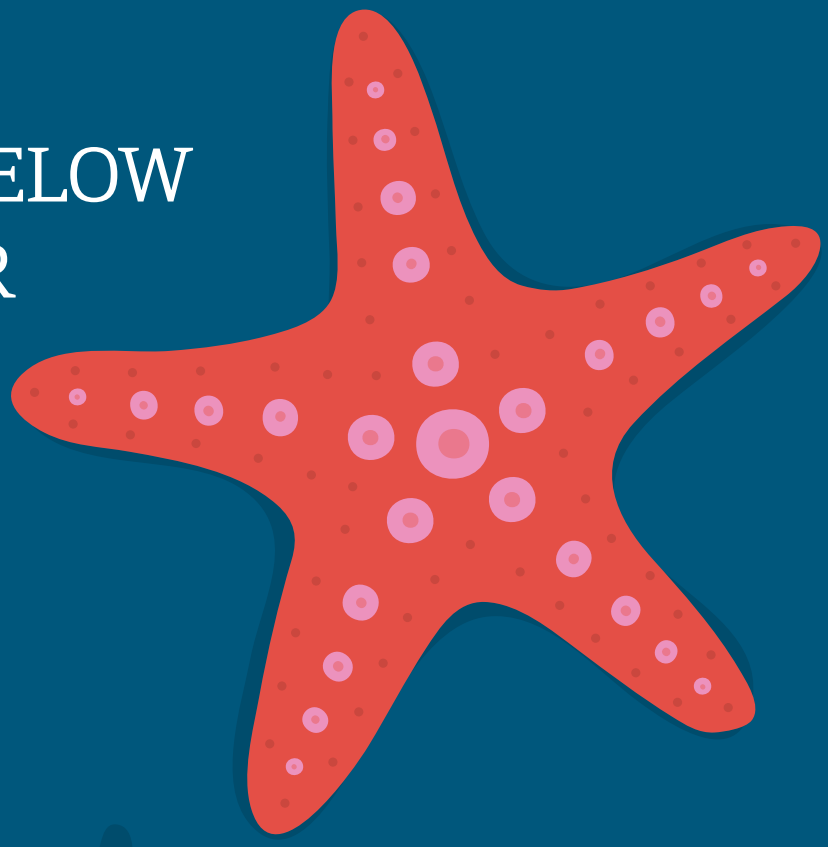
THE UiB MAGAZINE.

2019/2020
Research and education at the University of Bergen



LIFE BELOW WATER

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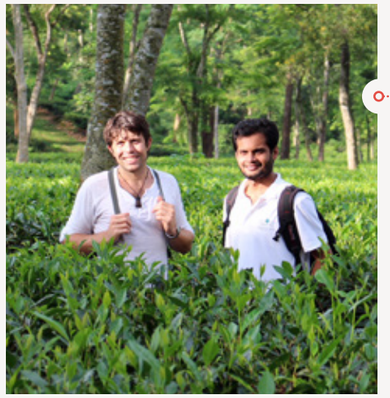

KNOWLEDGE THAT SHAPES SOCIETY

Knowledge that shapes society is not just a vision for us. It is our mandate. That is why we lifted the words to the forefront of our newly revised university-strategy. And why not? Our research and education certainly shows how high quality knowledge has an impact.

A good example is the TRACKS project, where environmental researchers worked closely – and exchanged knowledge – with local communities in Bangladesh, leading to new ways to cope with climate change. The international expansion of the Bergen 4-Day Treatment for severe anxiety disorders, developed by Gerd Kvale and Bjarne Hansen, is another great example of impact. In fact, Time Magazine named them as two of the 50 most influential people in health care in 2018.

The University of Bergen has taken the national leading role on the UN Sustainable Development Goals (SDGs) in the university sector. The goals permeate our work and we do not only contribute to them through research. In February 2019 the second national SDG Conference Bergen took place, the only national conference of its kind and a meeting place underlining Norwegian universities' collective commitment to the 2030 Agenda and to partnerships for the goals. Sustainable development remains a foundation for the university's policies, for instance UiB has taken decisive steps towards reducing its institutional emissions. Furthermore, outreach through the strategic initiatives SDG Bergen and Ocean Sustainability Bergen has resulted in the university being a creative and innovative force for change. In 2018, both United Nations Academic Impact and the International Association of Universities appointed UiB to have a distinct and leading role on SDG 14 – Life below water.

Sustainability requires new ways of thinking – innovation is necessary, as shown by the students behind ShrimpVision, who are developing a sustainable way of acquiring food resources from the ocean. Their work align with our institution's strategic areas, and seeing how these and other students innovate, brings me nothing but hope for the future.

Our students are impressive not least because they learn from our excellent researchers. It was awe-inspiring to visit Blombos Cave in South Africa, where Christopher Henshilwood and his archaeologists made the groundbreaking find of the world's oldest human drawing. The pioneering results delivered by Nikolai Østgaard and his team at the Birkeland Centre for Space Science are no less impressive.

This year we reopen our University Museum after a long period of refurbishing. With new experiences, like the skeleton of the "Plastic Whale", side by side with old treasures, the museum will again take its place as one of the cities' best conveyers of research-based knowledge.

We disseminate knowledge for the benefit of society, and present parts of this through our magazine. I wish you a good read!

PHOTO: EVIND SENNESET

Dag Rune Olsen
Rector, University of Bergen
Follow me on Twitter @UiBrector_Olsen

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ABOUT UiB
The University of Bergen (UiB) has approx.
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Cod can be the "canary in a coal mine" for oceans

Canarys were once regularly used as an early warning system in coal mines. The researchers in the dCod 1.0 project believes that in the ocean, the Atlantic cod can be an equally important warning symbol. TEXT OLE M. KVAMME AND ASBJØRN LEIRVÅG

"The cod is an icon in Norway, but its content also mirrors the pollution in the ocean", explains Dorothy Dankel, researcher in the dCod 1.0 project at UiB.

Together with her colleagues, she studies how Atlantic cod reacts and adapts to environmental stressors, including pollution and climate change.

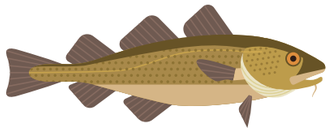
Understanding ocean health

"Ocean health is very important. Here in Western Norway the ocean is a connected system, so pollution that happens in one part of the ocean can also affect another. The cod is a widespread species, so if cod can really be a type of bioindicator species, a type of canary in a coal mine, for us to understand ocean health, this can be a really important breakthrough," Dankel says.

The researchers study how pollutants from the environment affect the cod's organs. The scientists take out liver, gills and gonads and investigate the cod genes, considering questions like: *-How are the genes used? -Which genes are turned on and off? -What are the consequences for the cells?*

Interdisciplinary research

The resulting amount of data is huge; every cell contains about 20,000 genes. When each gene responds differently to different proteins, the data analyses gets



challenging. To lead way in this jungle of numbers, biologists work together with mathematicians, statisticians and bioinformaticians, using *big data* to extract information that can explain what is happening when cod is exposed to certain environmental pollutants.

"We combine the competencies in environmental toxicology, biology, bioinformatics and mathematics, to create a deeper understanding of cods' adaptations and reactions to stressors in the environment," says Anders Goksøyr, who is the leader of the project and professor at the Department of Biological Sciences at UiB.

The overall goal for the dCod 1.0 project is to create tools for environmental monitoring and risk assessment that can be used in assessing the impacts of for example the oil industry, sewage discharge into harbours and industrial discharge into Norwegian fjords. This will aid the government and industry to better handle pollution in the marine environment.

FACTS

- The dCod 1.0 project is financed until 2020. The results will benefit the Norwegian Food Safety Authorithy, Norwegian Environment Agency, Norwegian Directorate of Fisheries, and Norwegian fisheries.
- Part of the Centre for Digital Life Norway, supported by the Norwegian Research Council.
- Led by Anders Goksøyr at the Department of Biological Sciences, UiB.
- Partners include Department of Mathematics and Department of Informatics at UiB, NTNU, UiO, NMBU, HI, and NORCE, as well as international partners in Sweden (Gothenburg), Spain (Barcelona), and USA (Woods Hole, Florida and Stanford).
- Budget: 38 mill NOK.

Follow the project: **dcod.no**, or using **@dcodprodj** and **#dcodproj** in social media.

dCod 1.0 project leader Anders Goksøyr and researcher Dorothy Jane Dankel. PHOTO: SOLFRID T. LANGELAND, UiB

ILLUSTRATOR: STOCKPHOTO

On track with climate change

Bangladesh is one of the most vulnerable countries in the world to climate change. Scientists from UiB have worked together with communities around Sylhet, in northeast Bangladesh, in search of new ways for understanding and adapting to the climate. ▸▸

TEXT JANNE-BEATE BUANES DUKE

PHOTO: ANNE BØRHER

WORKING TOGETHER: Scott Bremer (left) wanted to test how scientists could work together with the local communities to produce high quality climate science when he was running the TRACKS project. Here he is in a tea-garden with his project partner Saifullah Bin Aziz. PHOTO: ANNE BREMER

"The aim of the project has been to re-learn how to understand and anticipate this new climate, to develop strategies and concrete actions for long-term adaptation for the locals," says Scott Bremer, researcher at UiB.

He managed the TRACKS Project (Transforming Climate Knowledge with and for Society) that has led to positive outcomes for adaptation for Bangladeshi communities.

Transforming climate knowledge

"Over the past years, the people in Bangladesh have experienced huge seasonal change. They used to think in terms of six seasons, but now they only have three and a lot more rain and flooding, which makes it difficult to plan around," Bremer says.

Bangladeshi communities around Sylhet are highly dependent on agriculture for their livelihoods, and have weak infrastructure for dealing with extreme weather events. This means that any variability in the weather can have serious impacts, ranging from low crop yields to flooding or the spread of infectious diseases.

> We sat scientists and local community members as peers.

The TRACKS project was focusing on communities in northeast Bangladesh, where there is high uncertainty about climate variability and change, particularly associated with the pre-monsoon and monsoon rains, and their impacts on the community. Bremer tells us that a wide range of research methods were used to mobilise old and new knowledge.

When the frog starts to croak

"We wanted to test how scientists could work together with the local communities to produce high quality climate science that draws on different types of knowledge, including local understandings of natural signs of the weather and seasons."

Bremer says being part of TRACKS taught him how valuable it is to be part of, and work in an trans-disciplinary environment.

"We sat scientists and local community members as peers. Together we mapped out what we knew about local rainfall in summer and the monsoon, how we could predict this rain, and what impacts it has. From this we decided on a list of gaps in our knowledge; things that we wanted to measure in the local area as 'citizen scientists'. This ranged from typical meteorological measures like rainfall, temperature and humidity, to local and traditional indicators of rain, like cloud cover and the behaviour of animals and insects. This also let us test the reliability of these local indicators, for example to see if when the frogs start croaking, that it will start to rain."

Narrative story collection

An important starting point for the project was to collect stories about what the rain means for communities, through interviews with the locals. That is, the importance of rain for their livelihoods, but also as part of their culture and understanding their place in the world. Mahmud, also part of the TRACKS project team, published a report from the field based on the collected narratives. In a section of this report, he explains how narratives brings an important aspect when we try to understand and interpret climate change in a broader perspective.

"The local people of a certain ecosystem know their stories very well. They remember what they experienced as children, what natural phenomena they experienced 20 or 30 years ago, and what changes they presently experience. They assess change and make predictions based on this knowledge. The knowledge is very precise…[and it can compliment]…modern scientific study. This is why bringing together indigenous and scientific knowledge is essential for tracking local climate change in an ecologically diverse country like Bangladesh."

Positive outcomes for adaptation

TRACKS measured a number of positive outcomes, through regularly assessing the projects impacts using interviews. Beyond collecting valuable scientific information, the project has also built capacity amongst the citizen scientists and their communities to make increasingly accurate weather predictions, and to use this information for adaptation in their everyday lives from farm management to planning travel.

Meteorological science in Bangladesh faces limitations, so the forecasts are not accurate at the village-scale. By empowering villagers with a portfolio of different climate knowledge, they have timely information at a much more detailed resolution.

"We see that many of the citizen scientists are able to make very accurate predictions by combining information from weather forecasts, temperature and humidity gauges they have at home, and their own reading of local signs, like where the clouds gather or the direction of the wind."

Personal stories

Further, the project measured changes to peoples' adaptive actions based on their improved understandings and predictions. Bremer notes:

"There is evidence of more adaptive practices in the daily lives of citizen scientists and their communities. These include public actions, like warning the village of impending storms, helping poultry farmers regulate heat in the sheds, and informed decisions of where to build flood works. But also private actions of individuals; how the shop-owner reorganises his shop, or how a son dresses his invalid mother. Personal stories are really touching, and motivate me towards doing more of this research."

