognized as a measure that promotes good health. But our study shows that other daily life activities may promote good health from a holistic point of view," the NTNU researchers said. "The results suggest that the use of cultural activities in health promotion and health care may be justified."

Intriguing gender differences
The findings also showed a number of interesting differences between men and women in terms of health benefits:

- Men seemed to get more of a perceived health benefit from being involved in different receptive cultural activities than women did. However, participation in different creative and receptive cultural activities was associated with good satisfaction with life, low anxiety and low depression in both genders. Researchers also found dose-response association – the more activities, the better a person felt.

approximately 120,000 individuals, where family data and individual data can be linked to national health registries.

HUNT includes an associated biobank that stores whole blood and DNA from 200,000 individuals, serum and plasma samples from more than 100,000 individuals, along with RNA tubes, cells, buffy coat, urine and na-heparin tubes for roughly 50,000 people. For more information, visit the HUNT home page.

- Participation in creative cultural activities was more strongly related to good health than participation in receptive cultural activities, while participation in receptive cultural activities was more likely to be linked with satisfaction with life, low anxiety and low depression than participation in creative cultural activities in both genders. This trend was also stronger in men than in women.
- In both genders, more people participated in creative rather than in receptive cultural activities.
- The frequency of participation along with the number of activities increased to the age of 50 and then began to decrease.
- A person's frequency of participation in cultural activities, along with the number of different activities, was also related to socio-economic status, with the variety of activities and overall number increasing with socio-economic status.

50797 participants

The HUNT study involved 50 797 adult participants from Nord-Trøndelag County, Norway who were queried about different aspects of their lifestyles and health. The researchers' findings will be published in the upcoming issue of Journal of Epidemiology and Community Health.

The study is entitled: "Patterns of receptive and creative cultural activities and their association with perceived health, anxiety, depression and satisfaction with life among adults: the HUNT study, Norway." Koenraad Cuypers, Steinar Krokstad, Turid Lingaas Holmen,

Margunn Skjei Knudtsen, Lars Olov Bygren, and Jostein Holmen. Journal of Epidemiology and Community Health, 2011, DOI: 10.1136/jech.2010.113571

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Spatial mapping brings Louis-Jeantet Prize for Medicine to NTNU

(25.01.2010) NTNU neurobiologists and researchers Edvard and May-Britt Moser have been awarded the 2011 Louis-Jeantet Prize for Medicine for their pioneering work in the discovery of "grid cells" in the brain. The award recognizes the Mosers, director and co director of NTNU's Kavli Institute for Systems Neuroscience, along with a German biologist, Stefan Jentsch, a director at the Max-Planck Institute of Biochemistry.

The CHF 700 000 prize, awarded by the Louis-Jeantet Foundation to the Mosers, is intended to highlight the work of researchers whose efforts in fundamental aspects of biology are expected to be of considerable significance for medicine.

Edvard and May-Britt Moser are deeply grateful for the recognition of their work. "A large team of researchers has worked with us in revealing the biological foundation of spatial mapping in the brain, and every one of them deserves a piece of this acknowledgement. We are also very grateful for the prize money, which will give us the

Edvard and May-Britt Moser: A journey into entorhinal cortex

Moser

Moser

Edvard and May-Britt

opportunity to embark on ambitious research projects for which it is hard to find regular funding," the Mosers said.

Torbjørn Digernes, NTNU's Rector, congratulated the professors and said he was very proud of the research team. "May-Britt and Edvard Moser are brilliant and dedicated scientists that repeatedly put Trondheim on the map of great science," Digernes said.

The Mosers were selected for the 2011 Louis-Jeantet Prize for Medicine for their 2005 discovery of “grid cells”, neurons that have a specific function in spatial representation. These cells enable mammals to know their precise spatial location and to move from one place to another.

For the last ten years, the two Norwegian researchers have been studying how the brain builds a map that allows rats – and likely other mammals including humans– to know their spatial location. The discovery of the location of grid cells in the entorhinal cortex of rodents suggests that this part of the brain is a crossroads in the cerebral network that enables mammals to find their way.

The Mosers will use their prize money to continue their pursuit of the secrets of the brain’s map-making capabilities. Their specific focus will be on how grid cells interact with other cells in the entorhinal cortex and hippocampus that contribute to spatial navigation and memory.

Moser.

For further information contact:

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Chick Corea selected for honorary doctorate

(27.10.2010) The world-renowned jazz musician Chick Corea will be appointed an honorary doctor at NTNU. The appointment will take place when he plays a concert with the Trondheim Jazz Orchestra in Trondheim on 28 October.

Chick Corea first began performing with the Trondheim Jazz Orchestra at the Molde Jazz Festival in 2000, when they held what has been described as the "miracle concert."

At that time, all of the musicians in the Trondheim Jazz Orchestra were students in NTNU's jazz programme. The Molde concert was followed by a Norwegian tour and the release of a CD, which garnered rave international reviews.

In 2006, the Trondheim Jazz Orchestra was invited to play in New York and Tokyo with Corea. This collaboration has helped bring recognition to NTNU's jazz programme and has helped in its development.

Corea's choice as an honorary doctor is a visible symbol of the university as diverse creative place, where arts and humanities are prized alongside engineering, the natural and physical sciences and other academic endeavours.

Three of NTNU's 32 honorary doctorates to date have been awarded to performers: violinist Anne-Sophie Mutter, actress Liv Ullmann and Arve Tellefsen. The majority of the other honorary PhDs have come from technological and scientific disciplines, which is NTNU's main focus area.

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Smartphone technology improves prosthetic limbs

(13.12.2010) Losing a limb can be a devastating experience, and while electrically powered prostheses can serve as a replacement for a lost arm, they are notoriously difficult to operate, and will never fully replace normal hand function.

NTNU researchers are working to improve this situation through the use of smartphone technology. The technology, called an accelerometer, gives users a better sense of the orientation of their artificial limb – thus making the limb easier to operate.

A helping hand

An accelerometer is a tool for detecting changes in gravity or velocity, and enables a device to determine its orientation. Accelerometers are relatively inexpensive, and are widely used in everything from video consoles to smartphones. The accelerometer in your smartphone helps it determine whether you want to look at a photograph in a portrait or landscape format, for example.

Øyvind Stavdahl, an associate professor at NTNU's Department of Engineering Cybernetics and Anders Fougner, a PhD candidate in the department, have shown that when an accelerometer is used in a

prosthetic arm, it is easier for the user to recognize exactly how the arm is oriented in space.

“Prostheses are driven by the remaining muscles in the severed limb. Sometimes, however, the prosthesis receives atypical signals from the muscles, which can confuse the system and lead to the prosthesis performing the wrong movement,” Stavdahl says. “Knowing the orientation of the arm is essential for normal prosthetic function. It simply makes it a lot easier to operate.”

Problems at Home

Since the first electrically powered prostheses appeared in the 1940s, there have been huge technological advancements in the field. Despite this, modern upper limb prostheses share the same basic structure as their 1940s forbears, with a mechanical hand that can grasp. Sometimes the arm includes a rotating wrist.

An amputee operates his or her prosthesis by moving a muscle, which then sends out a kind of electrical signal. Electrodes placed on the surface of the skin detect these “myoelectric” signals and convert them to movement using a microprocessor and motor. Activating specific groups of muscles will lead to specific movements, such as opening or closing the hand, or rotating the wrist.

“Mastering these hand movements require a lot of practice,” says Fougner. In fact, Stavdahl and Fougner’s research has shown that without any training, the user’s prosthesis will make the wrong move around 30 per cent of the time.

Hence, amputees are usually offered extensive training in a clinical setting, but when they return home, they start running into problems.

“A simple task, like picking up a cup of tea, might prove difficult”, says Stavdahl. “If you try to do this when the arm is in an awkward position, that is, a position that you haven’t practiced with before, the muscles will start sending unfamiliar signals to the prosthesis. This will often lead to the prosthesis doing the opposite of what the user intended – and the cup will fall to the ground.”

An accelerometer helps to compensate for these unfamiliar signals, reducing the user’s frustration.

Commercial potential

Prosthetic limbs can be tricky to manoeuvre. Younger people generally learn quicker, but some give up, and never manage to use the full potential of the device.

“Our hope is that this application might improve the lives of people,” says Fougner. But he stresses that it is equally important for prosthetic users to be given adequate training. Their research has shown that an accelerometer, combined with proper training, reduces the frequency of incorrect movements from 30 to 5 percent.

Although this is a niche market in Norway, where there are only about 600 upper limb prosthetic users, the new approach has huge commercial potential worldwide, particularly in Asia and the Middle East. “A more functional prosthesis might be on the market in a couple of years,” says Stavdahl.

The research is being conducted in collaboration with researchers at the University of New Brunswick in Canada.

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Explorer's Night

(10.12.2010) Just what does it take to climb Mt. Everest, ski across Antarctica or free dive to 160 metres deep – or more? On Friday, 17 December, five of the most extreme people on the planet will assemble in Trondheim to talk about their experiences at the limits of human survival.

"Explorer's Night" will be held from 18.00 to 22.00 at the Studentersamfundet, the Student Union Building in Trondheim. The evening features Herbert Nitsch, known as "the deepest man on Earth," as a result of his world free diving record of 214 m; Tanya Streeter, "the deepest woman on Earth," whose free diving record is 160 m; Børge Ousland, the first person to complete a solo expedition to the North Pole without re-supplying, the first to cross the Antarctic continent alone, and the only person on the planet to have done both; Sir Chris Bonington, a British climber with numerous first ascents to his name; and Dr. Jay Buckley, a medical doctor and astronaut whose achievements are "out of this world."

Man in Extreme Environments

The event has been scheduled in conjunction with a two-day conference at NTNU called "Man in Extreme Environments: Applied Physiology from Subsea to Space." The conference honours NTNU Professor Alf O. Brubakk, who has conducted groundbreaking research on physiological responses to extreme environments, particularly diving. Conference lectures are free and open to the public

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Is Santa Claus toxic?

(06.12.2010) The exact location of Santa's Workshop has long been kept secret, but one thing every child knows is that he lives somewhere up by the North Pole. It's a place that has seen great changes in recent years with melting sea ice and warmer summer temperatures attributed to global warming.

But climate change isn't the only bad news facing the world's favorite jolly old elf: research from the Norwegian University of Science and Technology (NTNU) shows that if he's eating anything that lives in the Arctic, chances are that he himself is loaded with toxic chemicals.

In a series of recent publications, NTNU biologist and professor Bjørn Munro Jenssen and colleagues have reported high levels of contaminants in a range of Arctic animals and fish, including polar bears, ivory gulls and most recently, Greenland sled dogs.

Bear health research

Polar bears have some of the highest levels of organic pollutants in their bodies of any animals on the planet.As part of their work in the Bear Health project, researchers are only now seeing decreases in the levels of PCBs in polar bear blood, even though the

pollutant was banned in the 1970s. Photo: Jenny Bytingsvik NTNU/NP

A toxic soup over the Arctic

The Arctic seems like it should be pristine: Only a few smokestacks foul its frigid air, and just a handful of industrial plants discharge pollutants to its rivers and seas. But industrial pollutants from western Europe, North America and Asia are dispersed by the air and ocean currents, and are concentrated over the Arctic. These chemicals are taken up by the smallest plants and animals lowest on the food chain, and are "biomagnified" as you go higher up on the food chain.

That's mainly why the 2500 or so polar bears that wander the remote Norwegian archipelago of Svalbard, only 1000 km from the North Pole, have some of the highest levels of toxic organic pollutants of any creature walking the planet, Jenssen and his colleagues have found.

Advice to Arctic Council

Jenssen and colleagues have been exploring the combined effects of pollutants and climate change in a large-scale research project called Bear Health, which was initiated in 2007 as a part of the International Polar Year. The most recent results from this effort have been published as a part of the Arctic Monitoring and Assessment Programme, (www.amap.no), which provides scientific information about arctic pollutants and their effects to the eight countries that are members of the Arctic Council.

In an article entitled "Exposure and effects assessment of

persistent organohalogen contaminants in arctic wildlife and fish," (doi:10.1016/j.scitotenv.2009.10.038) published in the journal Science of the Total Environment earlier this year, researchers reported the presence of persistent organic pollutants such as PCBs and brominated flame retardants in the bodies of a wide range of arctic wildlife.

Three species of whales, polar bears, ringed seals, Stellar sea lions, walrus, mink and arctic fox were among the animals reported to contain high levels of these persistent organic pollutants. However, East Greenland and Svalbard polar bears and Svalbard glaucous gulls were the only species directly found to show stress from the pollutants, but the researchers believe this is due to a lack of data, not a lack of effects.

Sledge dogs show thyroid effects

The most recent issue of the journal Ecotoxicology and Environmental Safety also features an article co-authored by Jenssen with a report on the effects of contaminants on Greenland sledge dogs. Research on the dogs helps researchers understand how animals that are high on the food chain, such as polar bears and other carnivores, might be affected by environmental contaminants.

The researchers fed one group of dogs a diet of minke whale blubber that was known to be contaminated with organohalogens such as PCBs. These dogs had altered thyroid hormones compared to a matched set of control sledge dogs fed uncontaminated pork fat. ("Alterations in

thyroid hormone status in Greenland sledge dogs exposed to whale blubber contaminated with organohalogen compounds"
doi:10.1016/j.ecoenv.2010.08.040).

Weight loss not a problem

But it's not all doom and gloom for Santa Claus, says NTNU toxicologist Tore Syversen, from the university's Faculty of Medicine. Should Santa decide to diet a bit – by eating less fatty contaminated foods, for example – he won't have to worry about harmful health effects from the contaminants that are surely stored in his own fat, round belly. "Most people lose weight quite slowly, which enables the liver to cleanse the body of the substances released from body fat," Syversen says.

"There is no research showing that dieting is dangerous for people who have accumulated toxic substances in their bodies," Syversen says, adding that it is can be quite beneficial for most people to lose a little weight – and that certainly applies to Mr. Claus.

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€2.5 million for neuroscience research

(26.11.2010) Professor May-Britt Moser has been selected as one of four Norwegian researchers to receive the 2010 ERC Advanced Grant. She will receive 2.5 million euro, together with additional financial support from NTNU, which together will give the university's Kavli Institute Systems Neuroscience an additional of 5 million NOK (0.62M€) extra per year for the next five years.

Moser's grant will fund a broad research programme, ranging from the basic phenomenology of the transition between hippocampal representations, to the role of gamma-oscillations, thalamic activity and anatomy and development.

Moser, who is co-director of the Kavli Institute, will use insights into memory separation processes ('remapping') to identify the principles responsible for ensemble

representation at behavioural time scales. She and her colleagues are currently developing a new method in the lab, where they will determine how environments and experiences are represented in the short-term time domain and how ensembles involved in one representation fade into those associated with another. These mechanisms will point the way to a better understanding of mechanisms responsible for retrieval of episodic memory.

A total of 37 Norwegian applicants were considered for an ERC advanced grant, of whom 15 were finalists in the stage 2 of the grant application process. NTNU had 5 applicants, and was awarded one grant for Professor Moser.

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Vacuuming up oil spills – with bark

(11.11.2010) Cleaning up oil spills is a time consuming, difficult process. But a novel approach developed at the Norwegian University of Science and Technology (NTNU) uses a new kind of vacuum cleaner that blows bark or other absorbent material onto oil spills, and then sucks the material up again. The vacuum cleaner is four times more efficient in cleaning up after oil accidents than conventional techniques.

It started with a simple assignment for master's students in NTNU's Department of Product Design: make something useful that employs air and electronics. Silje Rabben and three of her fellow students decided it was time to take oil cleanups out of the Stone Age, and developed the new kind of vacuum cleaner that speeds up oil spill cleanups.

The design has been so successful that the students founded a company, Kaliber Industrial Design, and are

now looking for investors to help market their invention, the MOSE – or “Mechanical Oil spill Sanitation Equipment.”

The invention has already won a number of prestigeous Scandinavian innovation awards, including DnB NOR's Innovation Award for Mid-Norway, 2010; Tekna's Innovation Award 2010; second place in the 2010 Venture Cup National Finals; and the best student idea in the 2010 Venture Cup competition.

No more hand scrubbing

Today’s oil spill cleanup technology usually involves the use of an absorbent material, such as bark or peat moss, to soak up the oil. Workers then have to remove the wet, heavy absorbent material, and the remaining oil residue may have to be scrubbed off the rocks.

“The oil vacuum cleaner automates what we currently do manually,” says Rabben. “It is common to use bark to absorb the oil. So we have also used it. But it is also possible to use peat moss or chemical absorbents.”

The vacuum cleaner currently weighs about 10 kilos, but the engineers are working to cut its weight to 5 kilos. The equipment will also be changed so that it can be folded up to be more compact.

But the secret of the design is all in the vacuum cleaner’s head. The machine first sprays bark or other absorbent material onto the spill. Rotating brushes in the head work

the oil and the absorbent material together. When the oil and absorbent material are thoroughly mixed, the direction of the rotating brushes is reversed, enabling the bark to be sucked up into the equipment while the rocks are simultaneously scrubbed.

Small spills no problem

Leif Gunnar Smistad, a fire engineer and oil spill manager at Trondheim's Fire and Rescue Service, says the advantage of the vacuum cleaner is that it is portable. Smistad helped develop the idea.

"Every day we spread bark on small oil spills from overfilled oil tanks or from car accidents. Then we use a broom, a shovel and a bucket to clean up. We're very interested in mobile solutions that make these cleanups more effective," Smistad says.

The American Dream

Company representatives participated in the recent Clean Gulf Training Event and Exhibition in Tampa, Florida, and then went to New Orleans to meet with authorities and companies who have been involved with the cleanup after the Macondo Deepwater Horizon accident.

"Naturally, there is a lot of focus on oil spills and cleanup work in the Gulf of Mexico after the Macondo accident," Rabben says. "We just have to jump in."

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Moose and heavy metals

(05.11.2010) Moose in southern Norway are in significantly worse health than those further north and in eastern Norway. An analysis of roughly 600 moose livers, combined with information such as carcass weights and ages, shows that Norway's southernmost herds are afflicted with kidney problems and osteoporosis.

Marit Nordløkken, a PhD candidate in NTNU's Department of Chemistry, is investigating whether one of the factors behind these findings may be high concentrations of heavy metals.

Cadmium accumulation

Nordløkken's analysis shows that there is enough cadmium in the moose organs from southern Norway that hunters should think twice before they eat large amounts of foods made with moose liver or kidneys, such as liver pate or kidney pie.

"Many heavy metals are stored in the liver and kidneys of animals and humans alike. I have found a great deal of

cadmium in my analysis. Cadmium is not acutely toxic, but the amount in the body increases with age and can eventually cause health problems and disease," Nordløkken says.

Geographical variation

Nordløkken has examined liver samples from about 600 animals. The samples are mainly supplied by hunters – primarly because it is rare that a moose will die of natural causes in a place where it can be found. She also collects information on carcass weight and age. This collection of information has enabled her to see that the size of the moose varies geographically, and that moose are larger the further north they live.

For example, the moose from the coasts of Nordland and Troms in northern Norway are much larger and heavier than their southern cousins, while moose from Trøndelag, in mid-Norway, are in the middle in terms of weight and size. Nordløkken is able to determine the age of the moose by counting the rings in their teeth, much like biologists can age trees by counting annual tree rings. The oldest animal she has found to date is a cow that was 17-and-a-half years old.

Different diets

It has long been known that there are higher levels of air pollution and higher levels of heavy metals in southern Norway than in the rest of the country. This is due to atmospheric long-range transport from the rest of Europe where the heavy metals fall with acid rain. The most severely affected areas are in West and East Agder

counties and parts of Telemark county. This area is characterized by bedrock with granite and gneiss, both of which are not very good at neutralizing acid rain. "It may also be important that the moose are living on different diets in different parts of the country.

The department has another project that examines plants in the southern region and will provide further information about heavy metals in the plants that moose graze on," say NTNU Professor Torunn Berg and Associate Professor Trond Peder Flaten, who along with Eiliv Steinnes are Nordløkken's advisers.

The research is being conducted in collaboration with NINA, the Norwegian Institute for Nature Research, which monitors populations of deer.

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NTNU architecture students help in Haiti

(01.11.2010) Six design and architecture students from the Norwegian University of Science and Technology have temporarily relocated to Port-au-Prince, Haiti for six months to help in the design of a structure that will be used by a women's self-help group.

The students are a part of TYIN Tegnestue, a non-profit humanitarian group started by NTNU architecture students. The group's previous projects include an award-winning design for a children's library in Thailand.

