# NTVA Review 2016

NORWEGIAN ACADEMY OF TECHNOLOGICAL SCIENCES

# NTVA **IN BRIEF**

**The Norwegian Academy of Technological Sciences (NTVA) is an independent organization founded in 1955. NTVA is a member of the International Council of Academies of Engineering (CAETS) and of the European Council of Applied Sciences and Engineering (Euro-CASE).**

**THE GOALS OF NTVA:**

- Promote research, education and development of technology and natural sciences
- Encourage international cooperation within these fields
- Further the understanding of technology and natural sciences among the authorities and the public to the benefit of Norwegian society and industrial development in Norway.

NTVA's members are scientists and industrial leaders recruited from academic institutions and industries in Norway and abroad. Individuals who have contributed significantly to the technological sciences or in related areas, or whose work has furthered practical applications of technology are eligible for membership. The total number of personal members was 582 at the end of 2016.

NTVA's Industrial Council consists of representatives of the management of companies and institutions in Norway. The purpose of the council is to support NTVA in fulfilling its general missions and to strengthen its relations with society. In 2016, the Council had 38 members.

**THE MAIN ACTIVITIES**

NTVA hosted 36 events in 2016, some of them in cooperation with partners.

**On 20 April** NTVA, NTNU; The Norwegian University of Science and Technology and The SINTEF Group arranged a seminar and formal dinner to celebrate mr Johannes Moe 90th Anniversary at the Lerchendal Gaard in Trondheim. Johannes Moe has been the President, the Rector and the CEO of the arranging institutions.

**6 to 8 September** NTVA arranged the academy`s Technology Forum 2016 in Trondheim under the title The NTVA Nordic Smart Cities and Communities Conference. There were speakers for USA and the European Countries an audience from the Nordic Countries

**16 November** NTVA and CEDREN – Centre for Environmental Design of Renewable Energy held a seminar in Oslo with the theme Norway – a possible green battery for Europe?

**PUBLISHER**

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ISBN 978-82-7719-086-7
Layout and printing: Fagtrykk Trondheim AS, 2017

Cover: From the Science Day in Bergen 27 October 2016.
Photos: Photographers names are linked to the pictures. The other pictures; Lars Thomas Dyrhaug

# FOREWORD

*Torbjørn Digernes*

We live in exiting times, with grand opportunities, at the same time as we see developments that pose threats to our societies. There is political turmoil in many corners of the world.

Information and communication technology has over the last 50+ years driven very large changes in the way we conduct our daily lives, and in the way we produce goods and services. The developing world has taken the opportunity, building their education systems and making big development strides. They have created new industrialised nations, giving them a much stronger role in the world's economy. The world is in the middle of what is often referred to as the fourth industrial revolution, the digitalisation of our societies.

In the same time era, it has gradually become clear that the accumulated effect of industrial activity using carbon based energy sources is creating a global warming that threatens the world's climate and the livelihood of many people.

The dynamics of all of this is forceful, and it drives changes in a rather unpredictable manner. The climate threat drives a fundamental change in an important societal infrastructure. The effect of the fourth industrial revolution is not well understood. Many jobs will disappear due to introduction of machine learning and machine reasoning. A key question is what will come instead, and how we can ensure that the wealth created through the new opportunities is distributed in ways that provides for a harmonic societal development, where everyone gets their fare share. We see market trends tending to aggregate wealth on fewer hands, and possibly leaving part of the world's populations behind in the race for a better future.

In Norway, we have behind us an era of almost 50 years where we have been able to build a national fortune based on ground rent from oil and gas which is the result of millions of years of geological activity. At the same time, like many industrialised countries, we have lost or outsourced a lot of the traditional manufacturing industries to the developing world.

The development we see around us now will reduce the importance of oil and gas in the energy supply. At the same time the fourth industrial revolution may create opportunities to reindustrialise Norway, since the labour component in the manufacturing process will be smaller, and the cost of well qualified people across the world is gradually levelling out.

Technologies and how we apply them will be a key factor in this development. NTVA is engaging in disseminating knowledge about this, and want to contribute to the understanding of what is going on. One element in this is a book project that we started in 2016, called "Technology changes society". It is an anthology where almost 20 authors give their description of key enabling technologies. This book will be ready from the press early autumn 2017.

Much of our attention during the next years will be towards developing more understanding of the driving forces, and their effects on society. For this we will call upon competency from a wide range of scientific disciplines.

Stay tuned!