MAPPING OUT: The scientists in the TRACKS project worked closely with the locals to find new ways of making climate science that draws on different types of knowledge, including local understandings of natural signs of the weather and seasons. PHOTO: ANNE BREMER

LOCAL KNOWLEDGE: The locals were higly involved in the TRACKS project. Here we can see Babu Anjan Purkayastha, a citizen scientist, installing a rain-gauge that is made to measure rainfall and humidity. PHOTO: SAIFULLAH BIN AZIZ

FACTS

Three goals for TRACKS

- A robust scientific understanding of climate variability in northeast Bangladesh and its impacts on communities, built on high quality climate and local knowledge.
- An innovative 'post-normal science' approach to mobilising climate knowledge for supporting 'community-based adaptation.
- Increased capacity within the communities of northeast Bangladesh to engage with different forms of knowledge in support of their adaptive action.

TRACKS was funded by The Norwegian Research Council, from 2014–2017.

Replacement for polluting coal in large power plants

The UiB chemistry researchers set out to develop a water purification method, but ended up developing a kind of fuel pellet that can replace coal in power plants.

TEXT ASBJØRN LEIRVÅG

"We have made a pellet that can be used in coal-fired power stations, without any major changes. Switching to this new fuel is relatively straightforward and does not require large investments. In addition, the pellets from the Norwegian technology company Arbaflame are based on a renewable resource that exists in plentiful supply in our part of the world: wood," says Tanja Barth, a professor at the Department of Chemistry at UiB.

Pellets may be the next big thing

Large power plants all over the world burn coal to generate electricity. Coal is affordable and readily available, but is also a major greenhouse gas culprit.

Replacing coal with other sources of energy could slash the world's CO_2 emissions. Conversion of coal-fired power stations has already proven to be a good solution. It eliminates the need for large investments and drastically reduces the amount of time needed to achieve cuts in emissions.

Barth's research group has resolved all these challenges, and the team is now collaborating with Arbaflame and SINTEF to develop Arbaflame's patented pellets.

Popcorn effect

Ordinary pellets are produced by wood being ground up and compacted. However, a process involving steam and high pressure transforms the pellets, increasing their energy density and giving them the same combustion value as coal, with 90% lower CO_2 emissions. In addition, the pellets are water resistant, meaning they can be stored in large, open containers and do not need protection from the elements.

> By using pellets instead of coal, the emissions are moved from fossil to renewable carbon.

"It's a bit like popping popcorn. At a certain temperature, the dry kernels are transformed: they change in appearance and gain new characteristics," Barth says.

Major investment

The pellets have attracted a lot of positive attention. The project has been awarded NOK 180 million under the EU's Horizon 2020 Programme. The Dutch energy company ENGIE is converting a large coal-fired power plant in Rotterdam for wood-pellet firing. This power plant supplies the 600,000 residents of the Netherlands' second largest city with electricity.

"The black pellets can be burned directly after crushing. The coal power plant has the capacity to produce 800 MW of electricity and has emissions of approximately 6.5 tonnes of CO_2 per day at 50% capacity utilisation. In addition, by using brown pellets instead of coal, the emissions are moved from fossil to renewable carbon," explains the chemistry professor.

The EU has set clear objectives to limit CO_2 emissions. Several countries have followed up by setting dates for phasing out coal for energy purposes. Everyone is looking for solutions that ensure sufficient energy for electricity production that cannot be covered by solar and wind power.

Large-scale

The project is called Arbaheat and is a collaboration between the University of Bergen, Arbaflame, ENGIE, SINTEF, the Port of Rotterdam, PNO and TNO.

Steam-treated pellets have been tested at 15 coal-fired power stations around the world. Canada wanted to phase out coal power, but the cost differences were too great. It cost CAD 5 million to convert a coal-fired power plant to be able to use the black pellets developed in Norway. By comparison, the cost of conversion to be able to use traditional pellets was CAD 170 million.

Coal is much cheaper than pellets, but this could change quickly, if more countries introduce a CO_2 tax on the use of coal.

According to the International Energy Agency (IEA), coal is responsible for 40% of global energy emissions from energy carriers, and currently accounts for 28% of the global energy mix.

Income from sales of the chemical by-product derived from pellet production also helps determine how profitable the conversion of coal-fired plants will be.

Valuable water purification

Most major innovations have an element of chance. Barth's group was actually looking for a good method to clean the wastewater from the production of biofuels. The result of their work was valuable chemicals, which could be sold for industrial purposes, and discharge water that satisfies all the wastewater treatment requirements.

Many products and materials contain oil. About 12% of the global oil production goes to petrochemicals. Plastic is a popular, versatile product, but more and more people are looking for alternatives.

"A lot of people are working on this. Chemically, many things are possible, but there are often other complicating factors. Plastic production relies on clean components to achieve the desired qualities. When we produce chemicals, we usually end up with a mix of substances – not pure substances," Barth explains.

She believes that industry still needs better technical solutions to be able to take bigger steps towards meeting the renewable goals. The oil industry has been improving refining technology for 100 years, with the result that the various products are now of very high quality.

"It is currently much more demanding to refine bio-oil, but a lot of people are working hard to find technological solutions."

Professor Tanja Barth. PHOTO: ASBJØRN LEIRVÅG, UiB

PHOTO: COLOURBOX

PHOTO: COLOURBOX

Pacific impact on the Arctic larger than expected

Lea Svendsen was surprised to see how the Pacific impact winter temperatures in the Arctic. Now, her results have been published in Nature Climate Change. TEXT ELLEN VISTE

Pacific sea surface temperatures oscillate naturally between warm and cold periods lasting around 20 years each. When the Pacific is warmer than normal, it can contribute to higher winter temperatures in the Arctic.

This is shown in a study published in *Nature Climate Change*. The research was conducted by scientists from the Bjerknes Centre, the Geophysical Institute at UiB, NORCE and the Nansen Environmental and Remote Sensing Center.

"The results imply that a warmer Pacific Ocean in the following decades could accelerate the ongoing Arctic warming," says Lea Svendsen, who has led the research.

By now it is well-known that Pacific temperatures impact global temperatures. The newly published study shows that Pacific temperatures also has a direct effect on decadal temperature trends in the Arctic.

Arctic warming

The Pacific was in a cold phase between 1999 and 2013. This compensated for some of the global warming caused by greenhouse gas emissions. The global warming during those years was consequently less than expected.

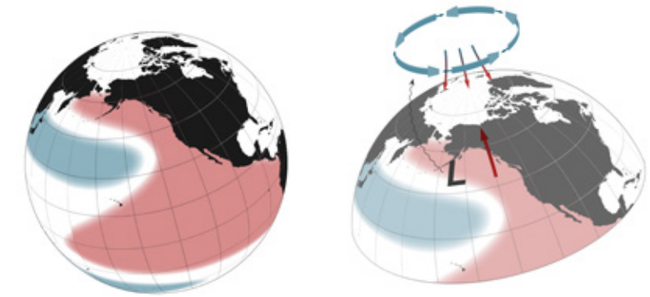
Even though the Arctic temperatures have increased dramatically in recent years, the Pacific has been cool and this could have dampened the Arctic warming. Now the Pacific might be transitioning into a warm phase.

Surprised by the results

It is not new to scientists that the global oceans can impact Arctic temperatures. But until now the Atlantic Ocean has been recognized as a more obvious candidate than the Pacific. Heat is transported northward by the Gulf Stream and the atmosphere. A lot of research has therefore focused on the link between the Atlantic and the Arctic.

"With the Atlantic Ocean as our closest neighbor here in Norway, it is easy to forget the vast Pacific Ocean on the other side of the globe. I was surprised when I saw the results. But after working on this for a few years, I would rather be surprised if the Pacific Ocean didn't impact the Arctic. Our colleagues in Japan that know the Pacific well were clearly less surprised by our results than our colleagues at home in Bergen."

Temperatures in the Pacific oscillate between warm and cold phases. During warm phases, the surface water in large regions of the Pacific is warmer than normal (red), while it is colder than normal (blue) in some regions to the west. During cold phases, the pattern is roughly the opposite. ILLUSTRATION: ELLEN VISTE



During warm phases, the Aleutian low is stronger than normal. This leads to more warm air being transported northward and into the Arctic. Also, the enhanced low leads to a weakening of the polar vortex in the stratosphere. This causes more sinking air over the Arctic. Like for the enhanced heat transport, this sinking contributes to more heating near the ground. ILLUSTRATION: LEA SVENDSEN/ELLEN VISTE

Earlier warm period

The researchers at the Bjerknes centre have, in this new study, investigated a specific period in time between 1910 and the 1940s. During these decades the Arctic temperatures increased by more than one degree. This increase in temperature is comparable to the warming from 1970 to 1990 when greenhouse gas emissions were much larger than during the 1920s and 30s. It is therefore unlikely that the greenhouse gas emissions alone could explain the Arctic temperature increase that took place from 1910 to the 1940s.

We already know that anthropogenic greenhouse gas emissions, an increase in solar insolation and the fact that we had few volcanic eruptions contributed to the Arctic warming from 1910 to the 1940s. The new results show that the sea surface temperatures in the Pacific also contributed.

The researchers used the Norwegian climate model NorESM to experiment with the Pacific temperatures. In some model simulations they included the natural decadal oscillations in the Pacific, and in the other simulations these were averaged out. The difference between these simulations was used to separate the effect of the temperature oscillations in the Pacific.

> "A warmer Pacific Ocean could accelerate the ongoing Arctic warming."

Low pressure and the stratosphere

The modeling study showed that the warm Pacific impacted the Arctic in two ways. First of all, when the Pacific is in a warm phase the low pressure in the Pacific near the Aleutian Islands is stronger than normal. A stronger low-pressure will transport more warm air from further south in the Pacific northward into the Arctic.

The researchers also found an impact via the stratosphere. The strong low-pressure enhances the wave activity in the atmosphere that weakens the polar vortex. When the polar vortex weakens, there is sinking motion over the Arctic which leads to warming near the surface.

It is still unclear if the Atlantic or the Pacific is more important for winter temperatures in the Arctic. When both the Atlantic and the Pacific are warmer than average, we can expect that also the Arctic gets warmer. But in reality, there will be a tug-a-war between the two oceans, on top of anthropogenic climate change.

"We will have to wait and see if the Atlantic or the Pacific wins the battle for Arctic temperatures during the next decades," Svendsen says.

Lea Svendsen at the Bjerknes Centre and the Geophysical Institute at the University of Bergen. PHOTO: JAN KÅRE WILHELMSEN, UiB

Offshore wind parks: Out of the blue and into the green

Norway has some of the best wind resources in Europe and an oil and gas industry with a history spanning almost 50 years. We have the technology required for developing offshore wind farms. So why are we hesitating?

TEXT IDA BERGSTRØM

PHOTO: COUTURBOX

Offshore wind energy. This magic formula is mentioned when we talk about our future energy requirements. It is a good alternative to windmill parks located in unspoilt countryside. It is the solution to how the offshore industry can be used once the petroleum age is over. It is a huge, perpetual, renewable resource which is just waiting for us.

So why are developments progressing so slowly?

"Investing in offshore wind turbines is very capital-intensive. Under today's conditions there are only a few companies that have the necessary resources," says Professor Berte-Elen Konow at Faculty of Law, University of Bergen.

Greener direction

During the course of her academic career, she has conducted research on financial law and international liens in particular. She has now chosen a greener direction for her academic work, and is a pioneering researcher in the field of sustainable *finance*. She is the Faculty's representative on UiB's Climate and Energy Transformation Committee, and affiliated with the Bergen Offshore Wind Centre (BOW).

> "If we are to attain our sustainable goals, we will need to make a substantial economical effort."

Professor Konow has embarked on the first stage of a major research project, designed to investigate if Norway's regulations on liens and asset registration are modern enough and provide adequate leeway for companies undergoing a readjustment phase. She and her colleagues at the UiB and the NHH (the Norwegian School of Economics) will be addressing the issues involved, find new solutions, and make recommendations about sustainable finance for offshore windmills.

"If we are to attain our sustainable goals, we will need to make a substantial economical effort. The private and public sectors alone would not be able to fund the required adjustments," says Professor Konow, adding:

"We have to make sure private companies in the forefront of the `green` and sustainable development, meet equal financial framework and conditions as the existing industry."

Professor Konow believes that more companies will need to become involved if we wish to facilitate a major development of this type.

"The question is whether or not we should wait for the major players to take everything, or if we should ensure that several companies will be able to contribute towards developing offshore wind parks. I want to find out if the legal financial framework conditions are good enough for anyone wanting to invest."

An equally important task is to explore the possibilities for legal changes, and to contribute to a process that may ensure that our legal framework is in correspondence with current international law.

Sustainable finance

The UN has mooted the need for sustainable finance. The EU, which is a party to the Paris Agreement, has also undertaken to help EU countries lead the way in respect of sustainable finance.

The Norwegian maritime industry already possesses much of the infrastructure, technology and expertise that would be required for such restructuring. The international offshore wind market is currently undergoing rapid development. Teknisk Ukeblad writes that last year alone 15 new offshore wind parks were built in Europe.