The students on the Haiti project are Jonas Asheim, a 5th year student in NTNU's Department of Product Design, along with Lydia Høyem Anker, Olav Fåsetbru Kildal, Ida Johanne Andersen Ve, and Anne Gjesdal Bjørndal, all of whom are 4th year architecture students. They will be working with Manman Troll, a women's network connected with Project Haiti, another Norwegian humanitarian group run by volunteers. The plan is to build a bakery and living space that can be used by the members of the women's network to earn income.

The students are being supported by two architects from TYIN Tegnestue, Andreas Grøntvedt Gjertsen and Yashar Hanstad, and Hans Skotte, an NTNU associate professor. They are blogging about their work and posting pictures that describe the challenges involved in helping Haiti rebuild eight months after the devastating earthquake that levelled much of the country's capital city, Port-au-Prince and its surroundings.

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NTNU spin-off secures NOK 25 million

(20.09.2010) MemfoACT, an NTNU spin-off, has secured NOK 25 million to turn its award-winning membrane technology into a commercial product. Based on research conducted at NTNU's Department of Chemical Engineering, the company's carbon membrane can transform low-grade biogas into valuble biofuel that can be used in cars, buses and trucks.

The technology will first be used to upgrade units that produce biomethane from biogas. In turn, this biomethane can be used as engine fuel for cars, buses and the like.

The company currently has three lab scale demonstration/test rigs in operation, where the carbon membrane is being tested and verified on real biogas streams.The test rigs, all of which are in Norway, are located at FBAS (Fredrikstad biogass AS) in Fredrikstad and GLØR (Gausdal, Lillehammer og Øyer Renholdsverk) in Lillehammer, in addition to the Høvringen sewage biogas plant in Trondheim. The NOK 25 million will be

used to build a full-scale pilot unit to produce the MemfoACT membranes.

Mimics natural membranes

The MemfoACT carbon membrane enables separation of gases without the use of chemicals or other contaminants, by imitating nature's own separation method, known from internal organs such as kidneys and lungs where urea and oxygen are separated from blood. The special feature of the carbon membrane is its ability to combine high selectivity with high productivity which results in low gas separation costs.

One key advantage of MemfoACT's technology is that it can be retrofitted in a cost-effective way to existing small to medium scale biogas plants as well as built into new biogas plants. Other biogas purification technologies, such as pressure swing adsorption (PSA), physical absorption, chemical absorption and cryogenic separation, are highly energy demanding and have waste issues. In contrast, MemfoACT's membrane separation technology is an energy efficient and environmentally friendly method for biogas upgrading.

High energy potential

The potential biowaste energy available iin Europe is estimated at approximately 400 TWh/yr, or about 13 per cent of the region's 3042 TWh total electric energy consumption. Some estimates say that the EU could replace its natural gas imports from Russia if the total energy potential in biowaste were used as biomethane.

The total biowaste potential in Norway is calculated to 6 TWh/yr.

Biowaste is a renewable and CO_2-neutral energy source, which means that the CO_2 that is released when burning biomethane was already in the natural cycle. Collecting and burning biomethane, which has a larger global warming potential than CO_2 (almost 23 times higher), hence contributes to a reduction of the greenhouse effect.

Helps with challenges in organic waste management
Investment in organic waste management will be boosted by regulations that prohibit methane emissions and increased attention to methane as an aggressive greenhouse gas. Waste management is strictly regulated, both in Norway and the EU. It is forbidden to emit methane from industry, sewage and waste treatment facilities.

Strong investor team
MemfoACT recently conducted a share issue amounting to NOK 16 million, and has an investment team consisting of Viking Venture, Alliance Venture, Salvesen and Thams and the waste management company GLØR IKS. The company has also won pilot project funding from Innovation Norway, with NOK 5.3 million in support, matched by contributions from its three biogass pilot customers. MemfoACT was created in August, 2008 as a joint venture betrween NTNU Technology Transfer and NTNU scientists Professor May-Britt Hägg, Dr. Ing. Jon Arvid Lie and Dr. Ing. Arne Lindbråthen.

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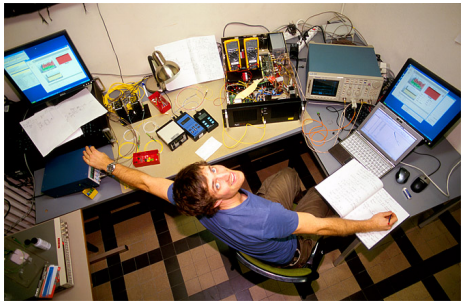
Vulnerability in commercial quantum cryptography

(29.08.2010)The Norwegian University of Science and Technology (NTNU) and the University of Erlangen-Nürnberg together with the Max Planck Institute for the Science of Light in Erlangen have recently developed and tested a technique exploiting imperfections in quantum cryptography systems to implement an attack. Countermeasures were also implemented within an ongoing collaboration with leading manufacturer ID Quantique.



Quantum cryptography is a technology that allows one to distribute a cryptographic key across an optical network and to exploit the laws of quantum physics to guarantee its secrecy. It makes use of the Heisenberg uncertainty principle – observation causes perturbation – to reveal eavesdropping on an optical fiber. The technology was invented in the mid-eighties, with first demonstration less than a decade later

and the launch of commercial products during the first years of the century.

Although the security of quantum cryptography relies in principle only on the laws of quantum physics, it is also dependent on the lack of loopholes in specific implementations, just like any other security technology. “The security of quantum cryptography relies on quantum physics but not only... It must also be properly implemented. This fact was often overlooked in the past,” explains Prof. Gerd Leuchs of the University of Erlangen-Nürnberg and the Max Planck Institute for the Science of Light.

Recently, NTNU in collaboration with the team in Erlangen has found a technique to remotely control a key component of most of today’s quantum cryptography systems, the photon detector, which is reported today in Nature Photonics advance online publication doi:10.1038/nphoton.2010.214. “Unlike previously published attempts, this attack is implementable with current off-the-shelf components,” says Dr. Vadim Makarov, a researcher in the Quantum Hacking group at NTNU, who adds: “Our eavesdropping method worked both against MagiQ Technology's QPN 5505 and ID Quantique Clavis2 systems.” The effort has also been described in a news article in Nature magazine, and in a webpage by the 'hackers' themselves.

In the framework of a collaboration initiated with ID Quantique, the researchers shared their results with the

company prior to publication. ID Quantique has then, with a help of NTNU, developed and tested a countermeasure. Academic researchers of the two laboratories will continue testing security aspects of quantum cryptography solutions from ID Quantique. “Testing is a necessary step to validate a new security technology and the fact that this process is applied today to quantum cryptography is a sign of maturity for this technology,” explains Grégoire Ribordy, CEO of ID Quantique.

About the Quantum Hacking group
The Quantum Hacking group at the Department of Electronics and Telecommunications, Norwegian University of Science and Technology, works in the field of quantum cryptography, with the main goal to make quantum cryptosystems secure in practice. This is done by playing the role of the evil eavesdropper, and hacking practical systems by exploiting imperfections. Using these results, we propose modifications to the systems and new security proofs which take imperfections into account.

About the QIV group
The Quantum Information Processing group in Erlangen represents a close collaboration in the field of quantum communication between the University of Erlangen-Nürnberg and the Max Planck Institute for the Science of Light. One of the group's research focuses is research in quantum key distribution and operating a free-space link transmitting continuous-variables quantum information.

About ID Quantique

ID Quantique is a global leader shaping the evolution of network security through the development and commercialization of Quantum Key Distribution and high-speed encryption products. In 2001, the company was the first to bring this new technology to the market. In 2007, it was able to announce the first public application of this technology to secure a network used for vote counting in an election in Geneva. In addition to its strong technology focus on Quantum Key Distribution, ID Quantique has also developed expertise in the area of high-speed encryption and has a broad portofolio of solutions for layer 2 encryption. A privately held company headquartered in Geneva, Switzerland, ID Quantique is a spin-off from the University of Geneva and has close ties with leading academic institutions.

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Polar bears, gulls, most at risk from contaminants

(09.08.2010) Although animals throughout the Arctic are exposed to an alphabet soup of pollutants and contaminants that are carried north from industrialized countries, only polar bears in East Greenland and Svalbard and glaucous gulls in Svalbard appear to be showing any deleterious effects, according to a new report co-authored by a researcher from the Norwegian University of Science and Technology.

The summary, which is part of a comprehensive effort called the Arctic Monitoring and Assessment Programme (AMAP), was published in a recent special issue of Science of the Total Environment. Bjørn Munro Jenssen, a professor of biology at NTNU, was one of the authors of the summary, which reports in part on his work with polar bears on Svalbard.

While researchers could not document strong evidence that contaminants such as PCBs and DDT were adversely affecting animals throughout the Arctic, other factors, such as the impact of climate change, disease and the

invasion of new species will affect the overall exposure that each animal has to pollutants. Climate change, in particular, will affect sea ice distribution and temperatures. This will in turn cause food web changes and changes in nutrition, which led the researchers to list animals at the highest risk from contaminant exposure.

The Arctic wildlife and fish considered to be most at risk are: Polar bears in East Greenland, Svalbard and Hudson Bay, killer whales in Alaska and northern Norway, several species of gulls and other seabirds from the Svalbard area, northern Norway, East Greenland, the Kara Sea, and the Canadian central high Arctic, ringed seals from East Greenland, and a few populations of Arctic char and Greenland shark.

Munro Jenssen's work was recently featured as a news story on the Australian Broadcasting Corporation's webpages.

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Kavli Day 2010

(25.08.2010) In celebration of Kavli Prize Week, the Norwegian University of Science and Technology, the Norwegian Academy of Science and Letters, and the Kavli Foundation will hold a series of lectures and events on 9 September 2010 in Trondheim, featuring a number of 2010 Kavli Prize Laureates. The festivities continue after the official celebration, with two symposia sponsored by NTNU, one in neuroscience and one in nanoscience.

Here is an overview of the day's events:

Time	Event
09.30	Welcome remarks, NTNU Rector Torbjørn Digernes
09.40	Greeting from the Norwegian Academy of Science and Letters
09.50	Introduction, Donald Eigler, 2010 Kavli Nanoscience Prize Laureate
09.55	Donald Eigler lecture, "The Small Frontier", followed by brief question and answer session
10.30	Introduction, Thomas Südhof, 2010 Kavli Neuroscience Prize Laureate

10.35	Thomas Südhof lecture, "Neurotransmitter release-- how synapses speak", followed by brief question and answer session
11.10	Concluding remarks, end of official Kavli celebration

Kavli Day 2010 at NTNU

Location: NTNU Gløshaugen Campus, the Natural Sciences Building (Realfagbygget) Auditorium R1

Neuroscience Symposium

NEUROSCIENCE SYMPOSIUM
NTNU Kavli Institute of Systems Neuroscience and Centre for the Biology of Memory
Location: Natural Sciences Building, Auditorium R1, and moving after the Kandels' lecture (ca 13.45) to NTNU's Faculty of Medicine, St Olavs Hospital, Centre for Women and Children

Time	Event
12.30	Kavli Institute Public Lecture, Auditorium R1, NTNU Natural Sciences Building,Realfagbygget

Eric Kandel and Denise Kandel, Columbia University: "There is Life after the Nobel Prize: A Molecular Genetic Approach to the Gateway Hypothesis of Drug Abuse"

The Neuroscience Symposium continues at NTNU's Faculty of Medicine, St Olavs Hospital, Centre for Women and Children

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14.15 Richard H. Scheller, 2010 Kavli Neuroscience Prize Laureate, Genentech: “The Molecular Mechanism of Intracellular Membrane Fusion."

14.45 Dan Feldman, University of California, Berkeley: “Cortical processing of whisker tactile sensation.”

15.15 Marla B. Feller, University of California, Berkeley: “The assembly of direction-selective circuits."

15.45 Break

16.00 Tim Bliss, National Institute for Medical Research, London: “LTP: past, present and future.”

16.30	Richard Morris, University of Edinburgh: "The revised synaptic tagging and capture hypothesis: implications for the persistence of memory."
17.00	John M O'Keefe, University College London, UK: “Signals for environmental novelty in the hippocampal formation."

Nanotechnology Symposium

The 2nd Nanotechnology@ntnu Symposium
Location: Natural Sciences Building (Realfagbygget) Lecture Hall R5

Time	Event
13.00	Bjørn Torger Stokke, NTNU NanoLab Board Opening of 2nd Nanotechnology@ntnu
13.05	Nadrian Seeman, Kavli Nanoscience Prize Laureate 2010, New York University, USA: "Using Chemical Information to Control the

Structure of Matter"

13.45 Anja Boisen, Technical University of Denmark, Denmark:
"Miniaturised Mechanical Sensors for Molecular Recogition and Nanoparticle Detection"

14.25 Coffee break

14.40 Charles Lieber, Harvard University, USA:
"Semiconductor Nanowires: Platform for Nanotechnology"

15.20 Lars Samuelson, Lund University, Sweden:
"Semiconductor Nanowires: A Generic Approach Towards Novel Materials Physics and Devices"

16.00 Bjørn Torger Stokke, NTNU NanoLab Board
Closing Remarks

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Better understanding of mapmaking in the brain

(09.08.2010)"Grid cells," which help the brain map locations, have been found for the first time outside of the medial entorhinal cortex in the rat brain, according to new research from the Norwegian University of Science and Technology (NTNU). The finding should help further our understanding of how the brain generates the internal maps that help us remember where we have been and how to get to where we want to go.

Five years ago, researchers at NTNU's Kavli Institute for Systems Neuroscience were the first to discover the intricacies of how the brain creates internal maps using grid cells in a coordinate system. Grid cells provide geometric coordinates for locations and help the brain generate an internal grid to help in navigation. Along with place cells, which code for specific locations, head direction cells, which act like a compass, and border cells, which define the borders of an environment, grid cells enable to brain to generate a series of maps of different scales and help with recognition of specific landmarks.

Until now, however, place cells had only been found in the hippocampus and grid and border cells in the medial entorhinal cortex. But in the August issue of Nature Neuroscience, Kavli researchers report finding many grid cells intermingled with head direction and border cells in the presubiculum and parasubiculum areas of the brain, which are locations that are the source of some of the major inputs of medial entorhinal cortex.

This finding will help in particular scientists who are trying to understand the mechanisms that actually generate grid signals in the brain. The presubiculum and the parasubiculum are not the same as the medial entorhinal cortex but share some properties and connections. “It is in this direction that we should look for further explanations,” says Charlotte Boccara, the first author of the paper and a researcher at the Kavli Institute.

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NTNU-Statoil-Berkeley Initiative

The University of California at Berkeley, the Norwegian University of Science and Technology (NTNU) and Statoil have signed a USD 580,000 collaboration agreement to establish a new mega-project research programme at Berkeley.

"We wish to see this initiative develop the best project- and functions managers across the whole industry. We have entered into this agreement because we believe collaboration between academics and industry is crucial to further develop our perspectives and skills in project development. We want to be a benchmark in the market," says executive vice president in Statoil Projects & Procurement Gunnar Myrebøe.

The research initiative, called "Understanding Success and Developing Management Leadership on International Mega Projects", is headed by UC Berkeley professor Iris Tommelein and NTNU professor Asbjørn Rolstadås.

Multi-disciplinary
The initiative brings together an international and multi-disciplinary group of academic researchers and industry colleagues with expertise in mega-project management to collaborate on case study based research on mega-projects.

Participants in the P2SL Mega-projects Initiative will develop a comprehensive understanding of how to lead, manage and succeed within international mega projects. The centre was launched to improve intellectual understanding and practices, including those involving international mega projects.

Cross collaboration
The goal of the initiative is twofold. The first is to increase successful management and leadership knowledge base on mega-projects, by working on a multi-disciplinary basis between research institutions, industry personnel and key contractors. The second is to develop educational material in order to strengthen Statoil's supplier companies' capabilities in managing mega-projects in geographically and geopolitically diverse settings.

“Large-scale projects may cost billions of dollars to perform and deliver. As Statoil’s projects become more geographically diverse and complex, they also become increasingly challenging to lead and manage”, Myrebøe says.

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On the same wavelength-- literally

Researchers at the Kavli Institute for Systems Neuroscience and Centre for the Biology of Memory at the Norwegian University of Science and Technology (NTNU) have discovered a mechanism that the brain uses to filter out distracting thoughts to focus on a single bit of information. Their results are reported in the 19 November issue of Nature.

The human brain is bombarded with all kinds of information, from the memory of last night's delicious dinner to the instructions from your boss at your morning meeting. But how do you "tune in" to just one thought or idea and ignore all the rest of what is going on around you, until it comes time to think of something else? In "Frequency of gamma oscillations routes flow of information in the hippocampus", published in the 19 November issue of Nature, researchers at the Kavli Institute for Systems Neuroscience and Centre for the

Kavli Institute for Systems Neuroscience and the Centre for the Biology of Memory

The scientific goal of the Kavli Institute for Systems Neuroscience is to advance our understanding of neural circuits and systems. By focusing on spatial representation and memory, the investigators hope to uncover general principles of neural network

Biology of Memory describe a mechanism that the brain uses to filter out distracting thoughts.

Think of your brain like a radio: You're turning the knob to find your favourite station, but the knob jams, and you're stuck listening to something that's in between stations. It's a frustrating combination that makes it quite hard to get an update on swine flu while a Michael Jackson song wavers in and out. Staying on the right frequency is the only way to really hear what you're after. In much the same way, the brain's nerve cells are able to "tune in" to the right station to get exactly the information they need, says researcher Laura Colgin, who was the paper's first author. "Just like radio stations play songs and news on different frequencies, the brain uses different frequencies of waves to send different kinds of information," she says.

Gamma waves as information carriers

Colgin and her colleagues measured brain waves in rats, in three different parts of the hippocampus, which is a key memory center in the brain. While listening in on the rat brain wave transmissions, the researchers started to realize that there might be something more to a specific sub-set of brain waves, called gamma waves. Researchers have thought these waves are linked to the formation of consciousness, but no one really knew why their frequency differed so much from one region to another and from one moment to the next.

Information is carried on top of gamma waves, just like songs are carried by radio waves. These "carrier waves" transmit information from one brain region to another.

computation in the mammalian cortex. The institute is one of just 4 neuroscience institutes funded by the Kavli Foundation. The other three are at Yale University, Columbia University, and the University of California -- San Diego.

NTNU's Kavli Institute coexists with the university's Centre for the Biology of Memory (CBM) but the scope of the Institute is broader and more long-term. CBM is part of the Centre of Excellence scheme of the Norwegian Research Council.

“We found that there are slow gamma waves and fast gamma waves coming from different brain areas, just like radio stations transmit on different frequencies,” she says.

You really can “be on the same wavelength”

“You know how when you feel like you really connect with someone, you say you are on the same wavelength? When brain cells want to connect with each other, they synchronize their activity,” Colgin explains. “The cells literally tune into each other’s wavelength. We investigated how gamma waves in particular were involved in communication across cell groups in the hippocampus. What we found could be described as a radio-like system inside the brain. The lower frequencies are used to transmit memories of past experiences, and the higher frequencies are used to convey what is happening where you are right now.”

If you think of the example of the jammed radio, the way to hear what you want out of the messy signals would be to listen really hard for the latest news while trying to filter out the unwanted music. The hippocampus does this more efficiently. It simply tunes in to the right frequency to get the station it wants. As the cells tune into the station they’re after, they are actually able to filter out the other station at the same time, because its signal is being transmitted on a different frequency.

The switch

“The cells can rapidly switch their activity to tune in to the slow waves or the fast waves”, Colgin says, “but it seems

as though they cannot listen to both at the exact same time. This is like when you are listening to your radio and you tune in to a frequency that is midway between two stations- you can't understand anything- it's just noise." In this way, the brain cells can distinguish between an internal world of memories and a person's current experiences. If the messages were carried on the same frequency, our perceptions of the world might be completely confused. "Your current perceptions of a place would get mixed up with your memories of how the place used to be," Colgin says.

The cells that tune into different wavelengths work like a switch, or rather, like zapping between radio stations that are already programmed into your radio. The cells can switch back and forth between different channels several times per second. The switch allows the cells to attend to one piece at a time, sorting out what's on your mind from what's happening and where you are at any point in time. The researchers believe this is an underlying principle for how information is handled throughout the brain.