Trondheim 26 June 2017

*Torbjørn Digernes*
*President*
*Norwegian Academy of Technological Sciences*

# NTVA **TECHNOLOGY FORUM 2016:**

**The theme of the 2016 NTVA Technology forum was Nordic Smart Cities and Communities. The Forum was arranged together the NTNU Faculty of Architecture and Fine Arts at NTNU in Trondheim and was held at the Scandic Lerkendal Hotel. It lasted for three days and drew 80 participants.**

**TUESDAY 6 SEPTEMBER**
Get-together: sightseeing in Trondheim and an informal dinner

**WEDNESDAY 7 SEPTEMBER**
*Opening Address*
Torbjørn Digernes, former NTNU Rector and president of The Norwegian Academy of Technological Sciences (NTVA)

*Senseable Cities*
Carlo Ratti, professor, MIT, Cambridge, MA, USA

*Introduction to the Conference*
Annemie Wyckmans, professor, vice dean research, Faculty of Architecture and Fine Art, NTNU

*Smart Cities in a European Context*
Massimo Busuoli, Head of the NTNU EU Office, Brussels

*The Research Council of Norway and Smart Cities*
Jonas Enge, Coordinator of the BYFORSK initiative, Research Council of Norway

*A Different Kind of Smart?*
Jonas Bylund, Management Board of the Urban Europe Program, Gothenburg, Sweden

*Our H2020 Lighthouse Project in Stavanger: How Did We Create Our Triple Helix Cooperation Between Public Sector, Research, and Innovation?*
Gerd Seehuus, The Triangulum Project, Stavanger

*Resilient Smart City Vejle, Turning Challenges into New Opportunities and Co-creating a Better City*
Jette Vindum, Vejle Municipality, Denmark

*How Trondheim Municipality is Becoming Climate Smart through the Use of Data*
Bjørn Ove Berthelsen, Department of Environment and Climate, Trondheim municipality and Patrick A. Driscoll, Project Developer, NTNU

*Smart Hospital Design*
John Krogstie, professor, NTNU Research Team

*The Urban Station Community – From Gas Station to Train Station Societies*
Åsa Hult, Program Manager, Swedish Environmental Research

*How Do You Know if Your City/Community is Getting Smarter?*
Miimu Airaksinen, professor, Technical Research Centre of Finland, VTT

*Can We Use Our Nordic Strengths to Be First Movers in the Development of Smart Cities?*
A debate moderated by Håvard Haarstad and Patrick A. Driscoll, NTNU

**THURSDAY 8 SEPTEMBER**
*How to Develop Smart City Strategies for Your Own Municipality/Region?*
Hilde Opoku, Deputy Mayor, Trondheim Municipality

*Data Security and Privacy in the Smart City?*
Odd Jostein Svensli, Numascale

*Smart-Energy OS – A platform for implementing energy related Smart Cities solutions*
Henrik Madsen, professor, DTU, Copenhagen

*NTNU Campus and the Sustainable City*
Amund Aarvelta, Department of Urban Planning, Trondheim Municipality

*The Next Step Smart Sustainable Cities at NTNU*
Annemie Wyckmans, professor, Vice Dean Research, Faculty of Architecture and Fine Art, NTNU

*From the Conference Hall at Scandic Lerkendal Hotel. Photo: Harald Danielsen*

*Prof Carlo Ratti, MIT, Cambridge, USA. Photo: Harald Danielsen*

# NTVA **SPECIAL AWARD 2016**

**On 24 May 2016 the Board of the The Norwegian Academy of Technological Sciences (NTVA) decided to award the year's special prize to Tore Lærdal, CEO of the Laerdal Group.**

*Tore Lærdal and Karl Almaas.*

Tore Lærdal has played a key role in the technological development of Emergency Medicine. He has also expanded Laerdal Medical into a leading supplier of life saving equipment and training and simulation tools in Emergency Medicine.

The committee for the special prize would specially mention the development of the SimMan simulator, an effective tool for training heart and lung rescue personnel.

SimMan simulates realistic situations for learning how to treat heartbeat, ECG and breating rate maladies. SimMan has become successful round the globe and is an important tool in the education and training of Norwegian hospital nursing staff.

In addition to his involvement in developing technological and educational tools, Tore Lærdal and the Laerdal Group long have commited to reducing infant mortality in developing countries. Measuring equipment for fetal heartbeat on fetus, simulators for woman giving birth, and an obstetrics education program have spread knowledge on lifesaving treatments for mother and child and have saved many lives.

The Mayor of Stavanger – Christine Sagen Helgø – held a speech for Tore Lærdal at the academy meeting in Arkeologisk Museum I Stavanger. NTVAs vice president Karl A Almås presented the diploma that accompanies the prize to Tore Lærdal. Later on, Lærdal and his wife and representatives of the University of Stavanger and NTVA attended a formal dinner at a restaurant in Stavanger.