The value of Professor Konow's recommendations could be transferred to other forms of sustainable finance. The Legal Department at the Norwegian Ministry of Justice is following her research with interest. As a far-reaching consequence, her recommendations could result in a legislative amendment which could expedite the development of wind power in the North Sea.

"I'm impatient to get going. We don't have any time to lose."

Berte-Elen Konow. PHOTO: ANDRÉ KVALVÅGNES, UiB

Linn Merethe Brekke Olsen, Remi Aleksander Johnsen and Anders Bjerga aim to enable more successful clean-up operations at sea. PHOTO: OLE M. KVAMME

Reducing harmful plastic pollution

"It is hard to imagine our society without plastic, which has many useful properties. But our throw-away culture has turned plastic into one of our major social challenges."

TEXT OLE M. KVAMME

So says Linn Merethe Brekke Olsen, a PhD candidate at the K.G. Jebsen Centre for Deep Sea Research at the University of Bergen. She has been passionate about – and actively working on – the issues surrounding plastic for a long time.

As a result of this interest, she has started the company Bergen Greentech together with Anders Bjerga, who is also a PhD candidate at the K.G. Jebsen Centre, and Remi Aleksander Johnsen, managing director of Salt Pixel, which works closely with the fishing and aquaculture industries. They develop new technical solutions to map and reduce the amount of plastic and other waste that finds its way into the sea.

Big changes with the plastic whale

Brekke Olsen sees many advantages in plastic; it is inexpensive, easy to shape and weighs less than the materials used previously, such as glass or metal. Food keeps for longer, and its use in aircraft and cars means that they consume less fuel and so emit less greenhouse gases.

"However, our general throw-away culture has turned plastic waste into a big problem. In the future, more plastic will be produced, and inadequate waste management means that even more plastic will end up in the ocean," she says.

The scale of the problem makes it hard to imagine a satisfactory solution, but Brekke Olsen believes that efforts to improve infrastructure and waste management are crucial areas, in addition to attitude-forming work.

"A lot changed after the 'plastic whale' was found near Bergen in 2017. Then we saw great engagement with the issue of plastic waste, including an increase in media exposure and large numbers of clean-up operations along the coast. But the plastic we can see is only a fraction of the whole picture. Most of it is below the ocean surface," she explains.

Mapping lost equipment

By mapping plastic waste in the ocean, the three founders aim to enable more successful clean-up operations.

Innovation Norway has supported the project with a grant of NOK 100,000 for market analysis, and the founders received positive feedback and support from the Norwegian Directorate of Fisheries, Deloitte, and players in the aquaculture industry. Bergen Greentech focuses on developing technology that can help to locate lost fishing equipment.

"An estimated 640,000 tonnes of fishing equipment are lost in the ocean every year. We also have a big fishing industry in Norway. So we see this area as a good place to start," say the three founders, adding:

"We are initially developing this technology for crab pots, which pose an extra problem in that the lost equipment is left on the seabed and 'fishes' by itself - what they call ghost fishing. This causes great damage to marine life. The technology can also be used on fishing nets and a wide range of other products over time."

In use, in store or lost

"With a simple registration system, we will be able to see whether the equipment is in use, in store or lost. The technology could be a great help in clean-up operations, such as the Directorate of Fisheries' annual raids on lost fishing gear. We hope the technology will lead to better identification of areas where a lot of equipment has been lost, and that these areas can then be prioritised for clearing," they explain.

Once it has been marked, recovered equipment can be returned to its owner, or recycled. Either way, we know that it isn't lost at sea. In this way, the technology benefits both the environment and the user.

> A lot changed after the 'plastic whale' was found near Bergen in 2017.

"The solution will be both simple and inexpensive for the consumer. It is implemented during the actual production of the equipment, and the registration process will be handled automatically using stationary or mobile readers".

Successful tests

In 2018, two successful tests of the equipment were carried out, where the marking was placed on pots in the Barents Sea in cooperation with the Norwegian Directorate of Fisheries, and later on the ROV "Ægir 6000", belonging to the K.G. Jebsen Centre for Deep Sea Research. In this test, the equipment was lowered to a depth of more than 2,000 meters in the Norwegian-Greenland sea.

"We are very pleased with the results of these tests," say the three, who will be carrying out further tests in collaboration with operators before the production phase begins. Their long-term ambition is to reach a global market.

Plastic waste like lost fishing equipment causes great damage to marine life. PHOTO: ISTOCKPHOTO

Psychology makes a difference for climate change

Researchers in psychology investigate our attitudes and actions towards energy transitions and climate change. TEXT MARGARETH BARNDON

Decisions regarding recycling, trips to London by airplane, use of collective transport to work, and who we vote for, are all affected by our own beliefs. Small decisions in the big picture it seems, but they accumulate to big changes.

We care more about climate change

"People in the western world tend to view climate change as a more serious threat to society and the world at large than for the individual as such. However, this seems to be changing," says Gisela Böhm, professor at The Faculty of Psychology, UiB.

"In Norway the amount of rain is increasing. We see flooding and landslides repeatedly and heatwaves in our favorite holiday countries in Europe."

These are all examples that affects us directly. She believes this leads to a change in people's perception.

Informed but not alarmed

Böhm participated in an extensive international survey in Europe which examined how ordinary people view climate changes and energy transitions. It explores attitudes towards climate change, energy production and energy transition. The report "European Perceptions of Climate Change" looks into the comparison across Germany, France, Norway and Great Britain, and into how the respondents estimate the different measures taken in their own country.

Böhm refers to one of the questions in the survey, asking the respondents when they think the changes will happen.

"A majority of the respondents answered that they can already feel the effects of climate change and see them with their own eyes," answers Böhm.

> "Climate change is created by humans in the first place, our decision-making and our behavior.

The countries in the survey consists of four of the most important energy producers. They are important because decisions on infrastructure and politics will be decisive to Northern Europe's energy transition.

Higher hopes and less fear

In Norway people tend to have higher hopes in respect to climate change solutions, according to the report, and they come out with less fear, outrage and guilt than the rest of Europeans asked. The report also found that Norwegians are likely to view being environmentally friendly as an important part of Norwegian identity.

Gisela Böhm and Charles Ogunbode, University of Bergen. PHOTO: SOLFRID LANGELAND, UiB

"I think we can explain lower fear by the mere fact that Norwegians are not affected to the same extent yet. As for the lower guilt response, we think there is a connection to the larger supply of renewable energy in Norway."

Image dilemma?

An analysis of the socio-political context in the survey indicates a cognitive dissonance in Norway. Norway seeks a climate-friendly image, while being unable to curb its domestic emissions and maintaining fossil fuel exports at relatively high levels. On the other hand, electricity is produced from hydropower and thus stems from a renewable source.

"Oil has played and still plays an important role in Norwegian society, and is a key provider of employment and energy," explains Böhm.

In this way it contrast to the image of the environmentally friendly Norwegian who is searching for new solutions. So, will my every day small decisions make any difference? Will current climate change as in more flooding in Norway affect us more?

"It definitively does," answers Böhm. "The attitudes are changing now, as we see the climate changes coming up closer to us."

Ways to cope

The challenges are already here, and we are now trying to find ways to cope. Psychology will play a major role because human behavior is central to energy use and environmental preservation.

"Climate change is created by humans in the first place, our decision-making and our behavior, and these are central themes in psychology," says Böhm.

From psychological research, we have learned about different types of behaviors and their relative impact on energy use, the connections of values, beliefs, norms and behavior, and strategies that can make a difference in promoting a more sustainable environment.

"The relevance is obvious, and my focus has been on ordinary people and their daily life decisions. Moreover, the politicians also need the public to implement their policies," states Böhm.

The impact of our mental models

Böhm is also one of the research leaders of the project *Pathways to energy transition*. In this project, she studies public perceptions and preferences concerning energy transition pathways.

This project will use the results from the *European Perceptions of Climate Change project* to take a closer look at our mental models of climate change and energy. The researchers will explore how the public plays an important role in the question of whether the transition to a low-carbon society can be successful. It is important to know how the public think about renewable energy and the different routes to achieve a low-carbon society.

"We want to find answers to how our mental models about climate change and energy transitions shape our understanding of the risks involved," concludes Böhm.

PHOTO: MARKUS SPISKE / UNSPLASH

FACTS

Conclusions from the report

- The survey paints a picture of European public as informed but not alarmed.
- In Norway, climate change and the environment had higher priority as national issues as compared to the other countries.
- In Norway the results showed a lower level of skepticism to whether climate change is caused by human activity.
- One half of respondents in Norway did think that climate change will lead to more migration to their own country in the future.
- Renewable energy sources are viewed very positively in all four countries.
- Opinions toward nuclear power were more positive in the UK compared to other countries.
- Strong support in all four countries for policies to address climate change.
- High level of support for the 2015 Paris Agreement.

SDG Bergen

In this special section of the UiB Magazine, the innovative SDG Bergen initiative is presented. TEXT SVERRE OLE DRØNEN

SDG Bergen is a strategic initiative at the University of Bergen (UiB) to engage critically with the Sustainable Development Goals (SDGs). Initiated by Rector Dag Rune Olsen and the UiB Rectorate, SDG Bergen has contributed to positioning UiB as the premier SDG-oriented university in Norway. UiB's Vice-Rector Annelin Eriksen is the leader of SDG Bergen.

In the inaugural 2019 Times Higher Education (THE) University Impact Rankings, based on the SDGs, UiB was the only Norwegian university to be ranked. UiB was ranked number 53 in the world for its social and economic impact.

UiB has taken national leadership on the SDGs through its leadership in the National Committee for the 2030 Agenda in Norway's university sector and as host of the annual National SDG Conference Bergen, which was first held in February 2018.

Internationally, UiB has made its mark across the 17 SDGs, with particular emphasis on SDG17: Partnerships for the Goals and SDG14: Life below water. In October 2018, UiB was announced as official SDG14 Hub for United Nations Academic Impact. In November 2018, UiB was made SDG14 Cluster leader for the International Association of Universities. The research centre Ocean Sustainability Bergen (OSB) handles the practicalities surrounding UiB's SDG 14 roles.

Through SDG Bergen Science Advice, UiB wants to establish an annual presence at the UN High-level Political Forum and to provide science advice to the UN system, international organisations and national governments. By partaking in science diplomacy, academia can contribute to better informed decision-making.

‹ **SUSTAINABLE LEADERSHIP:** The University of Bergen has been appointed official SDG14 Hub for United Nations Academic Impact and SDG14 Cluster leader for the International Association of Universities. PHOTO: EIVIND SENNESET, UiB

Taking a global SDG lead in ocean science

The University of Bergen has taken on a global leadership role on SDG 14, Life below water, and will act to inspire and motivate partners worldwide to create greater knowledge towards a sustainable ocean. TEXT SVERRE OLE DRONEN

On 24 October 2018 it was announced at the UN in New York that the University of Bergen (UiB) has become the official Hub institution for Sustainable Development Goal (SDG) 14, Life below water, for United Nations Academic Impact (UNAI). In November, at the annual conference of the International Association of Universities (IAU) it was announced that UiB will lead the university network's SDG14 Cluster, underlining UiB's strong position in the marine sciences.

"We are delighted to have been invited by UNAI and IAU to these prestigious roles and look forward to working with them and other international actors to promote knowledge, research and education for a sustainable Ocean," says Rector Dag Rune Olsen, who initiated SDG Bergen, a strategic initiative at the university.

The research centre Ocean Sustainability Bergen (OSB), a part of the SDG Bergen initiative, handles the practicalities surrounding UiB's SDG 14 roles.

Community engagement

UNAI has selected 17 universities worldwide for Hub status, one on each SDG, whereas IAU has chosen 16 member universities for its SDG Clusters and leading on SDG17 itself.

"We look forward to using our expertise in the marine sciences to bring both current and future partners together to make sure that the implementation of SDG 14 is done with scientific knowledge at the core," says Professor Lise Øvreås, OSB's academic director, adding:

"Above all we look forward to interact with the other UNAI SDG Hub institutions and IAU Cluster universities to bring about the partnerships needed to reach all of the Goals by 2030."

UiB was the first university in Norway to institutionalise the SDGs, primarily through SDG Bergen, OSB and the annual National SDG Conference Bergen. This work includes the establishment of SDG Bergen Science Advice, which runs the day to day operations related to scientific advice and science diplomacy at the university.

"Having a dedicated group has helped us a lot in this work, as has working closely with the broad range of marine sciences found across the university. After all, marine science is one of three focus areas at the university," says Professor Edvard Hviding, who is the academic director of SDG Bergen Science Advice.

> "To reach the ambitions at the core of the SDGs we need to work together in partnership across borders and academic disciplines."

He points out that Bergen as a city always has been dependent on the Ocean and thus UiB was ideally positioned for the SDG14 Hub and Cluster statuses.