"This switch mechanism points to superfast routing as a general mode of information handling in the brain," says Edvard Moser, Kavli Institute for Systems Neuroscience director. "The classical view has been that signaling inside the brain is hardwired, subject to changes caused by modification of connections between neurons. Our results suggest that the brain is a lot more flexible. Among the thousands of inputs to a given brain cell, the cell can choose to listen to some and ignore the rest and the selection of inputs is changing all the time. We believe

that the gamma switch is a general principle of the brain, employed throughout the brain to enhance interregional communication."

Can a switch malfunction explain schizophrenia?

People who are schizophrenic have problems keeping these brain signals straight. They cannot tell, for example, if they are listening to voices from people who are present or if the voices are from the memory of a movie they have seen. "We cannot tell for sure if it is this switch that is malfunctioning, but we do know that gamma waves are abnormal in schizophrenic patients," Colgin says. "Schizophrenics' perceptions of the world around them are mixed up, like a radio stuck between stations."

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A really clean room

When you're working with nano-scale sized particles, even the smallest speck of dust can seem like a boulder.


Photo: Ida Hederstrøm

That's why NTNU's NanoLab's clean room, which was inaugurated May 12, is designed to keep dust – or boulders, depending on your perspective – out. The lab and its equipment cost NOK 200 million, with NOK 144 million financed by the university, and the remainder from the Research Council of Norway and SINTEF, which continues to work collaboratively with NTNU on the project.

The clean room is equipped with highly advanced filtering and vibration control systems to enable scientists to make ultra precise measurements and manipulate materials at the nanoscale. "This makes the laboratory unique in Norway today," says Bjørn Torger Stokke, chair of the board for NTNU NanoLab. Erik Wahlstrøm, acting director of the initiative, says both the lab's opening – and the technology used to build the lab – are major milestones.

A meeting of chemistry, physics and biology

The new laboratory gives researchers access to the kinds of cutting-edge tools and facilities they need to do their work. There are actually five rooms, one for synthesis using chemical methods, one for synthesis using physical methods and a third for bionanotechnological research. Two other rooms are designed for characterization and other research. The entire laboratory has been built at a safety level that will allow work with genetically modified organisms, which means that researchers and their samples can move between the different rooms if necessary. The lab is currently outfitted with:

- NIL (nano imprinting lithography)
- EBL-SEM (electron beam lithography with scanning electron microscope)
- FEG-SEM (field emission gun scanning electron microscope)
- ICP-RIE (inductively coupled plasma reactive ion etch)
- FIB (focused ion beam)
- S(T)EM (scanning tunnelling electron microscope
- AFM (atomic force microscope)
- SCEM (scanning electrochemical microscope)
- Particle size analyser

New tools, new technology

Given NTNU's current expertise in alternative and renewable energy, researchers are expected to use the laboratory to create more efficient solar cells, catalysts for cleaner processes, and membranes that could separate CO2 from exhaust gases.

Other possible areas of research are in sensors in biomedicine, information storage that is not dependent on power, information storage that is not affected by strong magnetic fields, and the growth of nanometre size fibres for optics and other applications.

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New pan-European Palliative Care Research Centre established

A first-ever pan-European centre devoted to improving patient palliative care and end-of-life care was officially launched Thursday, October 15, at the Norwegian University of Science and Technology (NTNU), with the opening of the European Palliative Care Research Centre.

The centre is based at NTNU's Faculty of Medicine and at St. Olavs Hospital/Trondheim University Hospital.

Strength in international research

"We are too small and too few not to work together across national borders", says Professor Stein Kaasa, who is the leader of the new centre as well as a researcher at the NTNU Faculty of Medicine's Pain and Palliation Research Group. The formation of the new centre was announced at the 4th International Trondheim Conference on Palliative Care, held in Trondheim on Oct. 15-16.

The centre will focus on coordinating efforts between

groups and individual researchers across Europe, specifically Scotland, England, Italy, Denmark, Germany and Switzerland, along with the USA, Canada and Australia. Researchers hope to boost the amount of international multicentre studies, as well as to create an international PhD programme to educate young researchers in palliative care and to initiate and develop evidence-based guidelines for palliative care.

Support from the Norwegian Cancer Centre crucial

The Norwegian Cancer Society has awarded a major grant of 15 million NOK (1.8 million euro) to help establish the new centre. Additional support has been awarded by the Open Society Institute in the United States, the Floriani Foundation in Milan, Italy, and Nycomed, the pharmaceutical company.

"It is well acknowledged within the scientific field of palliative care that international collaboration is urgently needed in order to conduct sufficiently sized studies, as well as to evaluate the effect of new treatment strategies", says Dr. Augusto Caraceni, with the Italian National Cancer Institute and vice president of the European Association for Palliative Care. Caraceni has been named director of international affairs for the new centre. "Such a research strategy will need funding. The establishment of the centre, through the very generous grant from the Norwegian Cancer Society, makes this possible."

Open to all palliative care researchers

The centre will be based on an open invitation to all active researchers in palliative care to participate. It was established in Trondheim partly in recognition of the ability of the NTNU Faculty of Medicine's Pain and Palliation Research Group to quickly translate the results of clinical research into new patient treatment. "I have been collaborating with the Pain and Palliation Research Group at the Faculty of Medicine, NTNU, for almost a decade" Caraceni said. "The group in Trondheim is at the forefront in palliative care research in Europe and worldwide, with their capacity to plan and conduct translational research from bench to bedside, and their vision of a European research agenda across national borders is internationally recognized."

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Hard workouts -- reduced fertility

(2010) New research from the Norwegian University of Science and Technology (NTNU) shows that the body may not have enough energy to support both hard workouts and getting pregnant.

Are you a female athlete – or just someone who likes challenging workouts -- who also wants to get pregnant? It may make sense to ease off a bit as you try, according to new research from NTNU.

Roughly seven per cent of all Norwegian women are believed to have infertility problems, which means that they are unable to become pregnant during the first year of trying - even if they might later become pregnant.

Infertility can have many causes, both medical and lifestyle-related. Known risk factors include smoking, stress, and alcohol. Being extremely under- or overweight can also play a role.

It is known, however, that elite sports women have more fertility problems than other women. But does extreme physical activity play a role in fertility among other women as well? NTNU researchers examined precisely this question in a study involving nearly 3,000 women. They found that overly frequent and hard physical exercise appears to reduce a young woman's fertility. But the decrease in fertility probably lasts only as long as the hard training.

Two vulnerable groups

The study was based on material from the Health Survey of Nord-Trøndelag from 1984-1986 and from a follow-up survey in 1995-1997. All of the women who participated were healthy and of childbearing age, and none had a history of fertility problems.

In the first survey, women responded to questions about the frequency, duration and intensity of their physical activity - and ten years later were asked questions about pregnancy and childbirth. The NTNU researchers also recorded other information that could have significance for the study.

"Among all these women, we found two groups who experienced an increased risk of infertility," says Sigridur Lara Gudmundsdottir, a PhD candidate in NTNU's Human Movement Science Programme. "There were those who trained almost every day. And there were those who trained until they were completely exhausted. Those who did both had the highest risk of infertility."

Age an important factor

If the women also were under 30 years old in the first study, the relationship became even more evident in both groups. Among those who reported training to exhaustion (regardless of frequency and duration), 24 per cent had fertility problems. In the group that had trained almost every day (regardless of the intensity and duration), 11 per cent reported the same.

Even when the data were adjusted for other possible contributing factors (such as body mass index, smoking, age, marital status and previous pregnancies), the researchers found that women who trained every day had a 3.5 times greater risk of impaired fertility as women who did not train at all.

"And when we compared those who trained to exhaustion to those who trained more moderately, we found that the first group had a three-fold greater risk of impaired fertility," says Gudmundsdottir.

In women who reported moderate or low activity levels, researchers found no evidence of impaired fertility.

A transient effect

But the negative effects of hard training do not appear to be permanent, the researcher says.

"The vast majority of women in the study had children in the end. And those who trained the hardest in the middle of the 1980s were actually among those who had the most children in the 1990s," she adds.

There may be various explanations for why the women who first were least fertile ended up with the most children. "We do not know if they changed their activity level during the period between the two surveys. Or if they just had trouble getting pregnant the first time, but afterwards had a hormonal profile that made it easier to get pregnant again," Gudmundsdottir said.

Too demanding?
Scientists have a theory that high levels of physical activity are so energy intensive that the body actually experiences short periods of energy deficiency, where there simply is not enough energy to maintain all the necessary hormonal mechanisms that enable fertilization.

On the other hand, previous research shows that moderate physical activity gives women better insulin function and an improved hormonal profile - and thus better conditions for fertility - than total inactivity, particularly in overweight people.

Forget the easy chair
But Gudmundsdottir says that women who want to become pregnant shouldn't give up all physical activity.

"We believe it is likely that physical activity at a very high or very low level has a negative effect on fertility, while moderate activity is beneficial," she says.

But as far as identifying how much is "just right", the researcher is careful. "An individual's energy metabolism

is a very important factor in this context. The threshold can be very individual," Gudmundsdottir says.

She also recommends that physically active women be particularly aware of their menstrual cycles. "A long cycle or no menstruation at all is danger signals," she says.

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Breastfeeding is not as beneficial as once thought

(06.01.2010) Feeling guilty that you didn't breastfeed your children enough – or at all? Relax. New research shows that breast milk is not as important for either the mother or the child's health.

Researchers at the Norwegian University of Science and Technology have found that the association between breastfeeding and healthy children is not as strong as has previously been believed. It is true that breastfed infants are slightly healthier than bottle-fed babies. But apparently it is not the milk that makes the difference. Instead, the baby's overall health is all determined before he or she is born.

So why do so many studies associate breastfeeding with better health for young babies? The answer is simple: If a mother is able to breastfeed, and does so, this ability is essentially proof that the baby has already had an optimal life inside the womb.

Hormones are a determinant

Researchers at NTNU's Department of Cancer Research

Read more

Acta Obstetricia et Gynecologica. 2010; 89: 87–94

informa

MAIN RESEARCH ARTICLE

Mid-pregnancy androgen levels are negatively associated with breastfeeding

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Abstract

Objective. Breastfeeding depends on endocrine changes during pregnancy. The association between gestational hormones and lactation has been sparsely investigated. Previously, androgens were used for lactation inhibition. We investigated a possible association between second trimester maternal androgen levels and breastfeeding. *Design.* Prospective observational study. *Setting.* University hospital setting. *Population.* Women from a random sample of pregnancies (n = 43) and from a group with an increased risk for giving birth to a small-for-gestational age newborn (n = 118) were included. All participants had singleton pregnancies and one or two previous births. *Methods.* Maternal androgen levels were measured in gestational week 25. The association with reported breastfeeding was explored by univariate and multivariate linear regression analyses. Analyses were adjusted for factors known to be associated with breastfeeding. *Main outcome measures.* Breastfeeding at six weeks, three months, and six months postpartum. *Results.* In the random group, breastfeeding at three and six months was negatively associated with maternal testosterone, androstenedione, and free testosterone index levels. After correction for maternal age, education and smoking, breastfeeding at both three and six months was negatively associated with the free testosterone index. In the group of women with an increased risk for giving birth to a small-for-gestational age newborn, breastfeeding at six weeks and three months was associated negatively with maternal dehydroepiandrosterone and this association persisted after correction for maternal age, education, and smoking. *Conclusion.* Maternal androgen levels in mid-pregnancy are negatively associated with breastfeeding.

Key words: *Breastfeeding, lactation, androgens*

Introduction

Breastfeeding is the single factor that most favorably influences infant death rates worldwide (1). According to WHO, women are recommended to exclusively breastfeed for six months, with subsequent introduction of solid and complementary food. Thereafter breastfeeding should be combined with complementary and solid food for another 6–18 months (1).

Breastfeeding protects the infant against infectious diseases and is held to reduce the incidence of diabetes mellitus (type 1 and type 2), obesity, asthma, and a delay in the onset of atopic eczema in both teenagers and adults (2). Breastfeeding may even be associated with increased intelligence in the offspring (3,3). However, in several reports, a recent large cluster, randomized trial questions many of these positive effects shown in a number of observational studies (4–7).

Breastfeeding is influenced by many factors. Increasing maternal age and education are positively associated with breastfeeding, while high socioeconomic status and marriage show weaker positive

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and Molecular Medicine have recently found a correlation between the level of male hormones (androgens) in pregnant women and how much the women breastfed after birth.

"Pregnant women who have higher levels of androgens breastfeed less," says Professor Sven M. Carlsen. "Probably, this is a direct effect of hormones that simply limit nursing ability, by reducing milk production in the breast."

For example, there is a clear link between testosterone and breastfeeding ability. In fact, until 1980, when more suitable drugs were introduced, testosterone was used to stop milk production in circumstances where it was desirable.

"This was one of the reasons that we wanted to investigate whether the effects attributed to mother's milk really should be attributed to hormonal factors in pregnant women", says Carlsen.

Not a matter of will

Carlsen and colleagues have for years researched the connections between the conditions for the foetus in utero, and the effects these conditions have on the newborn. Among other things, they have looked at the relationship between testosterone levels and various risk factors that are believed to affect breastfeeding.

Women who are smokers, or are overweight, or who have the hormonal disorder polycystic ovary syndrome (PCOS) tend to breastfeed less than their peers. All the women in

these groups have higher levels of testosterone in their bodies when they are pregnant.

In contrast, the older a woman is, the more likely she is to breastfeed. All these relationships can be explained by the level of testosterone, Carlsen says. "It's thus not the woman's will to breastfeed. Women who had more testosterone in their bodies during pregnancy feel the effects of a hormone that limits breastfeeding. That is clearly why it is not as easy to breastfeed."

Placenta is key

Carlsen believes that it is the placenta, not breast milk, that has more of an effect on children's health.

"What happens is that there are hormones that come from the foetus that are converted to testosterone and oestrogen in the placenta -- if the process goes as it should. This is an energy intensive process. If the placenta does not have enough energy, a portion of the testosterone that would have been converted to oestrogen is in fact not converted. Then what happens is that the testosterone goes to both the mother and child, and probably affects both of them", he said.

For the mother, this means reduced development of glandular tissue in the breasts, so that the ability to make milk does not develop optimally during pregnancy. This translates into less or no milk breast milk.

For the child, it looks as if increased exposure to testosterone as a foetus can lead to an increased

incidence of obesity, type 2 diabetes and polycystic ovary syndrome in girls.

Much fuss

Breastfeeding is less common in younger women, smokers, women who have had preeclampsia or are overweight, or with lower birth weight or premature babies, or in women with PCOS, and when the child is a boy.

There are a number of models that are used to explain this – erroneously, Carlsen and his colleagues say. For example, it is claimed that the bond between a mother and her child will not be as strong if the baby is a boy than if the baby is a girl.

"This is the purest nonsense", Carlsen says. "Boys are not less loved by their mothers than girls. We can blame biology here, not mothers. All these relationships can be explained by one and the same cause, namely the level of male hormones during pregnancy."

"We find it very interesting that almost all of the factors previously shown to be associated with breastfeeding can be explained by changes in testosterone levels in the mother during pregnancy," he adds.

Message to new mothers: Relax!

The researcher stresses that it is inappropriate to blame mothers who are unable to breastfeed as much as they are advised. Mothers should not worry that their children will be sicker than children who are breastfed. And even though a child's health risks have already been

established at birth, the differences are so small that they can only be detected when looking at large groups.

Carlsen says mothers should not worry about this. "If you are pregnant, you should live as healthy a lifestyle as possible: quit smoking, cut back on your consumption of coffee and tea, and avoid alcohol", he says. "And when you give birth, you will do the best that you can, if you want to breastfeed."

The research adds that if a mother has a hard time breastfeeding, she should just relax and enjoy her newborn. "Don't let overzealous health professionals give you a guilty conscience" he says.

No breast milk benefit

The researchers examined more than fifty international studies about the relationship between breastfeeding and health. Most studies concluded that the more children are nursed, the healthier the children – which on the surface is correct, Carlsen says.

"But even if this is statistically true, it is not because of breastfeeding itself. There are very few studies that have examined the underlying controls on breastfeeding ability" he adds.

The largest study that has been done on breastfeeding and health was undertaken in Belarus. More than 17 000 women and children were studied, and the children were followed until they were six years old. This study cuts the legs out from underneath most of the assertions that breastfeeding has health benefits, the researchers say.

For example, the Belarus study found no signs that asthma and allergies were less prevalent in children who were nursed for longer than children who were nursed less.

The only area where the study concluded that breastfeeding confers a benefit was in mental abilities.

"It appears that children who are breastfed have a small IQ advantage", Carlsen says. "But this needs to be confirmed in new, carefully planned and conducted studies."

Breastfeeding should be out of politics
The researcher believes it is time for nursing enthusiasts to calm down.

"There are many good reasons to breastfeed. But concern for the child's health is not one of them. There is no reason why women who are struggling to breastfeed should have to go around feeling guilty, or think that they are giving their child a poor start in life if they can't nurse. Baby formula is as good as breast milk", Carlsen says.

Carlsen adds that it is far worse for babies to have a tired, stressed-out mother with a guilty conscience, than to forgo breast milk. The health aspects of breastfeeding should be left out of political arguments, he says.

Breastfeeding environmentally sound
Carlsen believes that the strongest reason to encourage mothers to breastfeed is because of the environment. Breastfeeding avoids the environmental costs of

producing bottles and formula, and the energy consumption that goes with sterilizing bottles.

Breastfeeding is also the right approach for developing countries, where economics, hygienic conditions and the lack of natural resources makes breastfeeding superior to bottle feeding.

Exercise and diet
A study is underway to see if exercise has an impact on testosterone levels, and thus perhaps also on breastfeeding.

"We would also like to have funding to implement a larger study on the effect of diet and nutrition counselling for pregnant women. There is still much we do not know", Carlsen said.

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Yes he can -- US Ambassador visit to NTNU

(18.01.2010)American President Barack Obama has only been in office a year but has steadfastly tackled some of the most pressing problems facing the United States, from health care reform to nuclear proliferation in Iran, the American ambassador to Norway told a gathering of NTNU students on Monday.

“He has taken on tough issues and has not shied away from tackling tough questions,” said Ambassador Barry White, Obama’s appointed ambassador to Norway.

White visited Trondheim Monday to meet with local and county officials, along with representatives from NTNU and SINTEF. He spoke after lunch to about 200 NTNU students at the Dragvoll campus. He said he saw his primary job in Norway was to improve business relationships between to two countries and “to bring

people together," including finding a way to bring more Americans to study in Norway. "I'm a strong believer in people-to-people dialogue", he said.

Expanded Fulbright offerings

At least one aspect of White's work will be made a little easier by the continued increase in the number of exchanges funded through the Fulbright Scholars programme, and the inauguration this year of a new programme called the Fulbright Arctic Chairs. The arctic programme sends a Norwegian arctic scientist to the United States for three months and brings an American arctic scientist to Norway for the same time period. It has been funded by with a 4-year, 6 million NOK grant from the Norwegian Ministry of Foreign Affairs. The recipients of the awards for the 2010-2011 academic year have not yet been announced. White said record low levels of arctic ice in the summers of 2007, 2008 and 2009 illustrated the problems being brought on by global climate change and underscored the importance of improving humankind's understanding of the arctic.

Students asked White about everything from Barack Obama's Nobel Peace Prize to the American government's failure to close the detention camps in Guantanamo Bay, Cuba. "Guantanamo Bay is one of the most serious problems (Obama) faces," White acknowledged. "It's clearly an embarrassment to the United States. But what do you do with the people who are there?" White said the United States had hoped for more willingness among European nations to accept relocation of some of the detainees, but added that the

reasons for their reluctance to open their doors to resettle detainees was understandable.

Nuclear proliferation biggest threat

White also identified potential nuclear proliferation in Iran as “the biggest threat to world security” and said the American government was looking forward to working with Norway on the issue. He closed his comments to the students with an exhortation that sounded more valedictory than diplomatic: “Study hard”, he said. “And go out and save the world.”

Before his appointment as ambassador, White was a successful Boston attorney and served for more than 13 years as Chairman and Managing Partner (CEO) of Foley Hoag LLP, where he was a senior partner in the firm’s business, corporate, international and government strategies practice areas. He practiced law at Foley Hoag for 40 years, and was also active as the Secretary, General Counsel and Member of the Executive Committee of the Greater Boston Chamber of Commerce and as a Director of the Massachusetts Alliance for International Business.

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NTNU composer up for Grammy award

(28.01.2010)Professor Ståle Kleiberg of the Norwegian University of Science and Technology's (NTNU) Department of Music and the Norwegian music label Lindberg Lyd have been nominated for a 2009 Grammy for best surround sound for the album "Treble and Bass."

The awards ceremony is Sunday, January 31.