*From the Auditorium, Arkeologisk Museum, Stavanger.*

# **JOHANNES MOE** COMMEMORATION

**On 20 April 2016 NTVA, The Norwegian University of Science and Technology (NTNU) and The SINTEF Group arranged a seminar and a formal dinner at the Lerchendal Gaard in Trondheim in commemoration of Johannes Moe's 90th Anniversary. Colleagues, business affiliates, members of NTVA and Moe's family took part.**

*Alexandra Bech Gjørv, CEO of The SINTEF Group, mr Johannes Moe and Gunnar Bovim, Rector at The Norwegian University of Science and Technology.*

Johannes Moe was born in 1926 at Modalen north of Bergen. He is a well-known and respected leader in academia and in business. Moe was originally was a professor in ship-building at NTH (now NTNU). After receiving his doctorate, he has been a chairman or a member of numerous key groups and committees in education, research, technological development and the civil society.

*From the seminar at Lerchendal gaard. The family of Johannes Moe in front.*

Moe was elected Rector at NTH in 1972. From 1976 to 1989 he held the position of CEO of SINTEF, Scandinavia's biggest independent research organization. Moe was the president of the Norwegian Academy of Technological Sciences (NTVA) from 1993 to 1998. Johannes Moe is commander of the Order of St. Olav. He has written an autobiography "On the verge of time: A participant in topical challenges."

**The seminar programme included:**

*Torbjørn Digernes;*
Welcome – Johannes Moe's life and a selection of his principal contributions.

*Gunnar Sand;*
Johannes Moe's contributions to developing the Norwegian petroleum sector

*Sven Ullring;*
A technological great as seen by Det norske Veritas (video)

*Eivind Hiis Hauge;*
NTVA's development and the Academy's work in meeting topical energy challenges

*Alf Bjørseth;*
Energy challengs, past and future

*Egil Myklebust;*
From the past to the future, continuous, ever-quicker change

*Gunnar Bovim and Alexandra Bech Gjørv;*
Discussion of the challenges in and possibilities of NTNU-SINTEF cooperation; a new epoch starts

*Johannes Moe and Dordi Skar.*

# SUCCESSFUL SCIENCE DAY IN BERGEN

**On Thursday 27 October the Bergen University College hosted a Science Day. More than 300 pupils and their teachers attended in the auditorium at Kronstad.**

Geir Anton Johansen, dean of engineering at HiB and leader of the NTVAs program board in Bergen, and Andreas Engeberg, member of the Tekna governing council, welcomed an audience full of expectation.

Minister of Education and Research Torbjørn Røe Isaksen welcomed the participants via video.

Introductory speaker Inga Berre spoke on geothermal energy and mathematics. She is a mathematics professor at the University of Bergen (UiB).

Then Anders Teigland spoke on nanotechnology. He is a research fellow at UiB.

Krister Nyløkken presented biomedicine and the development of new medications. He is on the staff of Bristol-Myers Squibb.

The lunch break was long enough to permit visiting many exciting stands that displayed experiments and equipment of the various disciplines at HiB, UiB, Tekna, and ViVite.

Otherwise, the participants could talk to representatives of the ENT3R science training incentive.

After the lunch break, Pia Ve Dahlen introduced the theme "With backside up in the air." She is the camp leader for the Passion for Ocean project.

*This is the way an Industrial Robot is working.*

Alexander Lundervold lectured on Math! He is an associate professor at HiB.

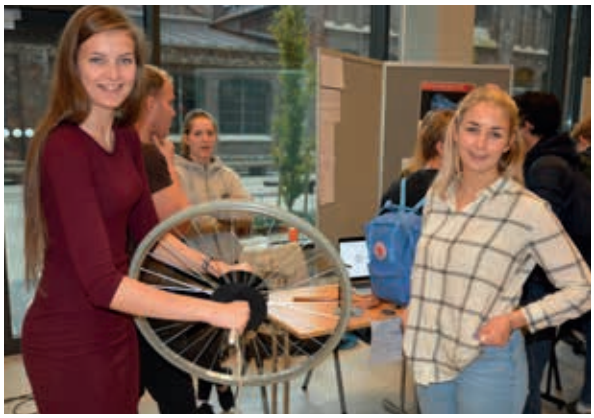
Tomas Roaldsnes concluded with a lecture on innovation and entrepreneurship. He is a student at HiB.

Andreas Wahl, a familiar NRK program leader, skilfully led Motivation Day and demonstrated with several of his experiments.