Education key to SDG14 success

The two professors point to the crucial job that lies ahead for all universities and higher education providers in terms of engaging critically with the SDGs.

"Our students are among the driving forces for sustainability and change towards a so-called green economy. At UiB we are currently in the process of evaluating how we can feature issues of sustainability across disciplines as part of our education," says Øvreås.

Øvreås and Hviding, along with former OSB Director Peter M. Haugan, are among the driving forces behind UiB's pursuit of a more ambitious approach to critically engage with the SDGs. This includes unconventional and innovative measures, such as teaming up with Bergen-based tall ship Statsraad Lehmkuhl to create a study programme as part of a circumnavigation of the globe so as to educate future leaders on sustainability issues.

"This is only one of a number of measures UiB is currently undertaking to critically engage with the SDGs. For us this all goes way beyond SDG14. Our approach runs through SDG17, Partnerships for the Goals, as we believe that to reach the ambitions at the core of the Goals we need to work together in partnership across borders and academic disciplines," Hviding says.

FACTS

UiB and SDG14

- United Nations Academic Impact (UNAI) invited 17 universities worldwide to be Hubs for the 17 Sustainable Development Goals (SDGs).
- The University of Bergen (UiB) was invited to be UNAI Hub for SDG14, Life below water.
- UNAI member institutions were selected as exemplars for their innovative research, teaching and community engagement related to a specific Goal.
- The International Association of Universities (IAU) has appointed UiB to lead its SDG14 Cluster.

From research to policy

When discussing sustainable development, terms such as science advice and the science-policy interface have become paramount. What is this all about?

TEXT SVERRE OLE DRØNEN

We asked veteran UiB researcher, Professor Silvio Funtowicz, to provide some clarity and critical thought on the subject, based on his experience providing scientific advice to policy-makers.

Encouraging citizen participation

"I have been engaged in science advice, sustainable development and the use of science for governance and policy for decades. Providing knowledge that is relevant to support political and policy-value processes," says Funtowicz on the emerging interest in the so-called science-policy interface.

He is, however, critical of those who equate knowledge with academic knowledge, and believes that a broader understanding of knowledge needs to be deployed. Something he has been involved in, encouraging citizen participation in knowledge creation.

"There is a lot of knowledge that goes beyond disciplinary science which is just as effective and relevant to political decision-making, such as the knowledge of fishermen and farmers," he says, and in that sense "science diplomacy might enable to relate a variety of knowledge sources, coming from a variety of countries and traditions."

The struggle for the right language

Funtowicz believes that one of the main challenges for academics is to be clear about what problem they are being asked about, and to adhere closely to the brief they are given.

"The problem for academics is that they are not used to the political-institutional ecosystem. Moreover, in that system, it can be a struggle to find the appropriate language. In an institution like a university, there is great freedom. Nevertheless, when you give advice to policy-makers, you must listen to, and study the context in which your advice or opinion will be used. Understanding how the policy-makers themselves understand the problem is a first and necessary condition."

> When you give advice to policy-makers, you must listen to, and study the context in which your advice or opinion will be used.

Even with these restrictions in mind, he believes that researchers have plenty of space to present their ideas to policy-makers, as long as they understand the policy subject and the context.

Tailoring your policy brief

One of the most common ways of providing science advice to policy-makers is via a policy brief. A short print or presentation containing policy recommendations based on scientific findings.

"Your policy brief has to be tailored and customised to the process," Funtowicz says, "however, it is just one element of the relevant knowledge, and is mostly a kind of reflection on the evidence. The brief might have diverse functions, and works differently depending on the circumstances. You have to be aware that it is different talking to a minister or to Parliament, and the brief should reflect that."

‹ **THE POWER OF SCIENCE:** Silvio Funtowicz discussing scientific advice and the societal impact of research at the 2019 SDG Conference Bergen.
PHOTO: EIVIND SENNESET, UiB

Science advice and sustainability

Six lessons learned

In 1998, Silvio Funtowicz organised an EU-sponsored panel at the UN Commission on Sustainable Development (CSD) in New York, with a critical look at the challenges in the use of science for sustainable development. Looking back, he feels little has been done in facing the challenges of sustainable development – even with the establishment of the SDGs. However, he did learn some lessons from the process which he wants to share:

1 When dealing with complex practical and political questions, the traditional solving strategy of reducing value issues to techno-scientific problems must be changed. Keep values explicitly in, rather than making them invisible.

2 Science and technology can support the policy effort but cannot replace the process that is fundamentally social, political and institutional.

3 We have not yet answered the question of what we want to sustain and why. We cannot sustain everything; more precisely, we do not want to sustain everything. Clearly, we do not want to sustain unsustainable practices and lifestyles.

4 How and who is going to make those choices? Setting goals might be a good idea but sustaining democratic socio-political processes and fair institutions to achieve those goals is urgent.

5 We need to answer the question: who and what is the subject of sustainability? Make it an inclusive WE rather than an exclusive THEM.

6 Sustainability is not in the future but in the present.

‹ **URBAN SPRAWL:** An aerial view of Johannesburg, one of the cities studied in the Urban Enclaving Futures research project. PHOTO: EDWIN REMSBERG/REDUX/NTB SCANPIX

Urban research takes on the SDGs

How do enclaves that arise as cities within a city, impact on urban planning and the creation of liveable and sustainable cities for all citizens? TEXT SVERRE OLE DRØNEN

This is one of the central themes in the research project Urban Enclaving Futures, which looks at the development of city enclaves beyond classic economic understandings of urban development. The researchers study social, cultural, spatial and other dimensions to fully understand the impact of enclaving in modern cityscapes.

Making a case for urban sustainability

A major component of the project is taking on board issues of sustainability by looking at how enclaving impacts on creating sustainable development, comparing the African cities of Accra, Johannesburg and Maputo.

"What you find in the rise of the urban enclaves is the so-called self-sustaining city," says Professor of Anthropology Bjørn Enge Bertelsen at the University of Bergen (UiB), before asking, "how do these enclaves, often behind walls, engage with the city outside of the enclave and how does this impact on the overall sustainability of both the local community and global goals to create a sustainable world?"

In the workshop, the researchers discussed sustainable city planning as a central part of the project. These enclaves are extremely car-based and use more energy than the cities as a whole. Current development of urban enclaves does not promote sustainable city planning in terms of transportation and use of public transport.

> "The rise of enclaving is the final blow to the modern fiction of urban planning."

Urban enclaving and the SDGs

The project touches on many of the 17 SDGs, but Bertelsen wants to move beyond traditional Western notions of Africa as a poverty-stricken continent, and instead prefers to focus on the rapid growth and its consequences – and possibilities – for Africa.

This is why the project has singled out one SDG of particular interest for the project and its researchers.

"SDG 11 on urban planning is one of the sustainability issues of interest for the project," says Bjørn Enge Bertelsen elaborating on this, "enclaving in its multiple forms and representations and manifestations kills the notion of urban planning. The rise of enclaving is the final blow to the modern fiction of urban planning. This is why we need to think about what city planning means in the age of enclaving and how this impacts on sustainability issues."

Science advice on urban development

As part of its SDG-orientation the project aims to contribute with scientific advice to bring critical dimensions on global sustainable development to decision-makers internationally and nationally.

"The world is becoming urban but what that means is also changing; we are no longer talking about cities in the conventional sense and enclaving is a prime symptom of this transformation. For this project it is therefore important to make our research and findings available to stakeholders and policymakers – aiming also to enter into dialogue with these and offering science advice about, for instance, the new forms of inequalities as well as possibilities that arise," says Bertelsen.

There will be further Urban Enclaving Futures workshops in Accra in January 2020 and in Johannesburg in January 2021, where the SDG-orientation in the project will be elaborated upon.

Search for **#UrbanEnclaving** on Twitter

FACTS

Urban Enclaving Futures

- *Urban Enclaving Futures: Patterns of global futures in three African cities* is an interdisciplinary research project funded by the Research Council of Norway.
- The project looks at how enclaving is changing the cityscapes of three African urban areas: Accra in Ghana, Johannesburg in South Africa, and Maputo in Mozambique.
- The project engages with the Sustainable Development Goals (SDGs), in particular SDG11: Sustainable Cities and Communities.
- Read more at: **uib.no/en/urbanenclavingfutures**

CITY PLANNING IN THE AGE OF ENCLAVING: Professor Bjørn Enge Bertelsen leading the way for researchers in the Urban Enclaving Futures project on a field trip of Maputo, Mozambique in January 2019. PHOTO: SVERRE OLE DRØNEN, UiB

World Wide SDG

UiB was the first university in Norway to institutionalize the SDGs, including establishing the SDG Bergen initiative. So what has SDG Bergen been up to in the past year? We select some highlights.

In October 2018, UiB was announced as the official **SDG14** (Life Below Water) Hub for United Nations Academic Impact. **#SaveOurOcean**

In April 2019, **UiB was ranked number 53 in the world** in the inaugural THE University Impact Rankings, recognising universities around the world for their social and economic impact.

In July 2018, UiB represented Norway's university sector in Norway's official delegation at the High-level Political Forum (HLPF) in **New York**. This included speaking in the General Assembly, co-arranging a workshop and giving science advice as part of the official Norway side event.

The United Nations building in New York City.
PHOTO: CHIP EAST/REUTERS/NTB SCANPIX

UiB and Norway's Permanent Delegation to UNESCO presented the Norwegian higher education model (focused on SDG14) at the first workshop for the International Association of Universities (IAU) SDG Cluster in **Paris**, in January 2019.

The second National **SDG Conference Bergen** took place 7–8 February 2019, with a critical look at the SDGs billed as *re:thinking/re:working – addressing the inequality of knowledge.*

UiB and the Bjerknes Centre for Climate Research co-arranged the official Norway side event during the climate talks at COP24 in **Katowice** in December 2018. **#ClimateAction**

Rector Dag Rune Olsen spoke at the IAU annual conference in **Kuala Lumpur** in November 2018, when UiB was officially announced as IAU SDG14 Cluster leader.

UiB was given special mention at the May 2018 Worldwide Universities Network (WUN) Annual General Meeting in **Perth** for the university's leadership role on the SDGs.

UiB participated strongly in the official Norway delegation to South Africa in autumn 2018. The visit concluded in **Cape Town** with a debate on education and sustainability, led by Rector Dag Rune Olsen. **#SDG4**

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Music in times of crisis

Edvard Grieg is a world famous composer and still played all over the world. The Centre for Grieg research at the University of Bergen penetrates deeper into Grieg's importance and looks at how political crises repeatedly make Grieg relevant as a symbol of humanistic and democratic values. TEXT HILDE KVALVAAG

During World War II, Norwegians in the Germans' prison camp at Grini nearby Oslo were allowed to form a string orchestra. During their concerts, the orchestra played Grieg's piano concerto in A-minor.

"Grieg's music had a strong emotional impact on the prisoners. Grieg meant something special to them," says Arnulf Mattes, Associate Professor and head of the Centre for Grieg Research at UiB, which recently transferred from The Faculty of Humanities to the Faculty of Fine Art, Music and Design.

Music is politics

Since 2016, Mattes has been working on the project 'Transforming the Nordic - Music and Politics in Norway 1930–45'. The aim is to research the political significance of collective memories created through music. And also how the relationship with Grieg's and other Norwegian music changed before, during and after World War II. Historically, Mattes states, Grieg has been used in critical situations, when common values are at risk, for instance during occupation. For example, the centenary of Edvard Grieg's birth in 1943, was a turning point in the struggle between Nazi propaganda and civil resistance in the music field.

"The Nazis realized they could not win the Norwegians' sympathies by praising Grieg. As a response to the abuse of Grieg's music by nazi propaganda, the resistance movement made a virtually total boycott of musical life until the occupation ended in 1945. So while the Germans tried to take Grieg hostage, as a Nordic, Germanic composer, he was also used as a symbol of the cultural and moral resistance to the occupation power."

Music as the glue of society

Mattes further states that the national significance of Edvard Grieg and his music was established during the nation-building period up to the Union dissolution in 1905. It seems however like his deep impact is firmly established.

"Grieg's position has changed in several periods, before, during and after World War II. The latest Grieg anniversaries in 1993, 2007 and 2018 also show how Grieg's music is creating community right up to our time. It may seem that Grieg's nation-building characteristics are constantly in demand in times when cultural consensus seems to be in danger of dissolving."

Possible pitfalls

"But there are some possible pitfalls when researching composers such as Grieg," Mattes says, adding:

"Grieg has achieved an exceptional icon status and seems unassailable, seen with Norwegian eyes. He personifies the ideal image of the "good" artist, both in an ethical and aesthetic sense."

"In our work at the Centre for Grieg research we want to revisit existing beliefs about Edvard Grieg. He should not be treated with awe. We will work to bring out 'forgotten', even surprising parts of his work as an artist and public persona in the bourgeois society of the 19th century."

Where did the women go?