"Treble and Bass", which features soloists Marianne Thorsen on violin and Göran Sjölin on double bass with the Trondheim Symphony Orchestra, has been released to great critical acclaim. In his review in the November/December 2009 issue of Fanfare Magazine (pdf), Jerry Dubins wrote: "...their sumptuous Romantic tapestries are woven on a modern loom that colors them in striking orchestral effects and often bold and imaginative harmonic and rhythmic reliefs." Dubins called the surround sound

“stunning” and gave the recording five gold stars, adding “more Kleiberg, please.”

Kleiberg and his colleagues are not the only Norwegians whose work is being considered for a Grammy award. StarGate Studios, a record production and songwriting team consisting of Tor Erik Hermansen and Mikkel S. Eriksen, both from Trondheim, are among the producers for Beyonce Knowles’s album “I am Sasha Fierce”, which has been nominated for Album of the Year.

This is the fifty-second year that the Grammys have been awarded. The ceremony will be held in the Staples Center in Los Angeles, California. Composer Ståle Kleiberg is professor of musicology at NTNU’s Department of Music, while violinist Marianne Thorsen is professor of violin and chamber music and Gøran Sjölin is a lecturer in the department.

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Mystery Nazi sign find in Trondheim

(08.02.2010) David Tuddenham, a marine archaeologist at the Norwegian University of Science and Technology (NTNU), expected to find medieval artefacts during a routine archaeological survey of the Nidelva River for the city of Trondheim in December 2009.

After all, Trondheim was founded more than 1000 years ago and was Norway's original capital city, so it wouldn't be unusual to find something from the Middle Ages hidden in the river's murky bottom.

So when Tuddenham saw a bright red sign sticking up out of the river bottom mud, he wasn't quite sure what it was – until he saw a swastika and the German eagle, symbols of the Third Reich, clearly from Germany's occupation of Norway during the Second World War. Now Tuddenham and his colleagues at NTNU's Museum of Natural History and Archaeology are hoping to find out

more about the story behind the sign and how it ended up in the river.

Terboven's realm

The sign, which measures 50 cm by 70 cm, says "Reichskommissar für die besetzten Norwegischen Gebiete Dienstelle Trondheim", which translates as "Reich Commissariat for the Norwegian occupied areas, Trondheim service area." Josef Terboven was Reichskommissar during the occupation of Norway, and researchers believe the sign would have probably hung at Stiftsgården - the Royal Residence in Trondheim -- which was Terboven's residence when he was visiting Trondheim from his headquarters outside of Oslo.

At first Tuddenham wondered if the sign was a fake, partly because the Germans themselves called Trondheim "Drontheim", and the sign clearly reads Trondheim. But further research showed that it was not unusual for civilian signs to use Norwegian place names. This, plus the exceptional quality of the sign itself, have convinced museum authorities that the sign is genuine.

Tuddenham is hoping that by publicizing the find, someone will come forward with pictures of the sign on the front of the royal residence, or may have stories about how it ended up on the bottom of the Nidelva River.

Thrown in the river – but when and why?

"We're very interested in finding out if this is the sign that hung at the Royal Residence – it looks like some type of

entrance sign," Tuddenham says. "Our theory is that someone tore it down in 1945 during the liberation celebrations and threw it in the river – but we really don't know."

Terboven was particularly reviled in Trondheim after he imposed martial law for a brief period in 1942, and at the same time executed 34 Norwegians in Falstad forest, north of Trondheim. The Nazis executed more than 200 people in Falstad. The exact number of victims is unknown.

More photos for download are available from the museum.

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Ocean Space Centre proposal

(08.02.2010) A conceptual study of a NOK 10 billion Ocean Space Centre was presented Monday to Trond Giske, Norway's Minister of Trade and Industry.

The  centre, which has been initially proposed for the Trondheim waterfront, would provide researchers the facilities needed to study an array of marine and maritime topics, from ship design to renewable energy production to fish farming of the future.

The preliminary study is available for download, but is currently only in Norwegian.

No decisions as yet

Giske, who was clearly enthusiastic about the project in a press conference in Trondheim Monday, underscored the importance of maintaining Norway's competitive edge in ocean technology, engineering and biology.

NTNU Rector Torbjørn Digernes said such a centre would enable researchers to "develop the knowledge that's needed to contribute to solving the global challenges the world faces."

"We are embarking on an exciting process that will determine whether it will be possible to establish an alliance among the public sector, industry and national and international research interests that can build and operate laboratories like the Ocean Space Centre", Digernes said.

The concept will be presented to the NTNU Board of Directors to determine what role NTNU should play in developing the concept further.

The centre would be a natural successor to the Hydrodynamic Laboratories at Tyholt, where researchers from NTNU and MARINTEK currently study and test the design of ships, ocean structures and propellers. The laboratories include a cavitation lab, a 50 m by 80 m ocean basin lab, and a 260 m long towing tank. However, as currently envisioned, the Ocean Space Centre would expand the scope of testing facilities in one unified centre to include state-of the-art marine biology laboratories.

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Going for the glide

(21.02.2010)Friction – or the lack of it — in cross-country skiing events at Winter Olympic games in Vancouver is a decisive factor in who wins the gold, NTNU researchers explain.

Fully seven of Norway's 11 Olympic medals to date have been won by residents of the small counties of Nord and Sør-Trondelag, which also happens to be home to NTNU. Among the university's researchers are experts on the physical demands of cross country skiing, the physics of ski glide (this article), physical training and the aerodynamics of ski jumping.

Wax and skis, skill and endurance

Felix Breitschädel, a PhD candidate at the Norwegian University of Science and Technology, has studied the interplay between the choice of skis and wax that makes a winning combination for skiers.Cross-country skiing takes enormous physical skill and endurance – but it also takes the right skis and the right wax to bring home the gold, as Norway’s elite athletes have learned during the Vancouver Olympic Games.

Cross-country skiing takes enormous physical skill and endurance – but it also takes the right skis and the right wax to bring home the gold, as Norway's elite athletes have learned during the Vancouver Olympic Games. Felix Breitschädel, a PhD candidate at the Norwegian University of Science and Technology, has studied the interplay between the choice of skis and wax that makes a winning combination for skiers.

The wrong wax, wrong skis or mistakes in preparation of the base of the ski, "might lead to a change for the worse by up to 3 per cent," he says.

The prep that works best

Cross -country skiers are able to kick and glide because of the way the wax and the physical structure of the ski and its base interact with the snow. When the skier presses down on one ski during a kick, the wax and ski base grip the snow, enabling the skier to push off and glide on the other ski.

Breitschädel, who is in Vancouver with the Norwegian national team, says ski preparation specialists that travel with racing teams have developed a four-step process that helps them decide how the skis should be prepared and what will work best. The steps are:

1) Different skis are tested on the track the day of the race to see what works best.

2) Once a ski itself has been chosen, the prep specialists go to work to create a micro structure on the ski base

that will work in specific snow conditions. This structure is tested prior to the race.

3) Just a few hours before the race, the prep specialists have to test different waxes and wax combinations and wax the skis, which are then tested.

4) Just minutes before the race, the base of the ski is fine-tuned.

Coastal weather, mild temperatures
Breitschädel reports that the weather and track conditions at the Whistler Olympic Park in the Callaghan Valley are very special. “The arena is located 10 km west from Whistler, and about 200 km from the Pacific Ocean, and the area gets an average snow fall of 10 m in the surrounding mountains,” he says. “Currently, the average snow depth is 1.2 m at the Nordic area.”

Even though the site is not directly on the coast, it is still affected by coastal weather he says. The average temperature in February has been + 0.6°C, far warmer than the -1.4°C that has been the 4 year February average temperature.

But as long as there is enough snow, why does snow temperature matter to skiers? Breitschädel, says the mild temperatures in combination with regular showers increase the speed at which the snow changes structure, transforming pointy freshly fallen snowflakes into rounded snow grains. Regular freeze-thaw cycles further increase the snow grain size. Clusters of wet and round bonded snow crystals are the consequence.

Ski base grind and structure

Because the ski slides on the snow, the actual amount of surface area on the ski base is one important factor that determines how much friction there is.

If there is too much real surface contact area, the skier will actually experience some suction under wet conditions, but if it is colder, lots of surface area generates enough frictional heat to generate a thin water film for the ski to glide on.

“The ski base structure has to fit to the given snow grain condition,” Breitschädel says. “New snow, with its complex snow crystals, requires a different ski base structure than old transformed snow grains.” That means cold conditions call for fine grinds while coarse grinds are best for wet snow.

A tiny but critical difference

But what of the disappointings results for the Norwegian men’s team in the 15 km freestyle race? After race favourite Petter Northug turned in a disappointing finish, Norwegian media speculated that the wax might have been wrong. Breitschädel says that’s an overly simplistic assessment.

“Waxing is one out of four parameters which affect the total performance of a ski. In addition to the ski characteristic, structure and track conditions, the waxing and the final ski tuning with a manual rilling tool are all important,” he says. Each team carefully guards its wax and ski structuring secrets, but mistakes happen. The 3

per cent decrease in performance wouldn't make much of a difference for the average skier, he says, but "at such a high level they are crucial and can make the difference whether an athletes wins a medal or not."

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New webgame celebrates NTNU centennial

(19.02.2010) NTNU has released a new online game in conjunction with its 100th anniversary year.

The launch of the online game "The Battle for the Future" is one of several highlights of NTNU's celebration of its 100th anniversary. The game gives NTNU a unusual new communication channel that illustrates how the university has helped create modern Norway over the last 100 years. It has been produced both in Norwegian and English.

Giants duel online

The game was launched with a giant online duel Friday on the big screen in NTNU's high-tech VR lab. The two duelists were the University of Oslo's Rector, Ole Petter

The rumble in the academic jungle

We brought together Torbjørn Digernes, NTNU rector, and Ole Petter Ottersen, University of Oslo, to fight (figuratively) the battle for the academic future. See the video here.

Ottersen, and NTNU's Rector, Torbjørn Digernes. The confrontation, called "The rumble in the academic jungle", was designed to give the two leaders a chance to spar over the title of "Norway's best university".

The Battle for the Future

"The Battle for the Future" will hopefully be seen as both entertaining and educational. The game is played in an environment characterized by well-known Trondheim landmarks. The backstory is that a group that calls themselves "Optimists of the past"(OP) is trying to sabotage NTNU's laboratories. Our avatar and super hero - modeled after Rector Digernes - takes up the fight. Players are challenged to guide the super hero through the game's seven levels (laboratories). Along the way, the player encounters stories, research and facts related to NTNU's research.

"The Battle for the Future" is not designed to compete with massively multiplayer online games like the World of Warcraft or other professional games, but it is lots of fun. The game is primarily intended as a way of informing players about NTNU's work, with the information packed into the game itself. The game showcases the university's cutting edge research, with the seven game levels (laboratories) directly related to NTNU's priority areas of research. The information that players encounter during their journey through the game's world illustrates aspects of the role that the university plays in today's society.

The web-based game has been developed by NTNU and Terra Vision AS, a company created by two graduates of NTNU's Department of Computer and Information Science.

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Limiting exposure to harmful cooking fumes

(19.02.2010) Having trouble deciding whether to buy a gas or an electric stove?
If you're worried about cooking fumes – and research suggests you perhaps should be – an electric stove may be a better choice, researchers at the Norwegian University of Science and Technology have found.

The research, published ahead of print in Occupational and Environmental Medicine, showed that frying beefsteak on a gas stovetop instead of an electric stovetop resulted in increased exposure to chemicals such as napthalene and mutagenic aldehydes, which may be a risk factor in lung cancer.

Ultrafine particles a problem
Frying also increases exposure to ultrafine particles, which are more readily absorbed by the lungs. While exposure to these substances was "considerably higher" when cooking with gas compared to electricity, the researchers, Ann Kristin Sjaastad, Rikke Bramming Jørgensen and Kristin Svendsen, suggest that all

“exposure to cooking fumes should be reduced as much as possible.” Read more.

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Assisted reproduction technoloogy has no effect on birth process or baby's outcome

(01.03.2010)Whether a women gets pregnant the “traditional” way or by assisted reproduction has no effect on the birthing process itself or the baby, researchers at the Norwegian University of Science and Technology (NTNU) have found.
Gynaecologist and medical researcher Liv Bente Romundstad and colleagues from NTNU and St Olav’s University Hospital in Trondheim looked at the pregnancies of more than 1.2 million Norwegian women whose births were listed in the Medical Birth Registry of Norway between 1984 and 2006. Of these, 8229 were pregnancies that resulted from assisted reproduction technology.

In a series of articles published in The Lancet and Human Reproduction, the researchers reported finding no difference between infants of women who had conceived spontaneously and after assisted fertilization in birth weight, gestational age, risks of being small for gestational age, and preterm delivery. Researchers found

a higher risk of breech births in pregnancies from assisted fertilization, but their findings suggest the difference is due not to the technology itself, but to the gestational age of the baby and the number of previous deliveries that the mother had had.

Breech births

Romundstad found that five percent of the children from assisted reproduction are born in a breech presentation, compared with three percent of the average. She says this has a straightforward explanation: Mothers who have children by assisted reproduction, are in fact slightly older than average, tend to have shorter pregnancies, and fewer previous births.

When Romundstad adjusted for these differences, she found out that the difference in the proportion of breech births disappeared completely.

“We also believe that some of the frequency of breech births can be explained by the fact that children often are in the breech position early in the pregnancy,” she said. “The children turned several times during the pregnancy, and assumed the head-down position when the normal gestation period ended.”

“If a child is born before the end of the gestation period, it is not clear that the child has time to assume the head-down position,” Romundstad says.

Greater worries then – but not now

The second important key finding pertains to how the

Norwegian health system treated mothers who became pregnant using assisted reproduction.

“We were more anxious earlier. When we first started with assisted reproduction in 1984, all of these mothers were carefully monitored, and the children were born by Caesarean section,” Romundstad said. “This is a clear difference from women who didn’t need help getting pregnant. For these women, the Caesarean section rate was about 10 per cent.”

Now, Romundstad says, the rate of Caesarean sections in the two groups is quite similar. “For children in the breech position, the difference completely gone,” she says.

No reason for concern

Romundstad says the bottom line is that assisted reproduction itself doesn’t have an adverse affect on pregnancies or babies’ outcomes. There may be conditions that differ in mothers who use reproductive technologies compared to mothers who don’t need help getting pregnant, but those conditions are not due to the technology itself, she says.

“We want to avoid unnecessary medical intervention,” Romundstad says. “If there are no other medical indications, there is no reason to handle mothers who have used assisted reproduction differently than other mothers of the same age who have had the same number of births.”

Survival rates the same

Norway has a unique database for studying birth outcomes. The Medical Birth Registry in Bergen contains data for all Norwegian births from 1967. Beginning in 1984, records were also kept for “test tube” babies. Mothers who use assisted reproduction are given an ultrasound early in their pregnancies, and are followed until the child is one week old.

Romundstad has used these data to also show that the risk of mortality is the same for test tube children as for other children.

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NTNU researcher wins Editor's Choice Award

(08.03.2010)How much carbon does your country emit - and where does it come from? An NTNU researcher has an answer.
NTNU Professor Edgar Hertwich and colleague Glen Peters created a website to answer precisely that question. Now, the article describing the website has won an Editor's Choice Award from Environmental Science and Technology, a leading American scientific journal.

"Carbon Footprint of Nations"
Hertwich, who is head of the university's popular and internationally recognized Industrial Ecology Programme in the Department of Energy and Process Engineering, co-authored the paper "Carbon Footprint of Nations: A Global, Trade-Linked Analysis" with Peters, who is from the Centre for International Climate and Environment Research (CICERO) in Oslo.

The paper describes "Carbon Footprint of Nations", the website created by Hertwich and Peters, where users can check the importance of different consumption

categories for their nations, particularly for imports and exports. The paper was originally published in the June 15 edition of Environmental Science and Technology and details the greenhouse gas emissions associated with the final consumption of goods from 73 nations and 14 world regions.

Importance of emissions from the production of goods

The website also describes how emissions vary with consumption, and the consumption categories that are responsible. The picture that emerges is that there is a clear relationship between emissions and overall consumer spending, and that greenhouse gas emissions rise about 70% with each doubling of consumer spending. Increased consumption increases the share of emissions from transport and consumer goods and decreases the proportion of emissions that can be attributed to food. The study also shows that the emissions related to production of goods that we import are important. “This illustrates the danger of shifting emissions related to our own consumption from in-country to the developing world,” Hertwich notes.

Hertwich and Peter's paper was selected as the best policy paper published by ES&T in 2009, and was selected from among 80 papers nominated by the journal's editors. ES&T is published by the American Chemical Society and features nearly 1500 scientific articles each year. The announcement was made official on Monday, March 8.

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Harassment in the hospital

(27.10.2010) Bullying and harassment are daily fare for many hospital doctors, according to a new study co-authored by a researcher from the Norwegian University of Science and Technology (NTNU).

Among doctors at St. Olavs Hospital in Trondheim, Norway, 11 percent reported that they had been subjected to bullying and harassment at work, while 30 per cent said they had witnessed such harassment.

These are among the findings of a research study published in Work: A Journal of Prevention, Assessment and Rehabilitation, which examined the situation in university hospitals in the four European countries of Norway, Sweden, Iceland and Italy.

Bullying worst in Italy

The study shows that the bullying problem is not unique to St. Olavs Hospital. The situation was worst at the Italian hospital in the study, where 20 per cent of the medical staff reported harassment, of which 40 per cent was harassment by colleagues.

Italy is also different in that most of the harassment took place between managers and subordinates. In Sweden and Norway, hospital staff reported as much harassment from their colleagues as between managers and subordinates.

Absenteeism due to sickness a problem

While Norwegian politicians have expressed concern about the high levels of sick leave in the population as a whole, and blame doctors for being too generous in giving patients sick leave, the problem is the opposite in hospital doctors. According to another study, doctors work even if they are sick themselves. In fact, one unrelated study found that nearly 80 per cent of doctors questioned said they went to work even if they were sick.

Most doctors admitted that they had gone to work in a condition that in their patients would have merited sick leave.

Just 4 per cent absenteeism

At St. Olavs Hospital in Trondheim, about 4 per cent of doctors on average are absent from work due to illness, compared to a rate of 9 per cent in nurses and 11 per cent in other health care workers. These figures are the 2009 net sickness absence rates for the Trondheim hospital. For all industries as a whole, the rate was 7.5 per cent absenteeism due to illness, according to Statistics Norway.

An important reason for the low rate of sick leave may be that doctors are in an occupational group with very high

workload, and who thrive in high-speed situations and heavy workloads as compared to other professions. Many in the profession take good care of themselves. They exercise, eat right and have a healthy lifestyle in general.

Unintended consequences

"But a part of the explanation for the low level of absenteeism in doctors due to illness is their high rate of coming to work while sick, "says Lise Tevik Løvseth, who is a PhD candidate at the Norwegian University of Science and Technology's Medical Faculty. Løvseth has a background in work and organizational psychology from the university.

She points out that the situation is unfortunate for both doctor and patient. "One issue is that medical doctors can expose their patients to infection," she says. "But there are other consequences: Doctors may perform more poorly than when they are well, they have an increased risk of choosing the wrong treatment, are worse at communicating with patients, have a lower work capacity and increase the risk of exhausting themselves."

"The problem should also be viewed in the context of mental health. Strikingly, many doctors suffer from depression, suicidal ideation and burnout. The problem is universal, but few report it or seek professional help," says Løvseth.

Big drop

The project of which Løvseth's research is a part was established at the initiative of the Karolinska University Hospital and has been ongoing since 2002.

The purpose is to gather information about academic medicine, which requires doctors to combine research, teaching and specialization in addition to ordinary clinical practice. The combination entails challenges in several areas. It places great demands on individual doctors, who must perform as a kind of professional athlete, but also involves challenges in how he or she handles the balance between work and family/leisure.

"Karolinska University Hospital was concerned about the increased rates of sick leave among its doctors, and that it was difficult to retain employees. Particularly worrisome was the situation for female doctors, who were more likely to be on sick leave than their male colleagues. In addition, women doctors are still underrepresented in the job hierarchy despite the fact that the percentage of women in medicine is greater than ever," explains Løvseth.

Preventive measures

"Karolinska saw the need to investigate this in depth in its organization, as well as in the physicians' choice of career in academic medicine. In this context it is interesting to compare data from several European countries. A common factor for all hospitals was the ever-increasing demand for efficiency, along with a need to conduct research and compete for external research funding."