NTVA President Torbjørn Digernes gave a short closing speech. He and Andrea Wahl awarded the prizes. All the classes that attended were given copies of NTVA's book, Energy, Technology, and Climate - Challenges and Scope.

The Science Day in Bergen followed up on the motivation day that NTVA Oslo and the University of Oslo held the 21st of October last year commemorating the 60th anniversary of NTVA.

The Science Day in Bergen was jointly arranged by NTVA, Tekna, the University College in Bergen, the University of Bergen, Vilvite, the learning and experience centre, and ENT3R.



*A simple, but instructive experiment with a spinning wheel.*

# NTVA SEMINAR **IN COOPERATION WITH CEDREN**

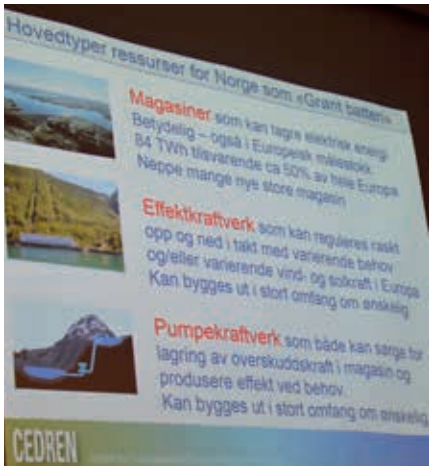
**Norway as Europe's green battery**

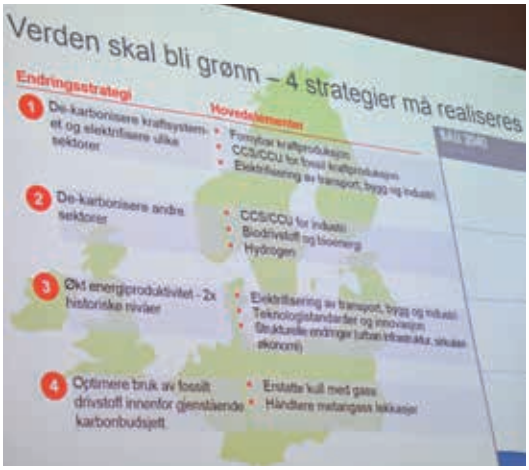
On 16 November in Oslo, NTVA joined with the Centre for Environmental Design of Renewable Energy (CEDREN) and the Research Council of Norwy in hosting a seminar that presented the results of CEDREN's research, supplemented with the views of industry, administration, and Statnett.

Europe is building out renewable energy as never before, with the goal that nearly all energy production should be renewable by 2050. Solar and wind power will probably be most used, but they work only when the sun shines and wind blows. This complicates regulating energy production in step with consumption. Consequently, it's necessary to build considerable storage capacity, new power lines, and efficient power stations that fill shorter or longer gaps in production due to little sun or wind. The question then arises as to whether the Norwegian hydroelectric network can be a "green battery".

Researchers Magnus Korpås, Atle Harby and Ånund Killingtveit outlined projected future needs and the possibilities for fitting Norwegian hydroelectric power into the European grid, the potential for and cost of new energy and pumped power storage in Norway, and the resultant challenges to the environment and society.

Statnett European Director Bente Hagem, Ministry of Petroleum and Energy Professional Director Manus Pandey, and Norsk Hydro Climate Director Bjørn Kjetil Mauritzen spoke on the challenges and possibilities of using Norwegian hydropower as a green battery for Europe.