The writing of music history has been dominated by the 'man and his work', the genius composers' perspective. Norwegian music history, as it turns out, follows the established pattern. The Centre for Grieg Research is now working on an application for a project that looks at gender and women in Norwegian music.

"We want to see how the women are portrayed in Norwegian music, for example as mythological figures. What role does the woman play in music? Except Nina Grieg, as one of the prominent examples, there is not much systematic research on female Norwegian musicians and composers."

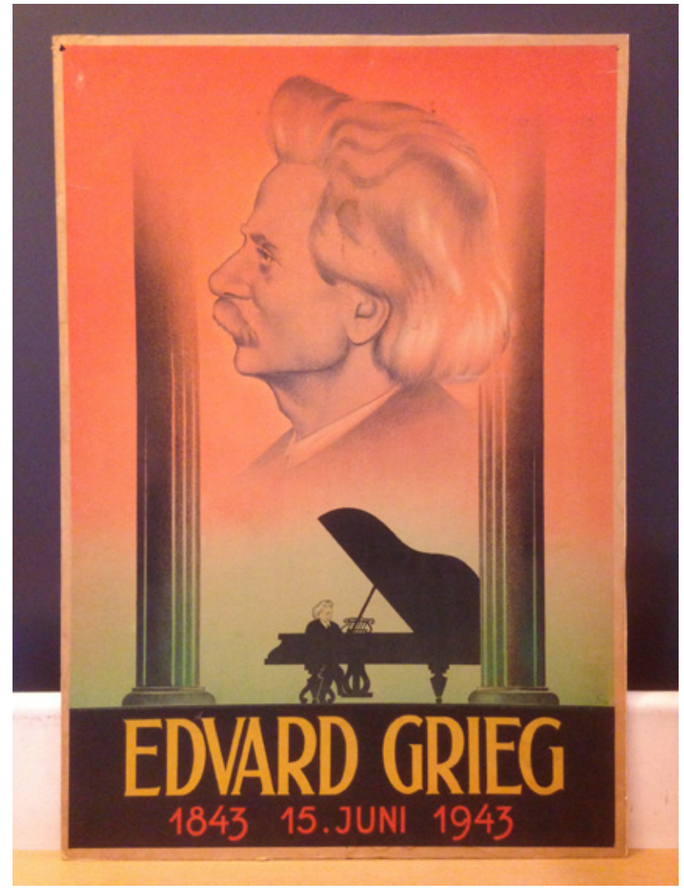
Mattes and his fellow researchers are asking: Is it because the women didn't write just as good music? Did they choose the "wrong" style? Was their music performed differently? And what about all the female singers who performed the composers' romances? Who were they? Where did they get educated, what career did they do? What influence did they have on the composers?

"The questions are many, as the gender perspective has long been absent in Norwegian music history," Mattes claims.

Many fields of research meet in music

Mattes has been the head of the Centre for Grieg Research for three years and is full of enthusiasm for the interdisciplinary research environment around the centre.

"It is important for us to work with the humanities, with historians, ethnologists and sociologists. Musical interpretation is a cultural practice. The same goes for music and politics. We look at what happens musically, but in order to understand the meaning, form and style, we must also look at factors related to the autonomy of the work. As music scientists, we are part of cultural science. At the same time we have a lot to learn from performing musicians and the scenic fields, and their experiences and theories of performativity. With this I mean the room music 'is staged' in, and where the performer and the listener enact music as a dynamic relationship," Mattes concludes.



Propaganda poster made by Nasjonal samling, the Norwegian party working for the German occupants, for the anniversary of Edvard Grieg in 1943.

Arnulf Mattes is the leader of the Centre for Grieg Research at the University of Bergen. PHOTO: PRIVATE

Rune Samdal and his wife Kirsten. PHOTO: INGRID HAGERUP

Preparing for the Alzheimer's wave

Alzheimer's disease is one of this era's biggest global societal challenges, according to researchers at the University of Bergen. TEXT INGRID HAGERUP

"It's your birthday tomorrow, and some people are coming round," Rune Samdal tells his wife, Kirsten. She responds by laughing a little, grabbing hold of his arm and smiling warmly at her husband.

They are sitting on the sofa in her room at Ulset nursing home, surrounded by pictures of their children and loved ones. There are flowers on the table. Otherwise, the room has a bed, television and CD player.

"She likes listening to music," Rune explains.

Kirsten is about to turn 71 years. She has had Alzheimer's disease for 23 of them. Rune Samdal describes her as an active woman, who loved singing and music, and used to sing in a choir. She stayed at home to look after their daughter, who had extra needs. When their daughter died at the age of 21, she left an enormous void in both their lives. Shortly after, Kirsten began to demonstrate dementia symptoms:

"The first sign was that she lost her sense of smell," Rune says. Later, other symptoms appeared. Rune had a busy job as a director at DNB. He would come home and find that tasks she had previously managed with the greatest of ease had not been done. However, it took almost 15 years before Kirsten was diagnosed with Alzheimer's.

> "The first sign was that she lost her sense of smell.

Dementia numbers will double

It is estimated that 77,000 people in Norway have dementia, and 60% of them have Alzheimer's disease. Most of those who develop the disease are more than 65 years old, but according to figures from the Norwegian Public Health Association, 4,000 people under the age of 65 in Norway have dementia.

One of the downsides of increases in welfare is that researchers expect the incidence of dementia and Alzheimer's to increase massively over the next few years:

"The number of people with dementia will double over the next 15 years. In some countries in Asia, Latin America and Africa, a 350% increase is predicted in the next few years," says Bettina Husebø, head of the Centre for Elderly and Nursing Home Medicine (SEFAS) at the Department of Global Public Health and Primary Care.

She believes the greatest challenge is that many of these countries are not prepared for what happens when people get older and die of causes other than malnutrition and infection:

"When people get a dementia disease, their personality changes, which can be unexpected for the people close to them and health care practitioners. In a transitional phase, it is likely that there will be an increase in abuse of power, use of coercion, and improper medication of the elderly," according to the researcher.

Alternatives to medication

"The average nursing home patient with dementia take eight different medicines every day," Husebø says.

These often include pain relief medicines, which can actually make the symptoms worse. Most patients have other conditions, in addition to the dementia disease.

"Alzheimer's patients can have pain or be depressed. This is why 'complex interventions' are needed," explains the researcher. In this context, she mentions the COSMOS method – a trial combining COmmunication, Systematic assessment and treatment of pain, Medication review, Occupational therapy, and Safety for nursing home patients.

These are examples of non-drug treatments that can make everyday life more pleasant and more meaningful for both the patients and their family and friends, although it will not necessarily slow down the disease progression.

"Like flipping a coin"

Is there anything that can slow down the progression of the disease? What do researchers really know about Alzheimer's disease? Charalampos Tzoulis is doing research on neurodegenerative diseases, which is basically "brain ageing", at the Department of Clinical Medicine at the Faculty of Medicine. ▶▶

FROM THE TOP: UiB researchers Bettina Husebø at the Department of Global Public Health and Primary Care, Charalampos Tzoulis at the Department of Clinical Medicine and Stefan Kölsch at the Department of Biological and Medical Psychology. PHOTOS: KIM ANDREASSEN (HUSEBØ), THOR BRØDRESKIFT (TZOULIS), EIVIND SENNESET (KÖLSCH)

"We know that nerve cells die, but not why or how they die," says Tzoulis.

It has been established that people with Alzheimer's have an increased accumulation of certain proteins in their brains. One of these proteins, beta-amyloid, forms deposits between the nerve cells that researchers call "plaque". What they do not yet know is whether plaque causes Alzheimer's, or whether it is a symptom of Alzheimer's. It has also been found that the disease is partially hereditary, but it is important to distinguish between early on-set Alzheimer's and Alzheimer's that develops after the age of 65 years. Early on-set Alzheimer's, which occurs in patients in their 30s and 40s, is often linked to specific, rare genes. There is less evidence of heredity when the disease occurs after the age of 65 years.

"The biggest risk factor for Alzheimer's is age. After the age of 85 years, about 40% of the population will develop dementia. It's almost like flipping a coin," Tzoulis concludes.

Music as medicine?

However, there are researchers who believe that non-drug interventions, such as music, can help slow down the progression of Alzheimer's disease.

Renowned musician and neuroscientist Stefan Kölsch is working on a new project at the Department of Biological and Medical Psychology at the Faculty of Psychology.

He works in the Bergen fMRI Group, which uses advanced imaging technology to analyse brain activity. They are starting up a new project, called ALMUTH, to investigate what effect music and physical activity have on the brains of people in the early stages of Alzheimer's.

"Many studies show that music has a positive effect on people with dementia. However, no one has examined what effect it has on the participants' brains," he explains. And he has high hopes:

"We are keeping all options open. It could even be that music, introduced correctly and at an early stage, can cure Alzheimer's disease. Physiologically it is perfectly possible. We see from brain scans that Alzheimer's disease affects the same part of the brain that is used to process music – the hippocampus," he explains.

Even if it turns out that music cannot "cure" Alzheimer's, the researcher is confident that they will see positive effect on patients. For example, music therapy may slow down the progression of symptoms, or improve patients' quality of life.

Using artificial intelligence

Charalampos Tzoulis agrees that music can help patients, but is less confident that music will prove to be a cure for Alzheimer's.

> "The biggest risk factor for Alzheimer's is age. After the age of 85 years, about 40% of the population will develop dementia."

He believes that in order to resolve the Alzheimer's riddle, we need to forget some of the previous findings and assumptions, what he metaphorically refers to as "anthromorphism", or human bias, in research:

"In our research, we use machine learning, i.e. artificial intelligence, to identify new correlations," says the researcher.

He mostly works on Parkinson's disease, which has similarities to Alzheimer's in several respects. By feeding a computer with data from healthy brain tissue and data from brain tissue from a patient who has had Parkinson's, the machine found that the diseased brain tissue had a defect in the mitochondria, which are the cells' power station.

Tzoulis cannot yet say whether this knowledge is relevant as part of a cure for Parkinson's, and even less, whether it can shed new light on Alzheimer's disease. However, he is convinced a radical change is needed in the perspectives in research in order to find an answer. These kinds of technological changes have happened before, and will happen again," says Tzoulis. He is therefore hopeful on behalf of Alzheimer's research:

"It is possible to find a cure for everything, including Alzheimer's. It is even possible to find a cure for the ageing process! Physiologically, it is not impossible; there are animals that are 'immortal'," says the researcher, who hopes we are closer to finding a cure for Alzheimer's, than for the ageing process per se.

"Our world cannot cope with the enormous growth in Alzheimer's. It is extremely important to find a solution," he says.

PHOTO: MAURO MARZORATI

Brush your teeth – Postpone Alzheimer's

You don't only avoid holes in your teeth by keeping good oral hygiene. Researchers at the University of Bergen have discovered a clear connection between gum disease and Alzheimer's disease. TEXT KIM E. ANDREASSEN

ILLUSTRATION: ISTOCKPHOTO

The researchers have determined that gum disease (gingivitis) plays a decisive role in whether a person developes Alzheimer's or not.

"We discovered DNA-based proof that the bacteria causing gingivitis can move from the mouth to the brain," says researcher Piotr Mydel at Broegelmanns Research Laboratory, Department of Clinical Science, University of Bergen.

FACTS

Gingivitis

- The bacteria Porphyromonas gingivalis (P.gingivalis) is one of the main causes to infection in the gums.
- The bacteria causes chronic infection in the gums, but can move to the brain where it can damage nerve cells in the brain.
- Circa 50 per cent of the population have this bacteria in one or another form.
- Circa 10 per cent of the ones having this bacteria will develop serious gum disease, loose teeth, and have an increased risk of developing Alzheimer's disease.
- In addition to Alzheimer's, the bacteria is linked to rheumatism, COPD and esophageal cancer.

The bacteria produces a protein that destroys nerve cells in the brain, which in turn leads to loss of memory and ultimately, Alzheimer's.

The study is published in Science Advances.

Brush your teeth for better memory

Mydel points out that the bacteria is not causing Alzheimer's alone, but the presence of these bacteria raise the risk for developing the disease substantially and are also implicated in a more rapid progression of the disease. However, the good news is that this study shows that there are some things you can do yourself to slow down Alzheimer's.

"Brush your teeth and use floss". Mydel adds that it is important, if you have established gingivitis and have Alzheimer's in your family, to go to your dentist regularly and clean your teeth properly.

New medicine being developed

Researchers have previously discovered that the bacteria causing gingivitis can move from the mouth to the brain where the harmful enzymes they excrete can destroy the nerve cells in the brain. Now, for the first time, Mydel has DNA-evidence for this process from human brains. Mydel and his colleagues examined 53 persons with Alzheimer's and discovered the enzyme in 96 per cent of the cases. According to Mydel, this knowledge gives researchers a possible new approach for attacking Alzheimer's disease.