"Work pressures on the individual are increasing, with an associated negative impact on working conditions. In several European countries this development has advanced quite dramatically. Sooner or later, the same trends will reach Norway. The more we can identify in advance, the better equipped we will be to prevent it, "said Løvseth.

Løvseth emphasizes that management cannot handle all of these challenges alone. "Doctors have a responsibility to find the right balance between professional and personal needs. This balance is extremely important for doctors who choose a career in academic medicine. Without real numbers for absenteeism due to sickness in this occupational group, we will not be able to address the problem and find solutions."

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A volcanologist's view of the Icelandic eruption

(19.04.2010) The airspace over a great deal of northern Europe remains shut and the Norwegian Prime Minister, Jens Stoltenberg, was stranded in New York City for several days because of the threat from a volcanic ash plume being belched out of Iceland. How long will the eruption of the Eyjafjallajokull volcano continue and what other kinds of activity can we expect?
A volcanologist at the Norwegian University of Science and Technology (NTNU) who has worked extensively in Iceland says a month-long eruption would not be out of the question. But the eruption could also continue for a year or more, he says.

Professor Reidar Trønnes, who was a research scientist at the University of Iceland's Nordic Volcanological Institute from 2000 to 2004, says as eruptions go, the Eyjafjallajokull volcano is not that large. Nevertheless, concerns about the effects of volcanic ash on jet engines led officials in the UK and Scandinavia to stop all air travel beginning on April 15, and extending into early Monday,

April 19, with sporadic airspace openings in parts of Norway depending upon the location of the ash cloud.

Ash and jet engines a dangerous mix

Volcanic ash, which is made up of tiny glass shards that are carried aloft in a foamy mix of steam, can damage jet engines by melting right inside them and causing them to seize up. “I am guessing that this closure of the airspace is something of a precaution because they don’t yet have a handle on the situation,” Trønnes said. “They don’t yet know what the concentration of the ash is in the air.”

Residents from a number of central Norwegian cities reported the smell of sulphur in the air, and some residents in northern Norway reported finding volcanic ash on their automobiles. Trønnes says that the ash gets shot high into the air as magma that was once deep in the Earth comes to the surface and is depressurized. Any water that has dissolved in the magma comes boiling out when the magma is no longer under pressure, much the way that CO2 bubbles out of your selzer water when the cap is removed, he says. The plume coming out of the Eyjafjallajokull volcano also contains a good deal of steam because the intensely hot magma is melting the ice cap that blankets the volcano, he adds.

Eyjafjallajokull's neighbour a concern

While the Eyjafjallajokull volcano’s eruption is highly dramatic, most volcanologists like Trønnes are watching the volcano’s much larger neighbour to the east, Katla. This volcano, buried under the Mýrdalsjökull glacier, Iceland’s fourth largest ice sheet, usually erupts twice a

century, Trønnes says, but has erupted just once in the last 100 years – in 1918. “Katla has had two large eruptions every century since Iceland was settled 1,100 years ago,” he said. “It is long overdue – or it could mean that Katla has changed its behaviour.”

Trønnes said that a number of large volcanic eruptions over the last several decades may have helped drain the vast magma reservoirs that would feed any eruption of Katla. These include eruptions as far back as one that created the island of Surtsey in 1963-67 and one that took place on nearby Heimaey in 1973. “The fact that we have had these two large eruptions in the 1960s and 1970s may have relieved the pressure in the Katla reservoir, although this is just speculation,” he said.

Ash, flooding still a risk

The Eyjafjallajokull volcano now appears to have released enough pressure that Trønnes does not expect any large-scale explosions, but the melting of the glacier caused by lava flows will continue to pose risks of potentially large and devastating floods, such as one that caused Icelandic officials to evacuate 800 people from their homes on Wednesday, April 14, he said.

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Anne-Sophie Mutter awarded honorary doctorate

(16.09.2010) NTNU Rector Torbjørn Digernes says that Anne-Sophie Mutter represents a shining example of all that the university values. On Wednesday 15 September, he named the world-famous German violin virtuoso an honorary doctor at NTNU at a special centennial concert attended by His Majesty King Harald V.

"Anne-Sophie Mutter is a great ambassador for all the values by NTNU stands for. She is internationally outstanding, has deep knowledge and committment to her art, and a global reach," said the rector in his speech announcing the award. The award was made at a special centennial concert held at Trondheim's main concert hall, Olavshallen, on Wednesday night, on the 100th anniversary of the opening of Norway's first institute of technology, in Trondheim in 1910.

Mutter plays frequently with the Trondheim Soloists, and Rector Digernes recognized her contribution to helping give the musicians --and Trondheim's music scene -- international visibility.

A guiding star

"The way that Anne-Sophie Mutter has instructed, inspired and been a beacon for the Trondheim Soloists over the last decade is unique in a European context. She represents the pinnacle of achievement in the artistic world. Her musical performances are based on a perfect blend of a profound knowledge of music and a strong passion for sharing her craft," said the rector.

"Mutter has shared her experience with the members of the Trondheim Soloists at a level far above what most people get over their entire lives as musicians. She has always emphasized the uniqueness of the orchestra's local profile, which is almost entirely based on past and current students from NTNU," Digernes said.

In the company of great scientists, engineers and artists

Mutter was unable to be present at NTNU's anniversary celebration. Via a videocast from Munich, however, the world-renowned violinist expressed great joy at the appointment.

"It's a very special honour to be appointed honorary doctor at NTNU. It is an especially great honour because it is NTNU's 100th anniversary, and because now I am in the company of highly skilled professionals in science,

architecture and music," said Mutter.

Mutter praised NTNU's committment to the Trondheim Soloists, comprised of young string students who play in venues around the world. "It is a fruitful collaboration, where the international reputation of the Trondheim Soloists also contributes to promoting NTNU's name internationally and linked to the extraordinary sound that the orchestra has," she said.

Mutter concluded by saying that she looks forward to returning to Trondheim to play in a concert as thanks for the honour. Read more about the violinist on her official website www.anne-sophie-mutter.de/me_index.php.

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Norway's Winning Olympic Recipe

(1.03.2010)

The 2010 Winter Olympics medal count is in, and while the top three medal winners – the US, Germany and Canada – may not be a surprise, the fourth runner up might be: residents of a small section of mid-Norway called Trondelag, home to about 400,000 people, accounted for 15 of Norway's 23 Olympic medals. In a Feb. 24 article, Wall Street Journal reporters Matthew Futterman and Kevin Helliker called the country's Olympic success, "The Mystery of Norway". What's the secret to this success? Researchers at the Norwegian University of Science and Technology (NTNU) explain the mystery behind the magic.

Frode Moen, head of mid-Norway's Olympic Sports Centre (Olympiatoppen), defended his PhD in coaching at NTNU on Feb. 12, the day the Winter Olympics started. He says part of the reason behind mid-Norway's dominance in the Winter Games is that the region has a long history of producing top-level athletes – which is an inspiration to today's medalists, such as cross-country Olympic gold medalists Marit Bjørgen and Petter Northug.

Success breeds success

“That is an important inspiration for new athletes,” he says. “But this is alone would not produce the results we have seen in the Olympic games.” Moen says that the investment of the Norwegian government in regional sports centres that nurture athletes and provide them top level training and coaching has paid off. In fact, the largest regional Olympic regional sports centre is in Trondheim, the city that is in the heart of Trondelag and is home to NTNU.

“We work hard to support the work of coaches and teams to develop new top-level athletes, especially in winter sports,” Moen says.

Well-educated coaches

The central Norway Olympic Sports Centre also supports the region’s many public high schools that offer a sports education programme. Central Norway has the most sports-related public high school offerings of any area in the country. High school students can pursue programmes that are focused on ski jumping, cross-country skiing, Nordic combined, alpine skiing and biathlon. In fact, both Marit Bjørgen and Petter Northug graduated from a sports high school. Moen says these programmes offer students both time to develop their talents as well as the benefit of experienced, well-educated coaches.

Because high school coaches work for the Norwegian public school system, their formal employment requirements are extremely strict. These coaches also

almost always have experience from their own careers as athletes. And – because there are more public high schools with sports programmes in central Norway than any other part of the country, there are a lot of experienced coaches who can support each other, and who are supported by the Olympic Sports Centre system, Moen says. “This gives central Norway a unique opportunity to grow the talent of the athletes who are willing to pursue Olympic and world championship medals,” he says.

Training supported by research

The Olympic Sports Centre in central Norway offers coaching programmes in cooperation with NTNU. NTNU researchers have also worked with trainers, coaches and athletes in developing optimal training programmes and equipment, says Øyvind Sandbakk, himself a PhD candidate at NTNU and expert at the mid-Norway Olympic Sports Centre. One example is research being conducted by Luca Oggiano, a PhD candidate in Fluid Mechanics at NTNU. Oggiano’s research involves customizing low drag suits with different textiles and different surface characteristics for different parts of the body, which leads to different aerodynamic properties for specific parts of the body. Oggiano also worked with Norway’s ski cross team to create a suit that was able to reduce the athlete’s drag by 15 per cent, which helped Norwegian competitors to win medals in the Olympic ski cross competition.

This support for athletics doesn’t stop at the high school level, however. For example, NTNU offers top athletes the

option to participate in “Team NTNU,” where they can combine a half-time course load with competitive cross-country skiing.

Continued support from politicians

Tore O. Sandvik, County Mayor of Sør-Trøndelag, is supportive of promoting competitive sports programmes throughout the Trondelag region. “Our ambition is to be one of the most sports friendly winter regions,” he says. “The more athletes we have the greater chance we have of finding the best ones.” Support for sports activities such as cross-country skiing goes beyond competitions, says Sandvik. “The more people who are active in sports, the better the region’s general health,” he says. “By supporting and helping talented athletes we also participate in creating role models for people who enjoy participating in sports at all levels. It’s also much more fun watching our own sports stars. Definitely a winning idea!”

Trondelag Olympic medalists

Marit Bjørgen, cross-country skiing (3 gold, 1 silver, 1 bronze)
Emil Hegle Svendsen, biathlon (2 gold, 1 silver)
Tora Berger, biathlon (1 gold)
Petter Northug, cross-country skiing (2 gold, 1 silver, 1 bronze)
Torgeir Nergaard, curling (1 silver)
Anders Bardal, ski jumping (1 bronze)

It’s also worth noting that the alpinist Aksel Lund Svindal (1 gold, 1 silver, 1 bronze), also had his high school education at one of central Norway‘s many public sport high schools. Ole Einar Bjørndalen (biathlon, 1 gold, 1 silver) also lived and worked in central Norway for several years.

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Baby swimming brings benefits

(28.04.2010)Teaching babies to swim turns out to be more than just fun. Baby swimmers have better balance and are also better at grasping at things than non-swimmers. This difference persists even when children are five years old, when babies who have been taught to swim still outperform their peers, research from the Norwegian University of Science and Technology (NTNU) shows.

“Practice makes perfect,” say Hermundur Sigmundsson, a professor of psychology at NTNU.

Now Sigmundsson and Brian Hopkins, a professor of psychology from Lancaster University, have shown that baby swimming is good for developing balance and movement in infants and young children.

Very clear results

The study involved comparing 19 baby swimmers against a control group of 19 children who had not participated

in baby swimming. The only factor that separated baby swimmers from the control group was swimming. All other factors, such as the parents' education, housing and economic status, were the same.

The baby swimmers had participated in swimming classes for two hours a week from the age of 2-3 months until they were about 7 months old. A typical session might involve helping the baby do a somersault on a floating mat, having the baby dive under water, jump from the pool edge, and balance on the hand of a parent while reaching to pick up floating objects.

At approximately age 5, both baby swimmers and the control group were tested with similar exercises. The exercises included walking on tiptoes, balancing on one foot, skipping rope, rolling a ball into a goal and catching a beanbag. The results were crystal clear, the researchers say.

“We saw very clearly that baby swimmers were the best in exercises that related to balance and the ability to reach for things,” says Sigmundsson.

Swimming in Iceland
The survey took place in Iceland, which is Sigmundsson’s homeland.

“Water is as important to Icelanders as snow is for Norwegians. A typical Icelander swims on average once or twice a week, and there is great deal of interest in baby swimming. I know an instructor who has been teaching baby swimming for 20 years. He had a great deal of

information about children who have participated in swimming courses. So it was natural for us to conduct the study in Iceland," Sigmundsson says.

Sigmundsson says he was simply overwhelmed by what the instructor was able to get the babies to do.

"The instructor was able to bring three-month-old babies right up to a balanced position, standing on his palm. The babies locked joints -- it was amazing to watch," Sigmundsson says.

Training makes a difference

He believes that the survey shows that specific training in young children gives results.

"It's incredibly exciting that specific training for young babies has an effect later in life. Development is a dynamic interplay between maturation, growth, experience and learning. Our study shows that we must never underestimate the learning aspect," Sigmundsson concludes.

The study was published in the May 2010 issue of Child: Care Health and Development.

Citation: Sigmundsson, H. and B. Hopkins. 2010. Baby swimming: exploring the effects of early intervention on subsequent motor abilities , Child: Care Health and Development. 36:3, 428-430. DOI: 10.1111/j.1365-2214.2009.00990.x

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NTNU receives IBM Open Collaborative Research Award

(12.05.2010) NTNU was awarded the international Open Collaborative Research (OCR) award by IBM -- making it the first university in Norway to win such an award.
The award is designed to promote open collaboration between university researchers and IBM, and comes with a cash donation of $100,000 USD per year for two years, along with access to IBM research personnel. NTNU is the first Norwegian university to receive this award. The Georgia Institute of Technology, Rutgers University, and Columbia University are among the other institutions that have won the award since its creation in 2006.

Centre for Integrated Operation a target

NTNU Rector's Torbjørn Digernes accepted the OCR award on behalf of NTNU from the CEO of IBM Norway, Morten Throkildsen. Most of the award money will be channeled into NTNU's Centre for Integrated Operations, where NTNU and IBM collaborate to develop support technology for the Norwegian oil industry.

The OCR award programme is designed to bolster strategically important research effort between IBM and leading universities in computer science, engineering, mathematics, and other areas where these kinds of shared efforts lead to innovation and benefit the world at large.

Open source software
The program promotes the development of open source software, related industry standards, and greater interoperability between systems. The fruits from the collaboration between IBM and NTNU will be open - meaning that the results will be freely available, and publicly shared to maximize the opportunity for others to build on the results.

Rector Digernes said he was very pleased that the cooperative agreement signed by IBM and NTNU in December 2009 had resulted in this recognition of one of NTNU's research communities.

IBM Norway CEO Morten Thorkildsen said he was delighted that NTNU had been selected as an OCR award winner, adding that IBM's work with NTNU had already resulted in technological advancements in the oil and gas industry and other areas. IBM hopes the award contributes to further progress in technology that can be developed in co-operation with the Norwegian oil industry.

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Save the planet? Stop eating meat

(07.06.2010)The Earth is expected to be home to roughly 9 billion people by 2050 -- and everyone needs to eat. But a new report from the United Nations Environment Programme observes that growing and producing food make agriculture and food consumption among the most important drivers of environmental pressures, including climate change and habitat loss. The report's lead author is Edgar Hertwich, a Professor of Energy and Process Engineering at NTNU.

The report, called "Assessing the Environmental Impacts of Consumption and Production: Priority Products and Materials" is the first-ever global-level assessment of the causes of different environmental pressures that result from economic activities. Professor Hertwich, who is director of NTNU's Industrial Ecology Programme, worked with colleagues for two years to develop detailed answers to three interrelated questions:

- What are the most important industries that cause climate change?
- How much energy do different consumption activities require when the production of the products is taken

into account?
- What are the materials that contribute most to environmental problems?

Agriculture causes major environmental impacts
Professor Hertwich said he was surprised to find that the environmental impacts of agriculture were greater than the production of materials such as cement and other manufactured goods. While the report does not make specific recommendations for change -- it is instead a detailed description of the problem -- Hertwich says, "it is clear that we can't all have a European average diet -- we just don't have the land and resources for that."

The report itself observes that "impacts from agriculture are expected to increase substantially due to population growth, increasing consumption of animal products. Unlike fossil fuels, it is difficult to look for alternatives: people have to eat. A substantial reduction of impacts would only be possible with a substantial worldwide diet change, away from animal products."

More income, more meat in our diets
Another surprise was the effect of increasing economic affluence on different environmental impacts. The report authors found that environmental impacts increase approximately 80 per cent with the doubling of an individual's income. This increase results in part from a shift to a more meat-intensive diet.

Another related problem -- and another surprise to Hertwich -- was the amount of food waste in both rich

and poor countries. "Between 30 and 50 per cent of all food produced is spoiled or wasted," Hertwich said. "It's really quite surprising how much food waste there is." In poor countries, food is spoiled on the way to the market, while in rich countries, it spoils in people's refrigerators, he said.

Hope for the future?

Both Hertwich and international environmental officials say that people and policymakers must face the substantial environmental challenges facing all of humankind. In a press release from the UNEP, Ashok Khosla, co-chair of the Panel and President of the World Conservation Union (IUCN), is quoted as saying: "Incremental efficiency gains in, for example, motor cars or home heating systems have provided some improvements but, faced with the scale of the challenge, far more transformational measures need to be taken--currently we are fiddling--or fiddling around the edges--while Rome burns."

Hertwich agreed with Khosla's assessment. "There are fundamental challenges out there that I don't think that we as a society have woken up to yet," he said. "Somewhere in our rear-view mirror there is a big monster, and we are pretending it is not there. But I think if we really decide to tackle these challenges we will be able to do so."

Hertwich has also developed a website that enables individuals to look at the Carbon Footprint of Nations. The report was released to coincide with the UN's

Environment Day on June 5. It has received extensive international coverage, including in The Guardian newspaper in the UK.

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Probiotic use in mothers limits eczema in their babies

(20.07.2010) Mothers who drank milk with a probiotic supplement during and after pregnancy were able to cut the incidence of eczema in their children by almost half, a new study published in the British Journal of Dermatology has shown.

The randomized, double-blind study, conducted by researchers at the Norwegian University of Science and Technology (NTNU), compared mothers who drank one glass of probiotic milk a day to women who were given a placebo. Use of the probiotic milk – which the mothers drank beginning at week 36 in their pregnancy up through to three months after birth -- reduced the incidence of eczema by 40 percent in children up to age two, the researchers found. The study is a part of a larger research project at the university called the Prevention of Allergy Among Children in Trondheim, or PACT, an ongoing population-based intervention study in Norway focused on childhood allergy.

Random sample of pregnant women

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Researchers followed 415 pregnant women and their children from pregnancy until the children were two years old. The participants were randomly selected among pregnant women in Trondheim - and then randomly divided into two groups, one of which was given milk with probiotics, and the other a placebo milk. Mothers in the study did not know whether they were given the probiotic milk or the placebo milk.

“The taste of both products was similar, and the milk was delivered in unmarked milk cartons. This means that neither the participants in the study or the researchers knew who had received probiotic milk or placebo milk,” says NTNU researcher Torbjørn Øien, one of the scientists involved in the study. “We can therefore say with great certainty that it was the probiotic bacteria alone that caused the difference in the incidence of eczema between the two groups.”

Eczema incidence lower, or less severe

The children were checked for eczema throughout the period, as well as for asthma and allergy at age two. Afterwards, the incidence of asthma, eczema and allergy was compared in the two groups.

“The results showed that probiotic bacteria reduced the incidence of eczema in children up to age two years by 40 percent. And the kids in ‘probiotics group’ who did have eczema, had less severe cases,” explains Christian Kvikne Dotterud, a student in the Medical Student Research Programme at the Department of Community Medicine

at NTNU.

The study did not show any effect from the probiotic milk on asthma or allergies, however.

More research on allergic diseases
Dotterud and his research colleagues have started a follow-up study of the children to see if they find any preventive effect on allergic diseases, especially asthma, when children have reached six years old.

“Our study is the first to show that certain probiotic bacteria given to the mother during pregnancy and breast-feeding prevents eczema,” says Dotterud.

Previous studies have shown that ingestion of some probiotics by children may prevent eczema, but this is the first study to show a preventative effect when the mother alone consumed the probiotics.

Via breast milk
“In Norway, there has been some skepticism about giving infants probiotics. Therefore, it is preferable that mothers take probiotics, not children,” he said. Probiotics are generally considered safe for healthy people.

To participate in the study mothers had to have planned to breastfeed their children.
“We believe that probiotic bacteria affects breast milk composition in a positive way,” Dotterud said.