"We have managed to develop a drug that blocks the harmful enzymes from the bacteria, postponing the development of Alzheimer's. We are planning to test this drug later this year," says Piotr Mydel.

For several years, Piotr Mydel has done research investigating how different bacteria are implicated in Alzheimer's disease. PHOTO: KIM E. ANDREASSEN

UiB archaeologists find the world's oldest drawing

Archeologist from UiB discovered the earliest known drawing in a cave in South Africa. The abstract drawing displays a red cross-hatched line pattern, created with an ochre crayon 73,000 years ago. TEXT JANNE-BEATE BUANES DUKE

Blombos Cave where the oldest known drawing was found. PHOTO: TRACSYMBOLS/UiB

"The drawing adds a completely new dimension to our ability to understand when early humans became like us. The drawing demonstrates that early Homo sapiens in southern Africa had the skills to make graphic designs in various media using different techniques at least 30,000 years earlier than first anticipated," says Christopher Henshilwood, Professor at UiB, and Director of the SFF Centre for Early Sapiens Behaviour (SapienCE) at the University of Bergen. The discovery was first published in Nature.

Discovered by chance

The drawing was discovered when Christopher Henshilwood and Karen van Niekerk were excavating the 73,000 year old layer in Blombos Cave in South Africa.

A dusty batch of stone flakes was shipped to the Wits University satellite laboratory in Cape Town to be rinsed and examined. And from here - we can only imagine the scene when their close colleague and archaeologist Dr Luca Pollarolo noticed a pattern made of lines on a small silcrete flake amidst the hundreds of similar flakes he was examining.

THE WORLD'S OLDEST DRAWING: The world's oldest drawing is 73,000 year old and made on a silcrete stone flake displaying a red cross-hatched pattern. PHOTO: CRAIG FOSTER

> It was one of those unexpected days, which any archaeologist lives for.

"The discovery was obviously very exciting for all of us! You can say – it was one of those unexpected days, which any archaeologist lives for," Henshilwood and van Niekerk say with a smile.

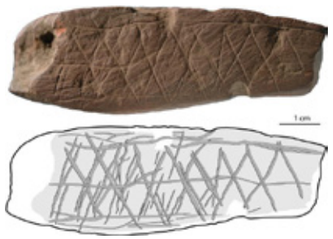
The silcrete flake was designated number L13. Even though they were quite certain of what they had – a drawing – they needed to strategise the best methodology that could prove it was a drawing.

The research journey

Many questions needed answers. Were the lines on the stone natural, a part of the matrix of the rock, or were they, perhaps, made by humans living in Blombos Cave 73,000 years ago?

"Our first step was to take the silcrete stone flake to our colleague Francesco d'Errico at the CNRS-PACEA lab of the University of Bordeaux in France, also part of the SapienCE team. Together we agreed on a systematic approach to answering the questions that the small, but interesting L13 had challenged us with."

An important part of the investigation was to carefully examine and photograph the piece under a microscope to establish whether the lines were already part of the stone, or if it had been applied to the stone intentionally. They also used sophisticated instruments to establish that the lines are ochre.



EARLY ENGRAVINGS: Crosshatched patterns engraved into pieces of ochre have also been found in the same layers as #L13 in Blombos Cave. PHOTO: JOURNAL OF HUMAN EVOLUTION

Years of inquiries led to the conclusion that the cross-hatched drawing had been made with a pointed ochre crayon with a tip around 1–3 millimetres in width. Further, the abrupt termination of the lines at the edge of the flake also suggests that the pattern originally extended over a larger surface, and may have been more complex in its entirety.

The analysis also confirms that the lines were indeed applied to the flake, and consisted of a haematite rich powder, commonly referred to as ochre, 73,000 years ago, and makes the drawing on the Blombos silcrete flake the oldest known drawing made by Homo sapiens.

EXCAVATING: Christopher Henshilwood (pictured) and Karen van Niekerk were excavating the 73,000 year old layer in the cave when they found the world's oldest drawing. PHOTO: TRACSYMBOLS/UiB

Early symbolic behavior

What can this drawing tell us about our human history?

"Before this discovery, Palaeolithic archaeologists had for a long time been convinced that unambiguous symbols first appeared when Homo sapiens entered Europe, 40,000 years ago, and replaced local Neanderthals.

Recent archaeological discoveries in Africa, Europe and Asia, in which members of our team have often participated, support a much earlier emergence for the production and use of symbols."

According to Henshilwood the abstract drawing is yet more proof that symbolic behavior started in Africa and not in Europe as first anticipated.

Symbols makes us human

Why is symbolic behavior so important in understanding early human behavior?

"Symbols are an inherent part of our humanity. We express symbols every day. They can be inscribed on our bodies in the form of tattoos and scarifications or through application of particular clothing, ornaments and the way we dress our hair. We use symbols every day and they exist in everything we do. Language, writing, mathematics, religion, laws could not possibly exist without the typically human capacity to master the creation and transmission of symbols and our ability to embody them in material culture."

"Substantial progress has been made in understanding how our brain perceives and processes different categories of symbols, but our knowledge on how and when symbols permanently permeated the culture of our ancestors is still imprecise and speculative," d'Errico says.

The drawing fits the bigger picture

The archaeological layer in which the Blombos drawing was discovered also yielded other indicators of symbolic thinking, such as shell beads covered with ochre, and, more importantly, pieces of ochres engraved with abstract patterns. Some of these engravings closely resemble the one drawn on the silcrete flake. In older layers at Blombos Cave, dated at 100,000 years, they also discovered a complete toolkit consisting of two abalone shells filled with an ochre rich substance, a red paint, and all the artefacts associated with making it including seal bone used to add fat to the mixture. This discovery proves that our early ancestors could also make paint 100,000 years ago.

"All these findings demonstrates that early Homo sapiens in the southern Cape used different techniques to produce similar signs on different media. This observation supports the hypothesis that these signs were symbolic in nature and represented an inherent aspect of the world of these African Homo sapiens, the ancestors of all of us."

FACTS

Blombos Cave

- Blombos Cave is located on the southern coast of South Africa, 300km east of Cape Town, and contains some of the earliest known evidence of behaviourally modern human cultural activity.
- Blombos Cave has provided artefacts dated to between 70,000 and 100,000 years ago, including shell beads, engraved pieces of ochre and tools, and the earliest evidence for the use of containers, abalone shells, to store a red, ochre and fat rich paint made 100,000 years ago.
- The abstract drawing, which consists of three red lines cross-hatched with six separate line, predates previous drawing from Africa, Europe and Southeast Asia by at least 30,000 years.

An astronaut is space walking outside the International Space Station. On the top-right, the ASIM instrument, always on the hunt for new thunderstorms. PHOTO: NASA

Hunting thunderstorms from space

Since April 2018, technology from The Birkeland Centre for Space Science (BCSS) at UiB has been in orbit around the Earth, placed at the International Space Station as part of the European Space Agency mission *ASIM (The Atmosphere-Space Interactions Monitor)*. One of the main objectives of the mission is to observe terrestrial gamma-ray flashes, as well as other largely unknown phenomena that occurs above the clouds during a thunderstorm.

BCSS-leader Nikolai Østgaard, Professor at the Department of Physics and Technology, describes the mission so far as a great success. One year after the launch, the ASIM payload had detected more than 200 terrestrial gamma-ray flashes, enabling the researchers to construct the first-ever images of such events.

ASIM has also shed new light on the sequence of events in the enigmatic phenomena that lasts only a fraction of a millisecond. Using data from ASIM, the researchers conclude that a terrestrial gamma-ray flash occur after electrical fields build up in the thundercloud, but before a lightning strike.

The main contractor for ESA is Terma, and the development of the ASIM payload has been a collaboration between multiple European companies and universities.

Centres of Excellence

The Research Council of Norway in 2002 initiated a scheme entitled Centres of Excellence (SFF). The research must be innovative and have major potential to generate ground-breaking results that advance the international research frontier.

In addition to Centre for Early Sapiens Behaviour and the Birkeland Centre for Space Science, the present Centres of Excellence at the University of Bergen are:

Centre for Intervention Science in Maternal and Child Health (CISMAC)

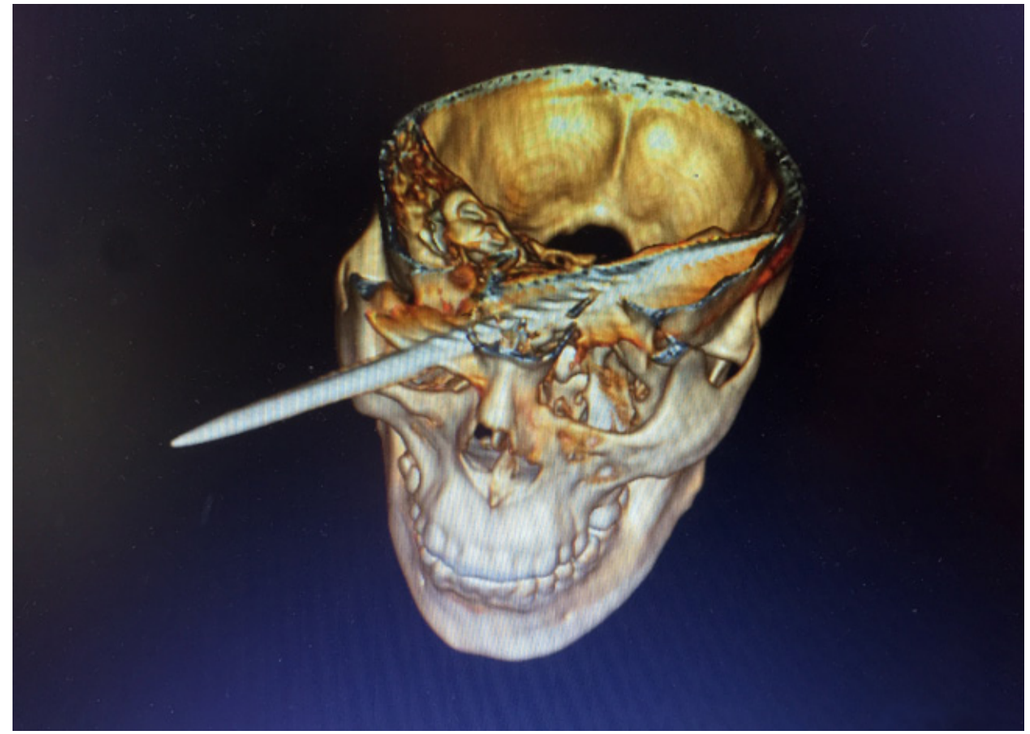
Established in 2013 to pursue a vision of equitable improvements in maternal, newborn and child health and development in low- and middle-income countries. CISMAC is a global leader in the field of maternal, neonatal and child health intervention research. Centre Director is Professor Halvor Sommerfelt at the Department of Global Public Health and Primary Care.

Centre for Cancer Biomarkers (CCBIO)

Established in 2013 to work on new cancer biomarkers and targeted therapy. Has particular focus on mechanisms that show how cancer cells are affected by the microenvironment in the tumors, and what significance this has for cancer proliferation and poor prognosis. Centre Director is Professor Lars A. Akslen at the Department of Clinical Medicine.

Brought brain surgery to Ethiopia

At the beginning of the millennium, there was no one capable of undertaking brain surgery in Ethiopia. Today, thanks to Professor Morten Lund-Johansen at the Department of Clinical Medicine and his colleagues, there are 35 specialists able to conduct head operations. TEXT KIM E. ANDREASSEN



This arrow was successfully removed by the local surgeons. CT SCAN PHOTO: MORTEN LUND-JOHANSEN

Head injuries are a widespread problem in low- and middle-income countries. In Ethiopia, most of these injuries are caused by violence (neighbour feuds) and traffic accidents (80%). Another common demand for brain surgery involves children with hydrocephalus or spina bifida.

"Before we came to Ethiopia, brain surgery was non-existent. People died if they had severe head injuries or tumours," says Professor Morten Lund-Johansen at the Department of Clinical Medicine at the University of Bergen, and Haukeland University Hospital.

> "We have finished the training part of the program, because the Ethiopians can now educate each other.

PHOTO: MORTEN LUND-JOHANSEN

He reported on his capacity-building efforts recently at Global Health Norway´s conference, "Competence Building for Impact – Time for Revolution."

Local capacity building

Since year 2000, neurosurgeons at the Haukeland University Hospital have assisted colleagues at the Black Lion Hospital in Addis Ababa, building up a training programme for neurosurgeons. This project received a major kick-start in 2006, after the surgeons received a huge grant from FK Norway (Norec), in addition to the economical support they were receiving from UiB and the Trond Mohn Foundation. This extra funding supported two PhD positions, among other things.

The collaboration between the hospitals has lead to the development of a larger exchange programme involving Ethiopian and Norwegian health personnel. More than 40 doctors and nurses have been involved in exchanges, or worked in the other country for six to 12 months.