The study was sponsored by Tine SA, which produced and distributed the milk used in the study. Tine SA is s Norway's largest producer, distributor and exporter of dairy products, and is a cooperative owned by 15,084 Norwegian dairy farmers. Tine SA had no role in the study designs, data collection or data analysis.

The results of the study have been published in the journal The British Journal of Dermatology. The article is entitled: Probiotics in pregnant women to prevent allergic disease: a randomised, double-blind trial [Epub ahead of print]

Why the increase in asthma and allergies in Norway?
PACT, the Prevention of Allergy Among Children in Trondheim study - was started in 2000 as a primary prevention, controlled study to look at measures that might reduce the increase in the incidence of asthma and allergies that has been recorded in Norway in recent decades.
It is an ongoing population-based intervention study in Norway focused on the impacts on childhood allergy of systematic and structure interventions to reduce tobacco exposure, increase the consumption of n-3 polyunsaturated fatty acids, and reduce indoor dampness.

What are probiotics?
Probiotics are live lactic acid bacteria which can be added to food and drink. In contrast to common lactic acid bacteria used in the acidification of products such as milk

and yogurt, probiotic bacteria have the ability to survive through the acidic stomach environment and settle temporarily in the intestine. The probiotic lactic acid bacteria have a natural place in the digestive system, where they strengthen normal intestinal flora and are good for the body.

What kind of probiotic milk did the scientists use?
Researchers used the Norwegian product Biola from Tine SA. There are wide variations in terms of how well the strains in the probiotic products on the market have been documented. Biola contains LGG ®, the probiotic bacteria that are currently the most extensively studied in the world. Biola product used in the study also contains Lactobacillus acidophilus (La-5) and Bifidobacterium lactis (Bb-12). These also have documented health effects, albeit less extensive than LGG ®. There is reason to believe that it is beneficial for your health to consume a variety of bacterial strains with documented efficacy, rather than unilateral influence of only one bacterial strain.

What is LGG ®?
LGG ® (Lactobacillus rhamnosus GG) is the probiotic bacteria strain that has been the most studied and researched in terms of human health effects. It has been shown that LGG ® contributes to good gut function and a stronger defense against unwanted bacteria and viruses in the stomach. At present there are more than 500 published articles on LGG ® in international journals and more than 30 doctoral theses have been completed on

LGG's ® effect on health. More than 40 countries in different parts of the world market products with LGG ®.

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Rat babies find their way

(17.06.10) Are we born with an innate sense of direction, or is it learned? Research from the Norwegian University of Science and Technology's Kavli Institute for Systems Neuroscience suggests that the brain comes hard-wired with working navigational neurons. While these neurons – head direction cells, place cells and grid cells – mature over time, they appear to function in rodents as soon as they make their first exploratory steps outside the nest.

Researchers Rosamund Langston and colleagues wanted to know how the brain mapped place and space when an animal navigates for the first time ever. The research team implanted miniature sensors in rat pups before their eyes had opened (and thus before they were mobile). That enabled the researchers to record neural activity when the rat pups left the nest for the first time to explore a new environment.

The researchers were not only able to see that the rats had working navigational neurons right from the beginning, but they were also able to see the order in which the cells matured.

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The first to mature were head-direction cells. These neurons are exactly what they sound like – they tell the animal which direction it is heading, and are thought to enable an internal inertia-based navigation system, like a compass. “These cells were almost adult-like right from the beginning,” Langston says.

The next cells to mature were the place cells, which are found in the hippocampus. These cells represent a specific place in the environment, and in addition provide contextual information — perhaps even a memory — that might be associated with the place. Last to mature were grid cells, which provide the brain with a geometric coordinate system that enables the animal to figure out exactly where it is in space and how far it has travelled. Grid cells essentially anchor the other cell types to the outside world so that the animal can reliably reproduce the mental map that was made last time it was there.

Baby rats open their eyes and begin exploring by about 15 days after birth. At this point, researchers could already see head direction cells nearly fully developed, and the rudiments of the other two cells in place. By the time they were 30 days old, or on the threshold of rat adolescence, virtually all of the different navigational cell types had matured.

Langston says the findings are a partial answer to the age-old question of whether or not you are born with the innate ability to find your way around. Her answer? “It

really seems that this is hard-wired," she says, "You do have a basic foundation that is there as soon as you can explore – there are strong building blocks for a system that you can use to navigate. " Langston says experience could also play a role, which makes this topic an important theme for further research.

The researchers found no difference in navigational skills between male and female rat pups, which implies that both sexes have the same building blocks with which to construct representations of space. Perhaps the age-old question of whether males or females have a better sense of direction could be a case of how we choose to build our map, rather than the materials we start with.

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Going for Olympic Gold -- Cross-Country Skiing

(12.02.2009)Cross-country skiing is one of the most demanding of all Olympic sports, with skiers propelling themselves at speeds that exceed 20-25 km per hour over distances as long as 50 km. Yet the difference between winners and losers in these grueling races can be decided by just the tip of a ski.
Norway, with just 4.7 million inhabitants, holds the world's records for most Winter Olympic medals, and most medals in cross-country skiing. So just what gives top racers the advantage?

In an article to be published in the European Journal of Applied Physiology, Øyvind Sandbakk, a PhD candidate in the Norwegian University of Science and Technology's Human Movement Science Programme, reports with his colleagues on the metabolic rates and efficiencies of world-class skiers. Sandbakk's research offers a unique window on what separates the best from the rest in the world of elite cross-country racers. In addition to his PhD research at NTNU, Sandbakk also works as a researcher

for Olympiatoppen Midt-Norge, the Mid-Norway Norwegian Olympic Committee.

Aerobic capacity and technique

“Skiers need high aerobic and anaerobic energy delivery, muscular strength, efficient techniques and the ability to resist fatigue to reach and maintain top speeds races”, Sandbakk says. Those physical attributes may not be so very different from other world-class athletes, except that cross-country skiers also need to have mastered a variety of techniques and tempos, depending upon the course terrain, Sandbakk notes.

These challenges mean that the importance of the athlete’s different physical capacities will differ in different sections of races, and between different types of competitions. For example, during the 10- and 15-km freestyle (skate) races in the Vancouver Olympics (the first of which are scheduled for February 15, with a 10km women’s race and a 15 km men’s race), skiers with high aerobic power (often referred to as maximal oxygen uptake per kilo body mass) will have an advantage in maintaining high speeds during the race, especially in the uphill terrain, Sandbakk says.

He says it is the uphill terrain that normally separates skiers the most during freestyle races. However, the 10- and 15-km courses also contain a great deal of level terrain, where an athlete with higher muscle mass and anaerobic power may have the edge needed to win.

Speeds, slopes and terrain

Cross-country skiing also challenges skiers to master a great range of techniques for different speeds and slopes. Sandbakk predicts this factor will be crucial in the technically difficult Vancouver competition tracks. In skating races, skiers have as many as seven different skiing techniques (much like the gears on a bicycle) at their disposal, and they constantly shift between these different techniques during a single race. “Skiers even adapt these seven techniques depending on the speed and slope”, Sandbakk says. “The best skiers tend to ski with longer cycle lengths (the number of metres a skier moves his centre of mass per cycle), but with a similar cycle frequency”, he says. “But during the last part of the race, the cycle frequency seems to be higher in the better skiers.”

Another crucial aspect of technique is when the skier pushes off with his or her skate ski, and the skier’s ability to recover quickly from the tremendous physical demand of providing a forceful push. “The ability to resist fatigue seems tightly coupled to the ability to maintain technique and keep up the cycle lengths and frequencies during a race”, Sandbakk says. “In two skiers of otherwise equal fitness, this may be the deciding factor during the last part of the race in determining who wins the gold.”

Norway holds Winter Olympic medal records

Norway has won 280 medals in the Winter Olympics, which is the record for the Winter games. Norway also has won the most Olympic cross-country medals of any

country, with a total of 87, 30 of which are gold, 34 are silver and 23 are bronze.

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NTNU says no to academic boycott of Israel

(12.11.2009) The Board of NTNU decided today, Thursday, to reject the proposal for a boycott of Israel. The decision was unanimous and in accordance with the Rector's recommendation.
The background to the case was an appeal from a group of employees at the Norwegian University of Science and Technology (NTNU) and the Sør-Trøndelag University College (HiST), with a challenge to the institutions to approve a cultural and academic boycott of Israel. The goal of the boycott was to exert international pressure on Israel to start negotiations with elected Palestinian authorities and the international community in order to put an end to the suffering of Palestinians during the occupation by Israel.

The petition was presented by the Rector during the previous board meeting as an oral briefing, and the Board then asked to have the matter put on the agenda for today's meeting for a substantive discussion.

Board against the boycott

The Board voted against the proposal to boycott, and stressed the need for open lines of communication and between scientists at NTNU and academic institutions in Israel.

“As an academic institution, NTNU's mission is to stimulate the study of the causes of the conflict between Israel and the Palestinians and how it can be resolved. This means that the university is also dependent on being able to cooperate with Israeli academics, and hear their views on the conflict”, said the board.

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NTNU a leader in sustainablity in engineering education

(25.09.2009) A new report recognizes the Norwegian University of Science and Technology as one of the top universities in Europe in incorporating sustainability issues in the education of all its engineers.

NTNU ranked second in a pan-European survey of more than 55 universities of technology (pdf) that educate engineers. The top ranked university was University of Strathclyde, in Scotland.

The ranking assesses universities based on five criteria:

- the official university policy on sustainable development in engineering education for research, education and in-house activities;
- the number of courses and specializations in sustainable development offered at the

undergraduate level;
- the post graduate educational offerings;
- the degree to which sustainable development is included in different curricula;
- in-house environmental management systems.

NTNU master's programme in Industrial Ecology
An important factor behind NTNU's high ranking is its Industrial Ecology Programme, which was created in the mid 1990s, and was the first programme of its kind in the world. Today it is a world leading academic programme in industrial ecology that attracts students from around the world. The focus is on state-of-the-art methods for environmental systems analysis and strategies for policy and management, as well as on the application of such strategies and methods to critical systems.

A number of other NTNU programmes, such as Product Design and Manufacturing, Civil and Environmental Engineering and Energy and Environment, incorporate environmental issues early on as part of their educational offerings. These courses of study, along with the HES programme in Industrial Economy , Product Design , and Technology Management and Physics, offer specializations that are related to sustainable development.

Consistent high marks
This is the second time that NTNU has received high marks from the EESD Observatory (Engineering Education for Sustainable Development), which produced

the survey and report. In fact, NTNU was the top ranked university in 2006.

The report was commissioned and conducted in cooperation with the Alliance for Global Sustainability (AGS).The EESD is comprised of the Technical University of Catalonia, Delft University of Technology and Chalmers University of Technology. AGS is an international partnership composed of the Massachusetts Institute of Technology (MIT), the Swiss Federal Institute of Technology, the University of Tokyo and Chalmers.

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Scholars at Risk welcomed at NTNU

(05.03.2009) NTNU will join the Scholars at Risk programme, the NTNU Board decided on February 25. NTNU's Student Parliament and SAIH, the Norwegian Students' and Academics' Assistance Fund, were instrumental in helping the NTNU Board adopt this decision.

Scholars at Risk is an international network that promotes academic freedom, including by providing temporary stay and work for graduates who are persecuted in their homelands. SAIH conducted a campaign in the autumn with a focus on academic freedom, and urged NTNU students to get involved. NTNU's Student Parliament subsequently decided that NTNU ought to join Scholars at Risk. As a result, the issue was incorporated into NTNU's international action plan, which was endorsed by the NTNU Board on February 25.

A global perspective

"We are very pleased that NTNU has shown solidarity with academics in other countries, and is looking at the issue at the academic freedom from a global

perspective", said Marthe Øren, director of SAIH-Trondheim.
"This was a great initiative from SAIH that the Student Parliament took up, and it proves that it is important to be engaged", says Bjørnar Kvernevik, President of the NTNU Student Parliament.

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Nobel laureate Ivar Giæver lectures in Trondheim

(03.04.2009) If Nobel laureate Ivar Giæver could develop one technology for the betterment of society, it would be this: computers that could think, faster and better than humans do.

Then they could solve all the other technological problems facing humankind. "It would be fantastic," he says. Just shy of 80, with a leonine mane of silver hair and an engaging smile, Giæver is an unabashed supporter of technology, who thinks that fretting about the unintended consequences of future technological developments is a waste of time.

"One hundred years ago, people in New York City were worried about where they were going to get enough horses," he remarks wryly. "What we worry about now is not what people are going to worry about in the future."

Giæver's vision may seem either lofty or irresponsible, depending upon your view, but it's in keeping with an intellectual approach that led him from a degree in mechanical engineering from the Norwegian Institute of Technology in 1952 to the Nobel Prize in Physics in 1973. Giæver returned to Trondheim and his alma mater – now the Norwegian University of Science and Technology -- to talk about the interplay between physics and biology, and his view of the next frontiers for science.

From superconductivity to cell behaviour

The title of Giæver's talk, "DNA -- Nanotechnology and a little more", delivered to the Trondheim Polytechnic Association on April 1, gives a flavour of where the scientist's interests lie now. In fact, not long after conducting the research that won him the Nobel Prize, Giæver was awarded a Guggenheim Fellowship and spent a 1969 in Cambridge, England, studying biophysics. It's passion that he has pursued ever since.

Giæver's intellectual journey started in part because of a housing crisis in post-war Norway. After he graduated from NTH and did his year of obligatory military service, Giæver had hoped to settle in the Oslo area with his young wife and child. But housing was very tight, and he would have had to wait eight years to get a house. In 1954, three weeks after he realized how difficult it would be to get housing, Giæver and his young family were on their way to Canada and a new life, with Giæver hired on to work at Canada General Electric's Advanced Engineering Programme.

Paid to do research

In 1956, Giæver emigrated to the US to study in GE's A, B, and C engineering courses. It was here that he had an epiphany that would change the course of his career. "I made what I called the biggest discovery of my life," he said in an interview recorded for the Nobel Foundation in 2004. "I discovered that people could get paid for doing research. I was completely flabbergasted – I never heard of that -- These people went around¿wrote on the blackboard, looked like they had a good time. I said 'That's what I want to do.'"

Giæver started working at GE's Research and Development Center in 1958 while simultaneously starting his PhD in physics at the Rensselaer Polytechnical Institute. In 1960, he performed the experiments with thin films, tunneling and superconductivity that would lead to his winning the Nobel Prize in Physics, an honour he shared with two others that year.

He finally left GE to become an institute professor at RPI in 1988. He also founded Applied BioPhysics, Inc., to exploit physical properties to make tools that could be used in drug discovery and cell research.

Limitless potential of biological research

Biological research, particularly genetic research, holds untold potential, he told an audience of nearly 200 at his Trondheim lecture. "We can do everything possible with genetic engineering," he said. "Everything that is natural is not necessarily the best."

Giæver was critical of Europe's reluctance to accept genetically modified foods, and addressed a number of questions from his audience about the potential problems that these foods might pose. "From my perspective, if you can make food that is better, healthier, uses less chemicals and is cheaper, then that is a good thing," he said. "There is no ethical problem."

In fact, he says, one of the best things that an engineering school can do for its students is to require them to study biology along with more traditional courses such as physics and mathematics. "Absolutely," he says. "That is where the new discoveries will lie. That is the future."

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NTNU and SINTEF in new national energy research effort

(16.02.2009) NTNU and SINTEF will be key players in six of the eight new national centres for environmentally friendly energy that were created by the Research Council of Norway in early February. “We are proud that we can contribute with our combined expertise to making the energy revolution possible”, NTNU Rector Torbjørn Digernes and SINTEF CEO Unni Steinsmo said.
Top management at NTNU and SINTEF praised the government, industry, and the Research Council of Norway for the decision to invest in eight new national "Centres for Environment-friendly Energy Research” (CEER).

SINTEF and NTNU are the host institutions for four of the eight centres, and will be partners in two others.

The Norwegian government has committed as much as NOK 1 billion for the centres over the next eight years, with another NOK 1 billion from industry, in accordance with both the national R&D strategy for energy, Energi21,

and a broad-based political agreement on climate reached by the Storting in February 2008.

Cooperative between Industry and research
Digernes and Steinsmo are pleased that the national research effort on renewable energy will be undertaken in centres where research and industry work together on common problems. Each centre consists of several research institutions and industrial enterprises, with the potential to add more partners over time.

The two leaders believe that Norway should invest in technologies where the country already has strong expertise. The model created by the government takes this approach, the two said.

Important global contributions
“The development of this technology is one of most important contributions that Norway can make to the world on climate issues”, Steinsmo and Digernes add.

“The new centres will be very important in Norway's international climate efforts. The Trondheim research community is already collaborating extensively on climate research with leading groups in Europe, USA and China /Japan. We will now build on this and develop both the technology and awareness of what will be needed for an energy revolution.”

Substantial emissions cuts
“We will work with our partners to ensure that Norway and the global community get the most return from our efforts. Norway in its role as a provider of cutting-edge

research and technology can contribute to global emission cuts that are many times greater than the cuts we can make here in Norway alone", the two leaders said.

This goal will be achieved through three main strategies:

- A sharp increase in the production of electricity from renewable sources such as wind, solar and biomass.
- The capture and storage of CO2 emissions from the use of fossil fuels such as coal, oil and gas.
- More efficient end use of energy (energy efficiency).

New industry, new revenue

The centres were selected by the Research Council of Norway based on the applicants' expertise and the opportunities the different groups offered for value creation and innovation.

The centres are expected to develop technological breakthroughs in renewable energy, but the initiative will have the added benefit of building the nation's academic expertise by adding new positions for PhDs, postdocs and researchers.

"This new environmental effort that the government is financing will stand or fall based on our ability to continually bring forward new professionals with the skills we need", Digernes and Steinsmo stressed.

High quality applications

The research council chose 12 applications for its "final

round" of evaluations.

Digernes and Steinsmo stressed that all applications were very high quality, and involved considerable work. The result was that different research and industry groups established cooperative efforts on various aspects of environmentally friendly energy. NTNU and SINTEF are hopeful that this effort can continue, even for centre applications that were not selected for the final round.

"These applications are of such high quality that it will be important to make use of these efforts in other ways. We are happy to work with the Research Council and industry to determine how this can be achieved", Steinsmo and Digernes said

"One important aspect is to make sure that we keep the community perspective in mind. This will be crucial in ensuring that we make the kinds of changes a new sustainable energy regime will require", the two added

The following new centres include NTNU and SINTEF as leaders or partners:

- Research Centre for Offshore Wind Technology.
  Host organization: SINTEF Energy Research
  Centre leader: John Olav G Tande

- BIGCCS Centre - International CCS Research Centre
  Host organization: SINTEF Energy Research
  Centre leader: Nils A. Røkke

- CEDREN – Centre for Environmental Design of Renewable Energy
  Host organization: SINTEF Energy Research
  Centre leader:Atle Harby

- CenBio – Bioenergy Innovation Centre
  Host organization:University of Life Sciences - UMB
  Centre leader: Lars Sørum

- ZEB – The Research Centre on Zero Emission Buildings
  Host organization: NTNU
  Centre leader: Anne Grete Hestnes, NTNU

- The Norwegian Research Centre for Solar Cell Technology
  Host organization: IFE
  Centre leader: Erik Stensrud Marstein

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Pictures from Doctoral Degree Awards Ceremony 2009

All photos should be credited to Thor Nielsen, NTNU Communication Division

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Matriculation 2009

(11.08.2009) From the global economic crisis to the swine flu epidemic and global warming, today's students face ample challenges that they can and must tackle, the Norwegian Minister of Research and Higher Education, Tore Aasland and NTNU Rector Torbjørn Digernes said Tuesday.

"We live at a time where there is a global economic crisis, a climate crisis, and a swine flu epidemic about which much remains unknown. What these crises have in

common is that knowledge is critical in tackling them," Aasland told the thousands of students, who filled NTNU's expansive commons on the Gløshaugen campus. "And it is you, the best minds we have, who must contribute to making the world a better and more interesting place. It is our knowledge that will be decisive in determining whether or not we find ways to meet our energy needs and reduce pollution."

"Yes you can."

Digernes echoed Aasland's challenge to students, and offered a vote of confidence in their abilities with a catchphrase borrowed from "someone who is more well-known than an NTNU rector," he said, with a nod to American president Barack Obama: "Yes you can!"

NTNU had a record number of applicants, Digernes said, with roughly 10800 students listing the university as their first choice. With approximately 7400 places available to new students, the university "could not accommodate everyone who wanted to attend NTNU", Digernes told the assembled first-year students. "You who are standing here today can therefore consider yourselves to be among the privileged."