The programme has led to a noticeable increase in the number of brain surgeons in Ethiopia. It began with Professor Knut Wester at K1 and Bergen-based surgeons training three specialists in Addis Ababa. These went on to train more Ethiopian neurosurgery specialists.

Today, there are 35, all educated in Ethiopia. They do 2,000 head operations per year in Addis Ababa alone, and five Ethiopian hospitals now offer neurosurgery, in addition to the hospital in the capital.

"We have finished the training part of the program, because the Ethiopians can now educate each other," Lund-Johansen says.

Malawi next

The building up of the surgeon capacity in Ethiopia has been so successful that it is a model for a similar project now starting up at the hospital in Lilongwe in Malawi, which is another collaboration-hospital to Haukeland. Thanks to economic support from Trond Mohn, among others, Haukeland hospital is now starting up a trauma centre to treat fractures and head injuries in the hospital in Lilongwe.

Haukeland has already contributed to the education of a Malawian neurosurgeon. Today there are two neurosurgeons operating in Lilongwe, because a newly educated Ethiopian is working together with him.

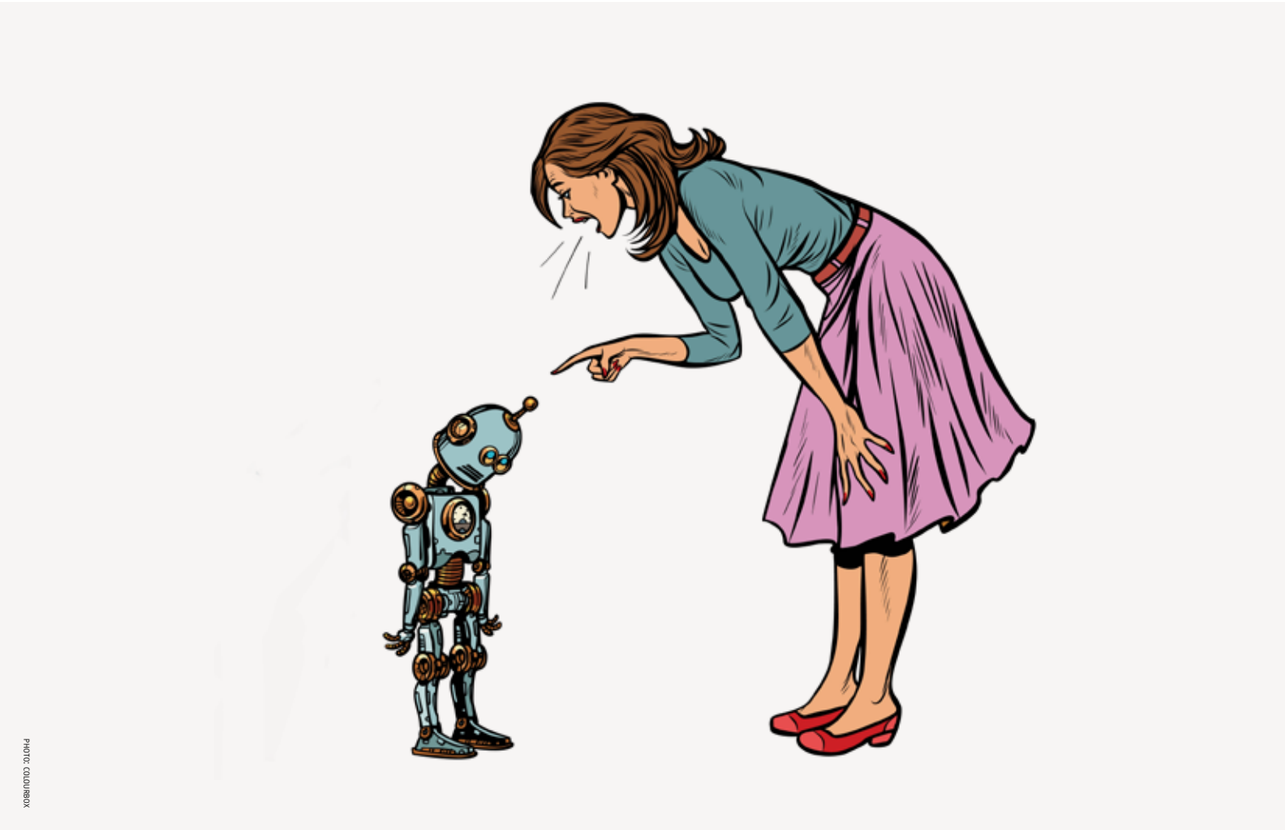
"We are planning to make a bridge, where Ethiopian surgeons collaborate with Malawians, and spreading the knowledge that we built up," Morten Lund-Johansen says.

Morten Lund-Johansen. PHOTO: PRIVATE

FACTS

Head injuries

- Head injuries cause 9 per cent of all deaths in the world.
- 2 million people need surgery for head injuries in low- and middle-income countries each year. Males are in majority.
- Neurosurgery is underprioritized in low- and middle-income countries.
- Violence is the main cause of head injuries. Data from Ethiopian Neurosurgery Database 2012–2014 show that of 811 acute head injuries were caused by 522 attacs (neighbour feuds), 149 traffic accidents, 86 falls and 54 other causes.



COLOURBOX

Shame on you, robot!

"A clever robot is not always a nice or a fair robot," says Marija Slavkovik, who is researching artificial intelligence at UiB. TEXT TORHILD DAHL

You most likely have a robot in the kitchen, in the car or in your handbag. It recognizes your face or your finger so you can turn on your phone, it gives you directions when you're driving your car, or it even recommends music that it knows you will love. You like it, and maybe you are even dependent on it, but does it have your best interests at heart?

"It is tempting to try to make the robots around us more human. Your teddy bear talks to you and is kind. The robot that shall lift patients into bed but drops them on the floor is bad. The driverless car that runs people over is bad. Just because the software is intelligent, it doesn't mean it can make ethical decisions like humans can. That is the problem. This is important to keep in mind when developing software that intervenes in people's lives," explains Slavkovik.

When a robot offers you a job

"Many of the robots that play a role in our lives are difficult to actually see compared to a driverless car or a talking teddy bear," Slavkovik says.

Does software that decides if you get a mortgage or not make the right choice? You risk being refused because the machine sees that your family is not rich. When a bank substitutes an executive officer with a software programme, the software won't be better than the information entered. This is what the online giant Amazon experienced. They received thousands of job applications and wanted to automate the process of assessing CVs. Information about the qualities of skilled people who had previously worked at the company was entered into their machines. This resulted in the robot only choosing men as future employees.

Kittens or killings in your feed?

Slavkovik is central to UiB's research into artificial intelligence at the Department of Information Science and Media Studies. Through close collaboration with actors located in Media City Bergen, students and researchers are developing intelligent tools for media production. The Institute is working to establish Media Futures as a Centre for Research-Driven Innovation (SFI), where together with their cluster neighbours TV2, NRK, BT, Schibsted and technology partners Vizrt, IBM and many others, they wish to delve deeper into the development of media technology for the future.

> "When developing robots of the future, we need to be aware of the ethical dimensions.

"We don't know enough, but we have to get started. The robots are already here, and when developing robots of the future, we need to be aware of the ethical dimensions. I am working to help make developers more aware," says the researcher.

"For example, we have software that influences what you think about society and makes decisions for you. You might think you are looking at things your friends have posted as soon as they post them, but algorithms have most likely delayed them. This affects what information you have access to. I might only be getting cute kittens in my web feed, but I am unaware about the horrible things happening next door. We have a long way to go regarding the development of good robots," she says.

MARIUS SCHERER VIK, UiB PHOTO

FACTS

Marija Slavkovik

- Born 1979 in Skopje in Macedonia.
- Graduated with a PhD in informatics from the University of Luxembourg.
- Associate professor of Information Science at University of Bergen (UiB).
- Currently member of the Research Group for Logic, Information and Interaction, headed by Professor Thomas Ågotnes.
- Her area of research is Artificial Intelligence (AI) with expertise in collective reasoning.
- The BAIA-Lab consolidates the Bergen Artificially Intelligent Agents research activities. Slavkovik is the current chair of the Lab.
- Slavkovik was the chair and host of the 16th European Conference on Multi-Agent Systems EUMAS 2018 in Bergen.

Human cells can change job to fight diabetes

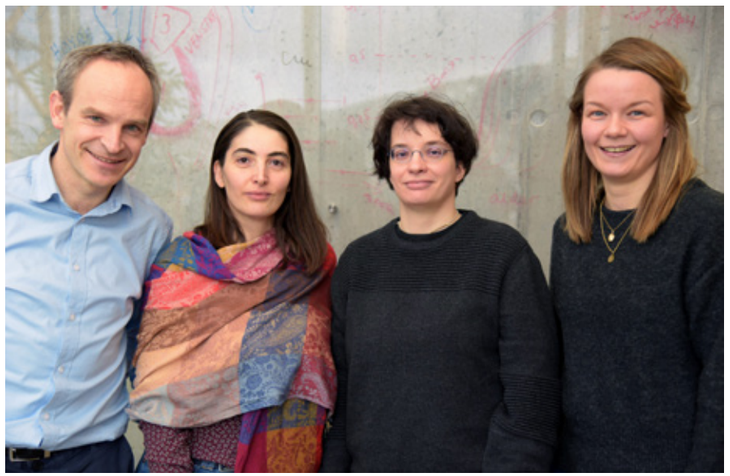
For the first time, researchers have shown that ordinary human cells can change their original function. The UiB-research published in Nature may give new hope for diabetes patients. TEXT KIM E. ANDREASSEN

Traditional cell biology textbooks say that most cells can only differentiate to the same cell type, with the same function.

It seems that some of these textbooks need to be rewritten, thanks to the new results by researchers at the University of Bergen and their international partners at Université de Genève (UNIGE), Harvard Medical School, Universiteit Leiden and the Oregon Stem Cell Center (OHSU).

The team's latest study shows that the cells in the human body are much more able to differentiate into different cell types than earlier assumed. They are the first researchers ever to have managed to influence the signals in human cells, so that these cells can change their original function.

"By influencing the glucagon-producing cells in the pancreas, we made them be able to produce insulin instead. This may lead to new treatments for diabetes," says Professor Helge Ræder, leader of the Diabetes Stem Cell Group, Department of Clinical Science, UiB.



Helge Ræder and his colleagues found that human cells can change their main task. From left to right: Helge Ræder, Luiza Ghila, Shimona Chera and Heidrun Vethe. PHOTO: KIM E. ANDREASSEN

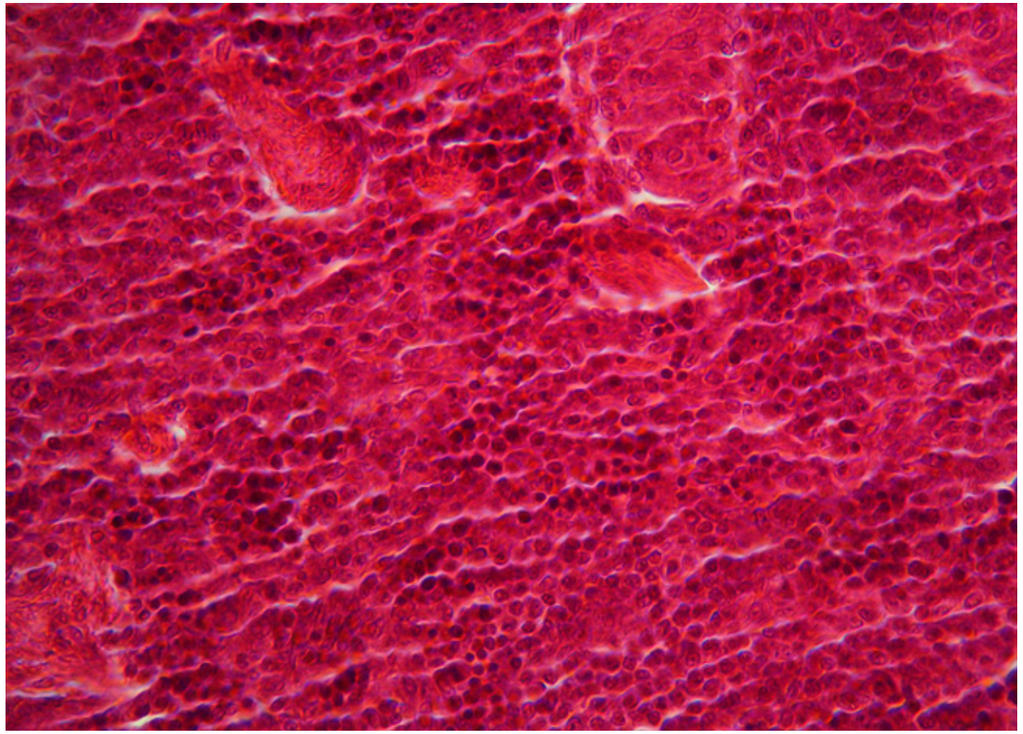


PHOTO: COLOURBOX

The researchers witnessed that mice recovered from diabetes after they had human manipulated cells transplanted into their pancreas, and became sick again when these cells were removed.