Popular student city

The speeches also acknowledged the practical realities of 21st century living in Trondheim, Norway's most popular student city, which is currently short of student housing. With a national election looming on September 14, Aasland reminded students – potential voters – that the ruling governing coalition led by Labour Party head Jens

Stoltenberg, has worked hard to bring more funding to higher education overall.

She noted that the government has built 1300 new student housing units this year and will continue to build more. Aasland's pledge comes as more and more eligible students apply for places at Norway's universities and university colleges. More than 104,000 students applied for places this academic year, with NTNU one of the top choices, particularly for areas such as nanotechnology, medicine and architecture.

Year's largest celebration

The hour-long event, which featured inspiring speeches interspersed with practical information and entertainment by NTNU's "music ambassadors", the Ola Kvernberg Trio, is by tradition NTNU's single largest annual celebration. It marks the beginning of the Norwegian university school year, of which the first week is generally devoted to freshman orientation. Most regular classes begin the week of August 17th.

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One litre of fuel, 1246 km and a prize-winning record

(12.05.2009) Ten NTNU master's students, two volunteer drivers and an 80-kg carbon fibre automobile dubbed "Fuel Fighter" set a new record in Lausitz, Germany last week, and won first prize in the 2009 Shell Eco-Marathon.

The competition, which began Thursday, May 7, is for university and upper secondary school students to design, build and race a vehicle that can travel the farthest on one litre of gasoline. On Saturday, after ironing out several technical bugs, the NTNU students drove 22 km in 55 minutes -- after which the fuel consumption in their hydrogen fuel cell car was measured. This is then converted to an equivalent use of gasoline.

The conversion showed that the Fuel Fighter travelled the equivalent of 1246 km on a litre of gasoline. The record was set last year by De Haagse Hogeschool (Netherlands), whose car ran the equivalent of 848km on a single litre of fuel. The Dutch team took second place in

this year's competition, travelling the equivalent of 804 km.

The NTNU students competed for the first time last year in the Eco-Marathon, and returned with a second place finish in the Urban Concept Fuel Cell category, which is intended for cars that have been designed with four wheels in a more conventional roadworthy format.

Most of the students are from NTNU's Product Design and Manufacturing programme, but there are also students from Chemistry and Biotechnology , Engineering Cybernetics, and Electric Power Engineering. The NTNU students thought they would be able to beat the 2008 record and travel 1000 km on one litre of fuel -- little did they realize how right they were!

This year marks the 25th annual Shell Eco-Marathon, which had its origins in a 1939 in an argument between employees of Shell Oil's research laboratory in Wood River, Illinois, as to whose car got better fuel mileage. The competition this year has drawn students from 25 countries in Europe, Africa and Asia.

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International Student Festival in Trondheim 2009 - the programme released

(28.01.09) ISFiT 2009 offers the most exciting festival programme in Trondheim ever. Both Trondheim and the participants of ISFiT will get a unique meeting with culture from all the corners of the earth.
Nobel Peace Prize laureates Desmond Tutu, Shirin Ebadi and Betty Williams will attend ISFiT 2009; the festival takes place between the **20th of February and the 1th of March**. They will meet students from the entire world, share their experiences and give advice for the future. Former head of the United Nations Monitoring, Verification and Inspection Commission, Hans Blix, will attend a meeting on weapons of mass destruction and the three novelists Bharati Mukherjee, Kjartan Fløgstad and Nawal El Saadawi will discuss literature as a political tool.

- This is impressive. I believe persons as Tutu, Ebadi and Williams look at ISFiT as an arena where they can get in touch with international youth, the leaders of tomorrow, says Torbjørn Lindstrøm Knutsen, professor of social

science at The Norwegian University of Science and Technology (NTNU).

ISFiT has a varied cultural program, with music, art and stage events from the entire world. The people of Trondheim and the participants will get a "once-in-a-lifetime" opportunity to explore and experience what the world offers. The Global Fiesta, a huge party for the entire city and concerts with French Herman Dune and Norwegian Marit Larsen are some examples of the exciting cultural events during ISFiT.

Every second year ISFiT gathers 450 students from the entire world. Since the beginning, different themes related to social and political topics of international importance have been discussed. The main theme of ISFiT 2009 is peacebuilding.

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NTNU mathematician adds up to the best

(28.04.2009) She's been named a member of the Royal Swedish Academy of Sciences, and awarded Norway's top researcher prize, the Moebius award.

On May 4, Idun Reiten, a mathematician at the Norwegian University of Science and Technology (NTNU), was recognized with the national Fridtjof Nansen Prize, for outstanding research in science and medicine. She has also recently learned that she will travel to Hyderabad, India, in 2010 to deliver the Emmy Noether lecture at the International Congress of Mathematicians – an honour that recognizes her as one of the world's leading female mathematicians.

"This came totally out of the blue," Reiten, 67, said. "I was pleasantly surprised."

Four decades as a theoretical mathematician

Reiten may have been surprised, but those who are familiar with her four-decade-long career as a theoretical mathematician were not. Reiten has authored more than 100 papers and developed a theory that bears her name, the Auslander-Reiten theory.

In 2007, she was elected to the Royal Swedish Academy of Sciences, the group that awards the Nobel Prizes in Physics and Chemistry, the only woman in the mathematics group and the only Norwegian in the academy's mathematics, natural sciences and technology disciplines.

"Beautiful and elegant"

Most recently, Reiten has worked in cluster theory, a branch of algebra that was introduced in 2000. Reiten's namesake theory has been described as "beautiful and elegant" by colleague Gordana Todorov, Associate Professor of Mathematics at Northeastern University in the United States.

"In many fields of mathematics and especially in the many aspects of the representation theory, Auslander-Reiten quivers (a particular consequence of the theory) appear as convenient combinatorial tools," Todorov says.
Reiten's collaborators work in the United States, Canada, Belgium, Greece, Mexico, Italy, Germany, Japan, Poland, England, France and Argentina.

But don't worry if you find cluster theory a bit esoteric – Reiten herself acknowledges the challenge in giving the

Noether lecture in India, even to a room full of more than 2000 international mathematicians, because any branch of mathematics is so specialized. “New theories are being developed all the time,” she said. “That is why it will be hard to give a lecture even to a general audience of mathematicians.”

German, Latin, chemistry and... maths

Reiten’s career developed somewhat unconventionally – she always loved mathematics, but was unsure if she should pursue a career as a mathematician. Instead, she specialized in Latin in high school, and studied German, mathematics and chemistry as an undergraduate at one of NTNU’s predecessors, the Norwegian Teachers College in Trondheim. She took her PhD in mathematics at the University of Illinois in 1971, and at the time was only the second Norwegian woman to be awarded a PhD in maths – with the first awarded in 1902. She says her interest in language and in mathematics grew out of a common fascination in finding patterns in things.

“I study abstract systems and find the properties that will apply elsewhere,” she says. “The idea is to see the similarities in things, to look for common structures.”

Thinks in English -- and in symbols

Reiten needs nothing more than a notebook and a pen to do her research, as she thinks out theorems and proofs. She writes in a small hand in unlined A4 notebooks, often diagramming her ideas with arrows to see if they will work. Reiten’s native language is Norwegian, but she thinks and writes in English. While she would encourage

anyone who is interested to pursue mathematics as a career, she says it's rare that she has to encourage higher level students. "Mostly people who study maths are people who really like it," she says. "It's rare that you say to someone, 'you should study maths'. Generally, people know."

The Emmy Noether lecturer at the International Congress of Mathematicians, which is held every fourth year, is now chosen by the International Mathematical Union to "honor women who have made fundamental and sustained contributions to the mathematical sciences". Emmy Noether was a German mathematician who was forced to flee Nazi Germany in 1933. She came to the United States to teach at Bryn Mawr College but died in 1935, just two years into her new life in America. Albert Einstein described Noether in a letter to the New York Times as "the most significant creative mathematical genius thus far produced since the higher education of women began."

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Carbon capture and storage a key to a greener future

(17.06.2009) Carbon capture and storage – in which the North Sea will play a key role -- has the potential to transform coal into an environmentally friendly fuel that will enable the world to make the transition to sustainable energy production, attendees at an international conference on CO2 capture and storage in Norway were told Wednesday.

If the world succeeds in safely sequestering gigatons of carbon dioxide, “coal will not be a dirty fuel,” said Erik Lindeberg, chief scientist at SINTEF Petroleum Research, at the 5th Trondheim Conference on CO2 Capture, Transport and Storage, held on June 16-17. “Instead, it will be an attractive transition energy source” that can help the world gear up to exploit wind, solar and wave power more effectively.

Lindeberg was one of five keynote speakers at the conference, hosted by the Norwegian University of

Science and Technology (NTNU) and SINTEF's jointly operated Gas Technology Centre. More than 300 researchers from across the globe travelled to Trondheim for the two-day event.

Two gigatons and counting

Lindeberg reiterated what most of the attendees already knew: that meeting global goals for controlling greenhouse gas emissions in the next few decades will require European nations to capture and store as much as two gigatonnes of carbon dioxide per year, or half of what Europe emits today. Lindeberg said undersea reservoirs will play a deciding role in meeting this demand – particularly the abandoned oil and gas reservoirs in the North Sea. "Large scale EU CO_2 storage capacity will rely on offshore aquifers," he said. "The North Sea has natural capacity for this storage."

Moving 2 gigatonnes of carbon dioxide to the North Sea could be done with 10 large pipelines, Lindeberg said, or about the equivalent of what is already in use by the petroleum industry there. All told, assuming costs of 40 euros per tonne of CO_2, carbon capture, transport and storage could become a 80 billion euro per year industry, he said. If storage alone represents 15 per cent of those costs, it will amount to a 12 billion euro per year industry -- or about the same value as Norway's current oil exports.

A hotbed of CCS research

NTNU and SINTEF hosted the conference as an outgrowth of a number of different carbon capture and storage

cooperative research projects that have been funded in Trondheim, both by the Research Council of Norway and by various European Union initiatives. The biggest of these is called (appropriately enough) BIGCCS.

Nils Røkke, conference chair and SINTEF's vice president, climate change technologies, says that NTNU and SINTEF together command roughly 20 million euros per year in funding for carbon capture and storage research. As a result, Trondheim "is the largest R&D community in the world right now for CCS research", he says.

The conference website contains more information about the programme and links to previous conferences.

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NTNU and StatoilHydro sign multi-million kroner cooperative agreement

(24.06.09) It's the single largest agreement NTNU has ever signed with a company. And it's the first ever in Norway that has been signed "virtually", with the help of NTNU's new virtual reality (VR) laboratory.
The "Akademia Agreement" between NTNU and StatoilHydro is a comprehensive cooperative programme for research and education, with financial support for student activities, PhD scholarships and professorships.

The agreement should also enhance international cooperation on the exploration for and production of oil and gas.

"The 'Academia Agreement' is the result of many years of cooperative efforts among Statoil, Hydro and NTNU. This collaboration has helped to provide better conditions for education and research here at the university, through greater access to resources as well as access to relevant, real world problems ", NTNU Rector Torbjørn Digernes says.

A virtual -- but real -- agreement

NTNU Rector Torbjørn Digernes (right) uses a high-tech communication system to meet with StatoilHydro's executive vice president for technology and new energy, Margareth Øvrum, who was in Bergen along with Gunnar Halvorsen and Petter Eltvik. Download larger version of photo

Norway's first ever virtual signing of an

The agreement extends over five years, and has a value of close to 20 million kroner a year. It is one of eight signed by the company with Norway's institutes of higher learning. All told, the Akademia Agreement budget for 2009 is 95 million kroner, according to StatoilHydro.

Virtual signing ceremony
The agreement was signed in NTNU's new VR laboratory at the Department of Petroleum Engineering and Applied Geophysics. The laboratory consists of two rooms outfitted with high-tech equipment where virtual reality technology, real-time data acquisition and interdisciplinary collaboration are being used to develop the future of how offshore and onshore operations will interact.

The goal of the laboratory is to enhance the quality of petroleum education at NTNU. Approximately 10 million kroner has been invested in the laboratory, with roughly eight million kroner funded by StatoilHydro.

A virtual signing of the agreement was conducted "live" between Trondheim and Bergen. Rector Torbjørn Digernes was in Trondheim, while StatoilHydro's executive vice president for technology and new energy, Margareth Øvrum, was in Bergen. The signing took place online using a Smart Board.

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agreement -- courtesy of NTNU's brand new virtual reality laboratory. Download larger version of photo

NTNU Rector Torbjørn Digernes and StatoilHydro's Margareth Øvrum Download larger version of photo

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Architecture students in Thailand

(29.06.2009)Five NTNU architecture students have created a non-profit humanitarian organization called TYIN that has designed and built a library and an orphanage in Thailand.
The June 22 issue of Arch Daily has an article about the orphanage while the June 25 edition describes what was done to design a small library that suited Thailand's needs.

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Boys want it but girls get it

(01.07.2009)A new survey among students at the Norwegian University of Science and Technology (NTNU) on sexual relationships and desires shows that traditional gender differences persist in terms of number of sexual partners -- even in liberated and freewheeling Norway.

Source: Aftenposten.no

The study, which will be published on the net-based research magazine called Interpersona.org, shows that boys pretty much always want to have sex, but that girls hold back.

"I believe these results illustrate how gender and sex are less connected to culture and roles, but are more the result of biology and evolution", Leif Edward Ottesen Kennair, associate professor at NTNU's Department of Psychology said to the Trondheim newspaper Adressavisen, and as reported in the Oslo-based Aftenposten.

Kennair has conducted an anonymous survey of nearly 1,100 individuals among heterosexual NTNU students - half of whom were women and half men.

How many partners?

The questions included attitudes towards sex as well as wishes and fantasies. Whereas females (on average) can see themselves having about five new partners during the next five years, males envisioned having 14. Female students thought they might have six to seven sexual partners throughout their lifetimes while the males predicted they would have 25.

Kennair pointed out that both females and males limited the total number of partners they would have.

"The males don't express a desire to have unlimited partners. But the difference is interesting. The males systematically will have more variation, from both a short and long term perspective. In free Norway, however, females -- anonymously -- can have as many partners as they want. But they don't express that interest", he says.

Biology in the driver's seat

Kennair says these choices reflect biology, and the fact that males can impregnate a new female every day, in theory at least, while females cannot become pregnant more than once every two years. Females have to be careful because pregnancy is so biologically costly.

"Females can have as much sex as they want. It's their desire that controls the frequency. But males have less sex than they want", he said.

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Screening for serious kidney disease

(03.07.2009)The combination of two common medical tests can improve a doctor's ability to predict which patients will develop serious kidney disease, a research team led by the Norwegian University of Science and Technology (NTNU) reports in a recent issue of the Journal of the American Society of Nephrology.

The finding also has significance for cardiovascular disease, which often goes hand in hand with chronic kidney disease.

Kidneys play an important role in regulating the body's fluids and salt balance, and cleanse the blood of waste products. More than ten percent of the world's population has a chronic kidney condition, which means that the kidneys gradually stop working. In spite of this widespread prevalence, relatively few individuals develop

More about HUNT

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies. Today, HUNT is a database with information about approximately 120,000 individuals, where family data and individual data

renal failure severe enough to require dialysis or transplantation.

Difficult to detect – until now

The catch has always been to figure out which of the patients with chronic kidney disease are likely to go on to the more severe and debilitating version of the illness, so that doctors can intervene early to try to prevent it.

A team of researchers led by Stein I Hallan at NTNU's Faculty of Medicine has found that using two common medical tests – measuring creatinine in the blood and albumin in the urine – improves a doctor's ability to detect early stages of serious kidney failure.

The researchers used data from the population-based Nord-Trøndelag Health Study (HUNT 2, 1995-1997) to examine information from 65,589 adults. Of these, 124 progressed to end-stage renal disease after 10.3 years.

Creatinine and albumin together as predictors

"High creatinine in the blood shows that the kidneys are doing a poor job of cleansing the blood, and means that kidney disease is already advanced. High albumin in the urine gives a measure of how rapidly kidney disease is developing", says Hallan.

Hallan emphasized that both tests should be used together to assess the future risk of kidney failure. He thinks the method will be an effective tool in the treatment of this patient group.

can be linked to national health registries.

In the United States alone, 785 000 people are expected to develop severe kidney failure in 2020, with treatment estimated to cost upwards of USD 32 billion annually. Doctors and researchers are therefore eager to find ways to make a diagnosis as early as possible.

Important for the heart and the cardiovascular system
Chronic kidney disease is also an indicator of high risk for cardiovascular disease.

Nephrology Medical researchers at St. Olavs Hospital in Trondheim and NTNU have previously shown that the combination of the two tests is a very useful tool for assessing future cardiovascular disease risk, especially in older patients.

“Chronic kidney disease and cardiovascular disease often go hand in hand and should always be evaluated with a combination of blood and urine samples,” Hallan says.

Other cooperating researchers for the study came from Ruperto Carola University in Heidelberg and the University of Regensburg, both in Germany. The study has been published in the Journal of the American Society of Nephrology.

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Ain't no mountain high enough

(14.07.2009) Two NTNU architecture students have taken on an unusual master's degree design project: they've created and constructed an aluminium sided viewpoint and refuge with stunning views in a wild valley in coastal Norway outside of Sunndal. It's just one of several mountain design projects at the faculty.

NTNU students have also been invited by a local trekking association to help envision a new mountain cabin to replace an existing structure (pictured above) at nearly 1400 m. that has been battered by more than a century of wind, snow and ice.

Shelter in a storm -- and more

The aluminium sided refuge, which is pictured in a slideshow from the local newspaper, Tidens Krav, is called "Ly", which means shelter, and was built with the help of eight other NTNU architecture students and the students' advisor, Julio Torracchi. The structure clings to the side of the steep Torbudalen valley, and is accessible from an abandoned 100-year old railroad right of way

that was built in connection with the Aura hydropower station in 1913. The aluminium the students used is in recognition of the area's heritage – electricity from the Aura station powers Hydro Aluminium's smelters in nearby Sunndalsøra.

A 100-year old rail line

"When we look at the work that was done here just 100 years ago, we feel like lightweights", commented Ingrid Nerass Dahl, an NTNU architecture student, who with Christoffer Imislund led the work as their master's design project. "Up here they worked year round with sledgehammers and crowbars, and they built a railroad line in the mountains, a lift in Litjdalen from Dalaråa to Toppheis, and kilometer long tunnels in the mountains. Unbelievable."

The refuge is also accessible from the Aursjøveien, a spectacular 100-km toll road that winds its way from Sunndalsøra up through Litjdalen and then down to Eikesdalen through a series of 180 degree hairpin turns. The shelter will be removed in a year.

Airy, but not alone

Dahl and Imislund's effort may be one of the more airy of NTNU architecture student projects, but it is not the only one that is linked to Norway's picturesque high mountains.

The Drammens and Oplands Trekking Association (DOT), a branch of the national Norwegian Trekking Association, invited 15 architecture students to help them plan for the

replacement of Høgevarde, (pictured above), a mountain hut at 1390 msl with some of Norway's most expansive views over Jotunheimen, Rondane and Hardangervidda national parks. The oldest section of the hut was built in 1893, and more than a century of snow, ice and rain have taken their toll on the structure.

A hut for the future

"We wanted a hut built for the future, but it's quite difficult to think in new ways when we are steeped in so much tradition here", said Henning Wikborg, DOT head, to Fjell og Vidda, an outdoors magazine published by the Norwegian Trekking Association. "The architectural help from Trondheim helps us to see non-traditional alternatives."

The fifteen students have used roughly 15000 hours to come up with three alternative designs that are suited to the fragile mountain area. The DOT will evaluate the merits of the three designs over the autumn, although Høgevard's replacement date has not yet been set.

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Blood pressure, weight and kidney disease risks

(21.07.2009)People with prehypertension are not at increased risk of kidney disease if their body mass index (BMI) is under 30.0 kg/m2, a first-ever examination of the combined effect of blood pressure and body weight on the risk of kidney disease shows.

The study, by a team of medical researchers at the Norwegian University of Science and Technology (NTNU) is available as a pre-publication article online from the American Journal of Kidney Diseases.

Prehypertension is a relatively new medical classification introduced in 2003 in the Seventh Report of the Joint National Committee on High Blood Pressure (JNC-7), and is defined as systolic blood pressure of 120 to 139 mm Hg or diastolic BP of 80 to 89 mm Hg. Studies from the United States and Asia have shown that prehypertension

More about HUNT

The Nord-Trøndelag health study (HUNT) is one of the largest health studies ever undertaken. It is comprised of a unique database of personal and family medical histories that were collected during three intensive studies. Today, HUNT is a database with information about approximately 120,000 individuals, where family data and individual data

can increase the risk of serious kidney disease, but because more than 30 percent of the US and European populations can be classified as prehypertensive, treating everyone with this condition would be an enormous undertaking, the researchers observed.

At the same time, obesity is also known to lead to end-stage renal disease (ESRD) and death from chronic kidney disease (CKD) as a result of diabetes and hypertension. These increased risks have led medical researchers to consider whether people with prehypertension should be considered for treatment if they have other cardiovascular risks, such as obesity.

Using data from nearly 75,000 participants in the HUNT 1 study, the first Health Study in Nord-Trøndelag, a team of NTNU researchers led by Dr. John Munkhaugen were able to further clarify the risks of ESRD in overweight individuals.

"We found a strong, independent and continuous association with both BP and body weight" on the risk of treated ESRD or chronic kidney disease related deaths, the researchers wrote. However, "prehypertensive participants increased their risk of treated ESRD or CKD-related death only if BMI was greater than 30.0 kg/mg2."

The strength of the NTNU study is its ability to use data from the two-decade old HUNT 1 study, which provides researchers the ability to follow up on measurements made 20 years ago. The HUNT 1 study involved 88.2 percent of all inhabitants 20 years or older in Nord-

can be linked to national health registries.

Trøndelag county, in mid-Norway. The data were linked to the Norwegian Renal Registry and to the Cause of Death Registry in Norway.

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NTNU nanotech, medicine attract the best

(21.07.2009)Three of Norway's five most competitive university programmes are at NTNU, according to government admissions figures released this week.

For students fresh out of secondary school, NTNU's 5-year master's programme in nanotechnology was the most competitive course of study in Norway, with the highest grade point requirements, according to the Norwegian Universities and Colleges Admission Service (NUCAS). NTNU's nanotechnology programme has 25 places, but more than 900 students applied for the programme, with 194 of these listing it as their first choice.

NTNU's 6-year long medical school programme was just behind nanotechnology in terms of grade point requirements for post-secondary school students,

making it the most competitive medical programme in the country for this student group. A third course of study, industrial economics, was the fourth most difficult programme in the country for these students to be accepted to.

Point system determines student placement

Norway uses a point system to assign places to university students based on the student's academic performance and other factors, including military service and, for some courses of study, gender. All told, 104,238 students applied for places at Norway's 7 universities and 39 university colleges. Fully 88 per cent of these students were offered a place at a university or university college of their choice, although the competitive nature of the process meant that just 65 per cent of applicants were offered their first choice of programmes.

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New Carbon Footprint Calculator on the Web

(17.06.2009) Ever wonder just how much of your country's carbon dioxide emissions come from imported food or goods? A new website created by researchers at the Norwegian University of Science and Technology (NTNU) and the Centre of International Climate and Environment Research - Oslo (CICERO) answers these questions and more.

Not surprisingly, the wealthier a country is, the more carbon dioxide it emits, say researchers Edgar Hertwich and Glen Peters. Hertwich is a professor of Energy and Process Engineering at NTNU, and director of the university's Industrial Ecology Programme, and Peters is a senior scientist at CICERO.

Their website, carbonfootprintofnations.com, enables users to check the importance of different consumption categories for their nations, particularly for imports and exports. The researchers have also published a paper in the June 15 edition of Environmental Science and Technology that details the greenhouse gas emissions

associated with the final consumption of goods from 73 nations and 14 world regions.

The national average per capita footprints varied from 1 ton of carbon dioxide equivalents per year in African countries such as Malawi and Mozambique, to roughly 30 tons per year in industrialized countries such as the USA and Luxembourg.

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First Nordic universities on iTunesU

(04.08.2009) The Norwegian University of Science and Technology (NTNU) and the University of Stavanger are the first Nordic universities to post lectures and talks on iTunesU for free download.
NTNU posted roughly 90 lectures Tuesday under the name "NTNU Open Courseware". The lectures range from popular presentations to formal course lectures, the majority of which are in Norwegian. Among the English-language videos that was posted is an interview with the Norwegian Nobel Prize winner Ivar Giaever, a graduate of one of NTNU's predecessors, NTH.

The NTNU lectures can be found at http://itunes.ntnu.no. The website allows videos to be downloaded and viewed on iPods that have a video function, as well as iPhones, Macs and PCs. iTunes U is an area of the iTunes Store where universities and colleges upload lectures, laboratory demonstrations and courses to share freely. Much of this content can be downloaded as podcasts.

iTunes U was launched in 2007. American universities such as Stanford, MIT and Yale were among the first to post material for download. European universities began posting to the site last year, but until today no Nordic country had posted course material on the site.

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Teetotalers more likely to be depressed

(27.09.2009) When it comes to alcohol consumption and depression, a new study by a team of Norwegian and British researchers shows that heavy drinkers – but also teetotalers -- have higher levels of depression and anxiety than those who drink moderately.

The study, "Anxiety and depression among abstainers and low-level alcohol consumers. The Nord-Trøndelag Health Study", was published in the most recent issue of Addiction, a peer-reviewed medical journal published by the Society for the Study of Addiction.

A long-standing mystery

Researchers have long struggled with a counterintuitive psychological mystery: While it's believable that heavy drinkers might be depressed, study after study shows that people who don't drink at all also have high levels of depression and anxiety. But why?

One working hypothesis has been that the depression recorded in groups that include teetotalers – people who don't drink at all -- may be due to the fact that these

groups can include people who quit drinking because of alcoholism. If abstainers who quit drinking because it was a problem could be excluded from the larger group of non-drinkers, the results might be different.

A team from the Norwegian University of Science and Technology, the University of Bergen, a number of Norwegian public health organizations and Kings College, London set out to test this idea. The team used information from a questionnaire in which 38, 390 residents of a county in mid-Norway – fully 41 percent of the county's population -- described their general physical and mental health, along with typical alcohol use over a two-week period. The questionnaire was part of a larger, long-term study called HUNT, which has periodically examined the physical and mental health and well-being of the residents of Nord-Trøndelag county since 1984.

The researchers found that even when they removed people from the study who had quit drinking because of problems with alcohol, the general findings held true: heavy drinkers and non-drinkers are more likely to be anxious and depressed than those who drink moderately. All told, 17.3 per cent of abstainers reported anxiety, while 15.8 per cent reported depression.

The happiest people, in contrast, were those who averaged about two glasses of alcohol per week, where a glass of alcohol represents one bottle of beer, or a glass of wine, or a shot of strong spirits.

Solving the puzzle

The questionnaire also allowed researchers to determine the general health of respondents, which might explain the links between depression and alcohol intake.

"We found on average that there were more people with physical complaints among the non-drinkers than in the other groups", says Eystein Stordal, an adjunct professor at NTNU's Department of Neuroscience. "These individuals are more likely to use medicines that mean they shouldn't drink. But it may also be true that having such an illness increases a person's tendency to be anxious or depressed."

Researchers also found that non-drinkers reported having fewer friends than drinkers did, which might explain their increased odds of being depressed.

"We see that this group is less socially well-adjusted than other groups", Stordal says. "Generally when people are with friends, it is more acceptable in Western societies to drink than not to drink. While the questionnaire recorded non-drinkers' subjective perception of the situation, a number of other studies also confirm that teetotalers experience some level of social exclusion. "

Potential public health consequences

Nearly 12 per cent of the survey participants described themselves as abstainers, while another 22 per cent were non-consumers. Alcohol abstainers were also more often female and older, and reported more health problems than non-consumers and mid-range consumers.

The researchers noted that because abstinence is more common in Western societies compared to harmful drinking habits, the potential public health impacts of these findings could be great. "In the case of depression, the odds of depression (in people who labeled themselves abstainers) were higher than even the heaviest alcohol consumers," the authors wrote. "In a society where use of alcohol is the norm, abstinence might be associated with being socially marginalized and at increased risk for mental disorders."

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1.4 per cent for a cooler planet

(10.09.2009) On the eve of the Norwegian national elections, climate researchers at NTNU and SINTEF have issued a challenge to lawmakers to support essential investments to meet the country's goals for cutting greenhouse gas emissions-- and that will put Norway at the forefront of climate change research and technology development.

For just 1.4 per cent of the national budget, which is 2000 NOK per Norwegian citizen per year -- or a little more than $300 US -- Norway could build on its already substantial expertise in renewable energy technology and carbon capture and storage to help lead the global effort to combat climate change. So says Rector Torbjørn Digernes, who with SINTEF executive director Unni Steinsmo, has issued a challenge to all politicians seeking election to the Norwegian Storting, or parliament, on September 14.

"We believe that knowledge and technology together are the key to solving the climate problem, both in terms of how we as a society adapt to a changing climate and how we reduce anthropogenic greenhouse gas emissions" Digernes and Steinsmo say. "Our proposal will place Norway in an international leadership role in controlling climate change and will showcase the nation's technological expertise and industries that are critical to addressing this global problem."

Ten billion kroner per year

As Norway's leading university for science and engineering, NTNU is already home to a wide range of climate related research, much of which is conducted in conjunction with SINTEF, Scandinavia's largest independent research institute.

But with just 3 billion NOK per year, Norway could expand its R&D efforts in everything from offshore wind power, to solar cell technology and bioenergy from sustainable sources.

Another 7 billion NOK per year would enable the country to phase out the use of oil for heating purposes, transform fully 20 per cent of the country's vehicle fleet and 25 per cent of offshore facilities to electric power, capture carbon dioxide from six of the country's largest manufacturing facilities, and implement wide scale comprehensive energy efficiency measures in buildings and industry.

Norway as a catalyst to international action

Digernes and Steinsmo say this kind of financial backing will do more than bring Norway into compliance with its ambitious climate goals of being climate neutral by 2050 at the latest. The size of the commitment will enable Norway to act as a catalyst, to spur other countries to take on the climate challenge, the two say.

"With a commitment such as this, Norway's role in controlling global emissions will be far larger than the direct reductions we will achieve nationally" Digernes and Steinsmo say.

For more information:
Olav Bolland

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NTNU takes precautionary steps to limit potential swine flu spread

(12.08.2009) Now along with sale items and daily specials, NTNU cafeterias and food shops will advertise precautions that staff, students and visitors can use to help limit any potential spread of swine flu, or influenza H1N1, during the upcoming school year.

Although swine flu is not currently a problem on the NTNU campus, school officials wanted to take preventative and precautionary steps in advance of the arrival of the school's 20,000 students in mid-August. First-year students were officially welcomed to NTNU on Tuesday, August 11 in a matriculation ceremony. At that time, NTNU's rector, Torbjørn Digernes, encouraged students to take simple precautions that are shown to help limit the spread of any infectious illness.

Encouraging good hygiene habits

Swine flu is currently found in 168 nations across the globe and is expected by world health officials to increase in prevalence as the autumn and winter traditional flu season advances.

The posters hung in cafeterias and other meeting places illustrate four good habits that people should use to limit the spread of the flu. These are: Use disposable tissues, cough or sneeze in the crook of your elbow, wash your hands thoroughly and often, and disinfect your hands if washing isn't possible. Accompanying the posters are dispensers for waterless hand disinfectant. Although the posters are in Norwegian, they are clearly illustrated with photographs that illustrate the measures.

Norwegian government updates

Norwegian health authorities believe that as much as 30 per cent of the population will contract swine influenza, or influenza A (H1N1), as it is officially known. The government has also created a special website with information and updates on the illness in Norwegian; the English version of this website contains basic questions and answers about the illness but is not at the moment regularly updated. The best resource for up-to-date information in English about what is happening in Europe, including Norway, is the European Centre for Disease Prevention and Control.

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NTNU joins European Technology Network

(27.11.08) The Norwegian University of Science and Technology (NTNU), Norway's leading university for higher education in technology, has agreed to join the Science|Business Network of prominent European research institutions, in an effort to promote enterprise in science.
The agreement is aimed at improving the dialogue between business and academia in Europe – long identified by experts as crucial to the region's success in international technology markets.

"Through this membership, technology from Trondheim will find a broader audience throughout Europe", NTNU's rector, Torbjørn Digenes says, "We are pleased to have such a great opportunity to present our technological solutions for the future to the global community. In the end the environment wins, once our clean tech solutions have become the standard all round."

NTNU excels in areas such as energy and petroleum, medical technology, materials, marine and maritime

technology, ICT and globalization.

NTNU has proved to be an attractive R&D partner; either alone or together with its on-campus neighbour, SINTEF, Scandinavia's largest independent research institute.

NTNU joins ten other leading European universities in the Science|Business Network. They are the University of Cambridge, ETH-Zurich, Karolinska Institutet, Imperial College London, University College London, TU Delft, Chalmers University of Technology, Politecnico di Milano and ParisTech.

Science|Business is an innovative news and events service focused on R&D investment and policy in Europe – a Financial Times of science. Through its daily news coverage, its network of leading institutions, and its high-level networking events, it aims to bring together leading players in the European marketplace for scientific and technological discoveries. It was co-founded by Richard L. Hudson, former managing editor of The Wall Street Journal Europe, and Peter Wrobel, former managing editor of Nature, the leading scientific journal. It publishes on www.sciencebusiness.net .

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Major research programme for CO2-capture

(14.08.08) A scientific research and development programme worth more than NOK 300 million is being launched in Norway with the aim of generating more cost effective technology for CO2-capture. The project is one of the biggest of its kind to date.
SINTEF, the independent research organisation, The Norwegian University of Science and Technology and Aker Clean Carbon, the industrial technology company, on Thursday August 14 signed an agreement for an eight-year science and development programme called SOLVit. The programme has a total financial value of NOK 317 million.

Gassnova SF – the Norwegian government's vehicle for CO2-management (capture, transport, injection and storage) – has approved financial support of NOK 34 million for the first phase of the project, which runs till the end of 2010.

Emissions from industry and power stations
The agreement concerns chemical processes that can

capture CO2 from the process industry and emissions from coal and gas powered power stations. Within these sectors, it is estimated that the 4,000 largest facilities account for about 40 per cent of man-made CO2 emissions globally. The SOLVit programme aims to generate better and more cost effective processes and chemicals to manage CO2 emissions from these facilities.

International energy companies have been invited to participate in the programme. These will provide useful input from the perspective of the facility operator.

Test centre link-up

"SOLVit makes SINTEF and NTNU able to consolidate the position as Europe's leading science cluster for CO2-management. The programme includes building a large laboratory facility that will strengthen our standing in the international arena and improve our position in competition for financial support for scientific research from institutions such as the European Union," says Ms Unni Steinsmo, chief executive of SINTEF.

"Results from the development research in the new laboratory in Trondheim will be tried out in test centres and hopefully also in full-scale facilities already in the first phase of the programme. This makes SOLVit even more exciting," said Ms Steinsmo.

Industrial competition

Aker Clean Carbon is heavily involved in competitions for CO2-capture projects in Norway and in the United Kingdom. Jan Roger Bjerkestrand, chief executive of Aker

Clean Carbon, says the wide-ranging and thorough cooperation on scientific research under SOLVit to develop better and more energy effective chemicals for the capture and cleansing processes will strongly support the company's standing in these competitions.

Aker Clean Carbon and SINTEF have together developed many chemical solutions based on amines, a chemical that has the ability to cleanse CO2. One of these solutions is already ready to use. Phase one of SOLVit will be used to test the other amine solutions under development by Aker Clean Carbon and SINTEF.

"We have a clear goal to bring the cost of CO2-capture and cleansing down significantly. In phase two and three of SOLVit, the parties will try to introduce new chemical solutions and elements to the process in order to generate cost cuts. The aim is to come up with a process facility for CO2-capture that can operate on half the energy consumption of today's processes," says Mr Bjerkestrand.

New laboratory in Trondheim

The programme also includes building a new laboratory at Tiller in Trondheim, which will cost NOK 42 million. SINTEF will provide NOK 25 million of the equity for the new laboratory, which will be situated next door to SINTEF's multi-phase laboratory.

The lab will be a unique test centre for pilot projects, including a 30 metre tall tower and processing column that reached 25 metres high – identical to the height

needed in full-scale industrial facilities. The lab will also be available for SINTEF's domestic and international customers and partners.

Complete chain of laboratories
The SOLVit-programme will also involve the testing of chemicals and processes in a mobile capture facility, which has been developed by Aker Clean Carbon and is currently being built at Aker Verdal. The mobile facility is large enough to process parts of emissions from power stations and industrial sites in periods of several months at the time.

SINTEF and NTNU have already established laboratories for small-scale testing of CO2-capture. This means Norway will be among the few countries with a complete set of laboratories in this area, from testing in the lab to pilot runs at semi-industrial scale.

PhD and master students
Science and education go hand in hand in SOLVit. Using the programme as a basis, NTNU will offer positions to six doctoral candidates and ten master students within the subject of CO2-capture.

"SOLVit is an important contribution to educating high-quality academic experts, for which there is great demand. The combination of education and industrial development in this project is very exciting and a great challenge," says Torbjørn Digernes, Rector of NTNU.

Joint financing
SOLVit has a budget of NOK 317 million and is led by Aker

Clean Carbon. The financing is a joint effort by Aker, which is the main partner, and other industrial partners, Gassnova SF which participates through the public CLIMIT programme, and SINTEF and NTNU.

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Best of all universities in Europe for engineering education in sustainability

(17.04.2008) NTNU has just been named as offering the best engineering education in Europe for sustainable development. NTNU's systematic focus on sustainability and the environment has put the university ahead of such well-known institutions as KTH and Chalmers in Sweden, and technical universities in Delft, Munich and Dresden.

Congratulations from Tora Aasland

Tora Aasland, Minister of Research and Higher Education, came Thursday to congratulate the university on the recognition. During her visit, university officials described environment and sustainability programmes and how an environmental perspective is integrated into every aspect of the school's engineering training.

"This recognition is quite gratifying, and well deserved. NTNU has a long history of including sustainability issues in their teaching. The Industrial Ecology Programme is not just the first of its kind, but has also been recognized

as the best for a number of years now. It's great to know that the students who graduate from NTNU have the strongest qualifications to contribute in solving the world's environmental problems", says the cabinet minister, who also took the opportunity to talk with some of the students who have chosen an environmental focus in their engineering studies.

The report from the EESD Observatory (Engineering Education for Sustainable Development) was commissioned and conducted in cooperation with the Alliance for Global Sustainability (AGS). AGS is an international partnership composed of the Massachusetts Institute of Technology (MIT), the Swiss Federal Institute of Technology, the University of Tokyo and Chalmers.

A systematic environmental focus

The report evaluated how systematically universities had introduced sustainability and the environment into their basic engineering education, the opportunities for specialization in sustainable development at the master's level (the last two years in the civil engineering programme), and whether a commitment to these efforts is anchored in the university's top leadership. The length of time that the universities had worked with these issues was also a consideration in the evaluation. NTNU scored highly in all areas that were evaluated.

NTNU has many different study programmes that have on their own initiative, or in cooperation with the Industrial Ecology Programme, have worked

systematically to educate students in sustainable development. A number of programmes, such as Product Development and Production, Buildings and Environment and Energy and Environment, incorporate environmental issues early on as part of their educational offerings. These courses of study, along with the HES programme in Industrial Economy, Industrial Design, and Technology Management and Physics, offer specialization that is related to sustainable development. NTNU was the first university in the world to offer a programme in industrial ecology, and was first to offer specialization in different programmes of study, and now also offers its own international master's programme – a programme that also attracts its share of good students from the USA. In 2004, the programme was selected as the best study programme in industrial ecology.

Strong engagement

NTNU's recognition is the result of strong engagement among a number of the university's professors, who have worked on a systematic basis over a number of years, and with support from the university leadership, to develop a meaningful and sound educational offering that answers the challenges that face modern society. Technology is central both as the reason for -- and the solution to -- the world's environmental problems. NTNU has not just concentrated its efforts on raising awareness about these problems, but on techniques for determining how different technological approaches can be used to respond to tomorrow's environmental challenges without generating new problems.

Børge Brende: "NTNU is the jewel in the Norwegian environmental crown"

Borges Brende, director of the World Economic Forum, and former Norwegian Minister of the Environment, congratulated NTNU on its recognition.

"For me this is no surprise – quite the contrary," says Brende. "Some of the most encouraging experiences I've had as Environment Minister were visits to NTNU to meet people and to lecture to students and researchers in different sustainability areas. I quickly noticed that this was indeed the jewel in Norway's environmental crown. When NTNU goes all out and works across disciplines to develop new technological solutions to our growing pollutions problems, it has to be good," says the former Environment cabinet minister.