> This may lead to new treatments for diabetes.

Resistant cells

In addition to having the glucagon-producing cells produce insulin, the study showed that these cells were more resistant against the immune system, which usually attacks insulin-producing cells in type 1 diabetes patients.

"This means that we probably can use the patient's own cells in this diabetes treatment, without being afraid that the manipulated cells will eventually be destroyed by the immune system," Ræder explains.

"Today, it is possible to transplant insulin producing cells from dead donors to diabetes patients. The big challenge is that we are only able to treat a very small fraction of the patients with this method."

A step toward new gene therapy

Ræder believes that the new method is not limited to only changing the function of the cells in the pancreas. He thinks that this cell flexibility will be found in many other types of cells in the human body, and may contribute to new treatments for many different diseases.

"The ability of cells to change their function may be important in the treatment of other diseases caused by cell death, including neurological diseases, heart attacks and cancer," Ræder says.

FACTS

- There are three different types of cells in the pancreas: alpha-cells, beta-cells and delta-cells. The cells make cluster and produce different kinds of hormones for blood sugar regulation.
- Alpha-cells produce glucagon, which increases the blood sugar levels. Beta-cells produce insulin, which decreases glucagon levels. Delta-cells produce somatostatin, which controls the regulation of the Alpha and Beta Cells.
- Persons with type I diabetes have a damaged beta-cell function, and therefore have constant high blood sugar levels. They need to get insulin by injections.

Among the 50 most influential in health care

Due to the development of the Bergen 4-Day Treatment for severe anxiety disorders, TIME Magazine named psychologists Gerd Kvale and Bjarne Hansen as two of the 50 most influential persons in health care in 2018. TEXT OLE M. KVAMME AND SOLFRID LANGELAND

Professor Gerd Kvale and Associate Professor Bjarne Hansen at UiB and Haukeland University Hospital have changed the treatment of anxiety and obsessive-compulsive disorder (OCD).

Normally OCD takes months of therapy to treat. Kvale and Hansen's model of concentrated exposure therapy - The Bergen 4-Day Treatment - gets the job done in just four days.

70% recover completely

In October 2018 TIME Magazine selected the research duo among *The Health Care 50: Fifty people transforming health care*. They were the only honorees representing psychological treatment.

"So far, about 1,200 people with OCD have gone through the intensive regimen; approximately 70% recover completely and remain in remission four years later," TIME Magazine wrote in October.

Now Kvale and Hansen are exporting the Bergen 4-Day Treatment to USA and numerous countries in Europe.

"We are going to share this method with the world. The first step is trials at a training centre in Houston, which is an outpost of McLean Hospital, where we will investigate whether the method can be used across cultures," Kvale says.

Center for Brain Plasticity

In Bergen, they have established a new research center focusing on the brain's ability to change.

The Bergen Center for Brain Plasticity is a collaboration between universities, health care services and training centres.

"This will give large numbers of patients a whole new lease of life," Kvale says, adding:

"We have worked systematically for a long time to achieve this. The support of the Trond Mohn Foundation and the Kavli Trust, ensures that we can continue our work, which will yield far-reaching benefits for the whole of society."

Kvale points out that the work has two important facets.

"What is truly unique is that we can treat people against anxiety and at the same time perform basic research on neural responses," she explains.

Thinking outside the box

"This funding opens up fantastic opportunities," says the rector of UiB, Dag Rune Olsen, highlighting how unique the project is.

"These researchers think outside the box and ask radically different questions. This is great research that scores well on all parameters," the UiB rector says.

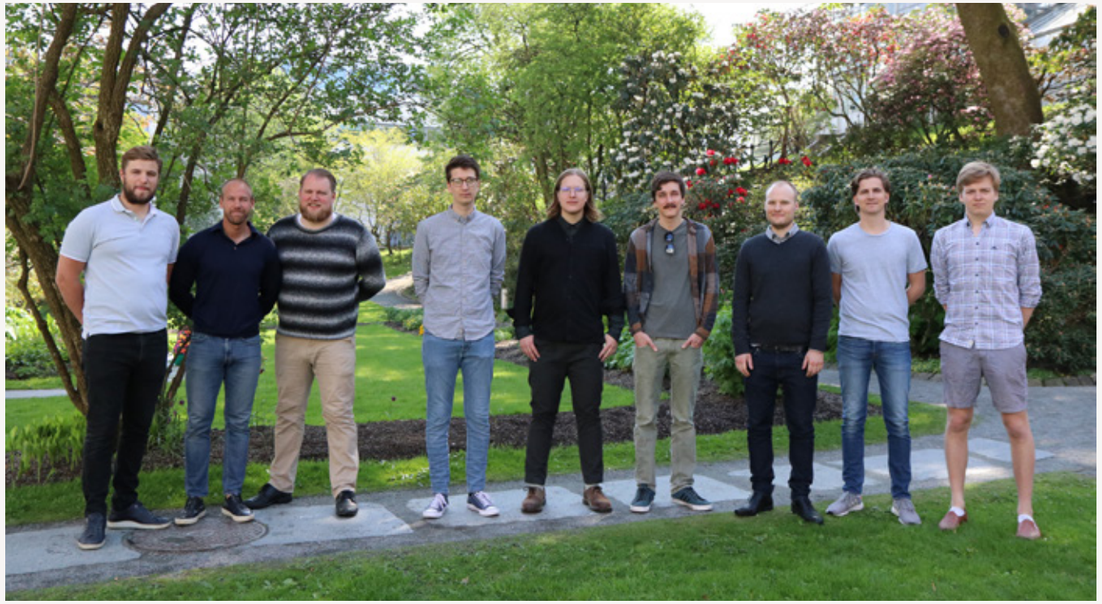
‹ "The support of the Trond Mohn Foundation and the Kavli Trust ensures that we can continue our work, which will yield far-reaching benefits for the whole of society", Professor Gerd Kvale says. Here Kvale and Hansen are flanked by Managing Director Sveinung Hole of the Trond Mohn Foundation and Managing Director of the Kavli Trust, Inger Elise Iversen. PHOTO: PAUL SIGVE AMUNDSEN, TMF

> "We are going to share this method with the world.

BERGEN: The Bergen 4-Day Treatment is now made accessible for patients internationally. PHOTO: COLOURBOX

FACTS

- The Bergen 4-Day Treatment (B4DT) is a treatment for severe anxiety disorders developed by Gerd Kvale and Bjarne Hansen.
- The treatment is currently offered to patients with Obsessive Compulsive Disorder (OCD), Panic Disorder and Social Anxiety Disorder.
- There is a vast interest in the treatment, both nationally and internationally, and international dissemination is started.
- 90% of the people who undergo the B4DT experience clinically relevant and significant improvements. Approximately 70% recover completely.
- The Trond Mohn Foundation, the Kavli Trust, the University of Bergen and Haukeland University Hospital has provided a total of NOK 111 million for a new mental health research centre led by Kvale and Hansen; The Bergen Center for Brain Plasticity.



‹ From left: *ShrimpVision:* Tord Teigstad, Tarald Kleppa Øvrebø and Sjur Øyen (not present: Martha Benan). *Spellbound:* Jonathan Lindø Meling, Joakim Vindenes, Trym Røed Arvesen, Audun Klyve Gulbrandsen, Ole Anders Smith and Adrian Tysnes. PHOTO: OLE M. KVAMME, UiB

Student innovation in knowledge clusters

Two UiB projects, based in separate knowledge clusters, have made it through the eye of the needle and been awarded NOK 1 million each in the Research Council of Norway's STUD-ENT innovation funding scheme. TEXT › OLE M. KVAMME

Under the STUD-ENT scheme, master's students can apply for economical support to develop a knowledge-based business idea and create their own workplace.

This year's award saw two student companies from UiB pass through the eye of the needle: *Spellbound*, led by Audun Klyve Gulbrandsen; and *ShrimpVision*, led by Tarald Kleppa Øvrebø. The two entrepreneurs are very grateful for the grants and have high ambitions for their projects.

XR in schools

Spellbound wants to influence the range of learning tools by providing a platform for Extended Reality (XR) for use in schools. The company originated in the programmes of study in Media and Interaction Design and Information Science, in the Department of Information Science and Media Studies.

"We want to bring textbooks to life, by making them interactive and more experience-based," says Klyve Gulbrandsen, and mentions the periodic table as one of many examples where students can use the new technology to experiment, build molecules and 'play' in a new, interactive way, providing better learning outcomes than traditional teaching methods.

"Our ambition is that in one year, Spellbound will have a solid position in the market for digital learning content in Norway. With time, we also hope to go international."

Sustainable farming of tropical shrimp

ShrimpVision originated from the newly established integrated Master's programme in Aquaculture and Seafood in the Department of Biological Sciences. The company is developing sustainable, land-based farming of tropical shrimp.

"Our project began when we started toying with the idea of breeding marine species other than salmon. The breeding of tropical shrimp is generally regarded as unsustainable, and is often based on primitive production methods. In addition, deep-frozen tropical shrimp are transported long distances, usually from Asia and South America, before reaching consumers in Norway. We therefore thought the idea of being able to deliver fresh, healthy, local tropical shrimp was very exciting," says Kleppa Øvrebø.

"Our goal for one year from now is to be in a position to scale-up from prototype to pilot facility, allowing us to go from producing kilogrammes to tonnes."

Cluster effects

Klyve Gulbrandsen and Kleppa Øvrebø both agree that their companies have benefited greatly from close contact with researchers and industrial players in their respective UiB knowledge clusters: Media City Bergen (MCB) and the marine cluster on Marineholmen, as well as the close collaboration with VIS (former Bergen Technology Transfer).

"There are several groups working with VR in MCB. Although we are competitors in some contexts, there is a strong culture of sharing in MCB, and we have benefited greatly from using NCE Media's lab for demos and testing," states Klyve Gulbrandsen.

Kleppa Øvrebø says there is a similar culture of sharing on Marineholmen, through the NCE Seafood Innovation Cluster and the Ocean Industries Accelerator, among others.

"We have benefited enormously from frequent dialogues with aquaculture and ocean-resource companies on Marineholmen, and notice that synergy effects contribute to an excellent innovation environment. The cluster possesses cutting-edge expertise in the entire value chain and is a world leader in salmon farming. "We want to adapt existing technology in our project for the breeding of tropical shrimp," he explains.

Participate

The project managers encourage students who want to start their own businesses to participate in creative arenas, such as those offered by the UiB Innovation Hub, VIS, Gründerhub Bergen, MCB's Hackaton, etc.

"These are brilliant arenas, where you can meet new people and learn from others," they both agree.

"In addition, it is very important that the project has a good team. It is not easy setting up on your own, and the importance of having good people around you cannot be overstated."

Victoria Betis
Victoria Betis is a 20 years old exchange student from France. At UiB she's studying the Nordic countries.

PHOTO: VICTORIA BETIS

The lake at Mount Fløyen

When arriving in Bergen for my exchange year, I learned that the city was one of the rainiest in Europe. Through my excitement about going on an exchange in Norway, I did not mind. Every single rainy time in Bergen is kind of refreshing. I love the smell of the rain on the ground, and the sound of the rain on the roofs of these colorful buildings makes me peaceful.

When the sun appears in Bergen, I'm always surprised and impressed by how everyone is postponing what they're doing to enjoy it. I think that the large amount of rain makes one appreciate the sunny weather more than anywhere. People are always happy when it's sunny. They enjoy their time outside and eat ice creams, even though it's 12 degrees.

There are many spots in Bergen that I appreciate, and the picture above shows one of my favorites. The lake Skomakerdiket at Mount Fløyen makes me feel both peaceful and happy – besides, it's a bit melancholic too. I have been there during all seasons and it's always very beautiful and different. The atmosphere stays peaceful no matter what.

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THE LAST PICTURE | THE UNIVERSITY MUSEUM OF BERGEN

PHOTO: SIMON SKJELVIK BRANDSETH, UiB

After being closed for almost five years, the University Museum of Bergen will re-open in the autumn of 2019. The historical building from 1865 has been completely restored, and will be filled with a broad range of new, exciting and innovative exhibitions.

One of the first "inhabitants" to move into the restored museum was the Plastic Whale, which made headlines around the world after being found stranded near Bergen in 2017. When researchers from UiB opened the stomach of the whale, they were shocked to find more than 30 plastic bags and numerous pieces of plastic.

It was not the first, nor the last, whale found under similar circumstances, but somehow the fate of this whale touched us all. It became a global eye-opener, setting marine pollution on the agenda and sparking initiatives on picking up plastic from the coastline.

The now famous goose-beaked whale will be part of an exhibition at the museum that shows some of the consequences of plastic pollution in the oceans. The whale did not die in vain, and at the University Museum of Bergen its legacy will live on to inspire new generations in the fight against marine pollution.