# NTVA **IN BERGEN**

## MINERALS FROM THE SEABED

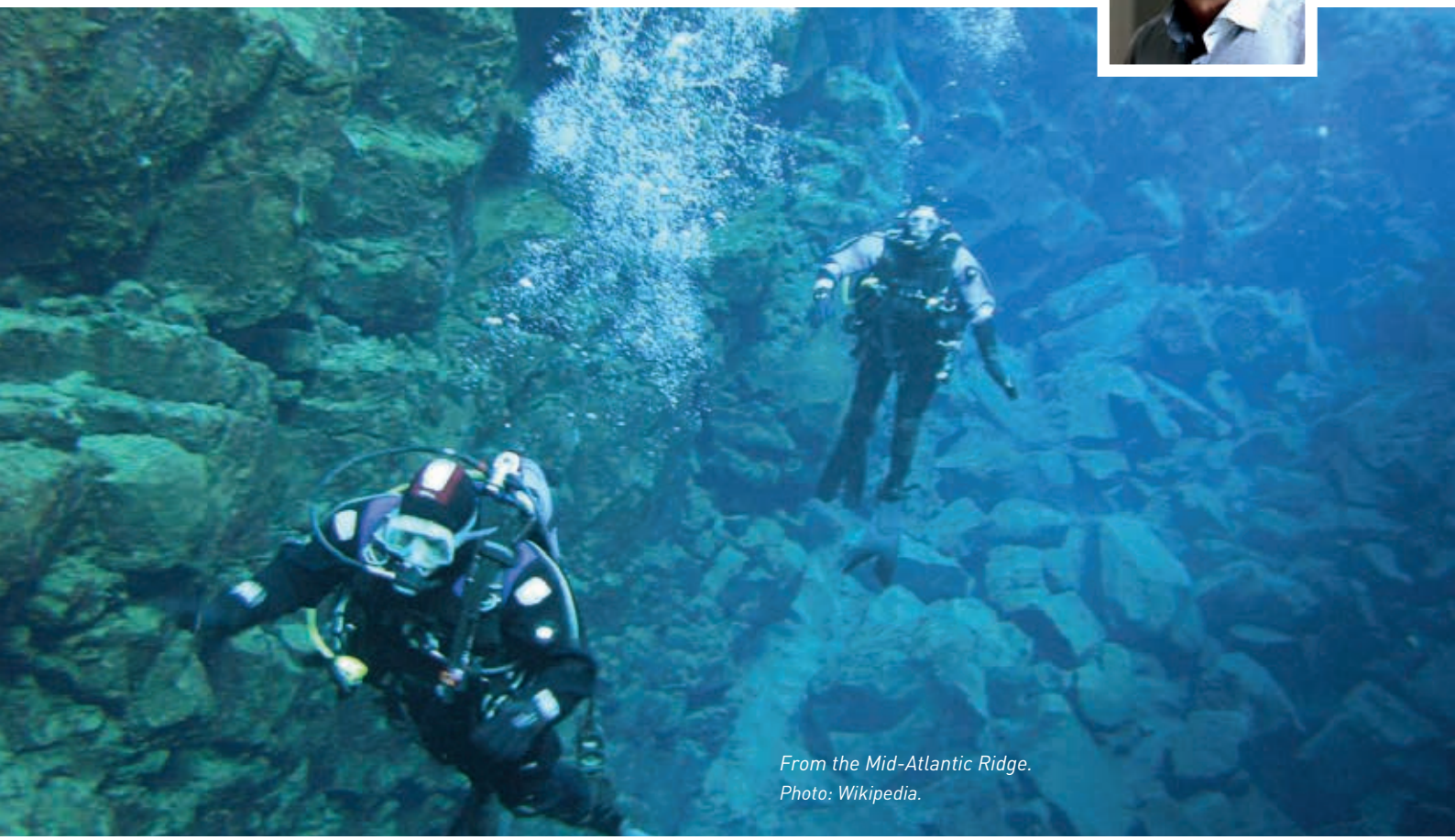
On 10th May NTVA in Bergen and the local branch of Tekna hosted a meeting at the Nansen Environmental and Remote Sensing Centre at Marineholmen. Rolf Birger Pedersen, University of Bergen professor and director of the Marine Robotics Facility (NORMAR), was the introductory speaker. For the last eight years, Prof. Pedersen has led the National Centre of Excellence (SFF) in Geobiology. He is one of the most known geologists in Norway and is recognized internationally.

The starting point of Pedersens lecture was an Atlantic Ocean cruise on which he studied the Mid-Atlantic Ridge and its undersea volcanoes. He reported that there are mineral deposits in the deep sea that can be sources of essential metals. They can be important as the yields of land-based ore mines are dwindling.

The potentials of and the technological, economic, and environmental aspects of mining the sea bed are thus far uncertain. But special ships are now being fitted for extraction of mineral deposits in the Western Pacific Ocean. This "test run" will show whether mining the sea floor can be sustainable in the near future. Norway has large maritime zones in which the University of Bergen has shown there are mineral resources.

Pedersen explain how the deposits were formed and illustrated the challenges associated with resource estimation and environmental impact.

*Prof Rolf Birger Pedersen.*
*Photo: UiB*



*From the Mid-Atlantic Ridge.*
*Photo: Wikipedia.*

# NTVA **IN OSLO**

## THE INTERNET OF THINGS

On 6th April 2016 NTVA Oslo held a meeting with a theme of the Internet of Things, a recently evolved enabling technology. According to its adherents, the Internet of Things (IoT) can solve future challenges in several areas: traffic, health, environment, and the ageing population. But IoT also is a technology that can threaten innumerable workplaces and may wipe out entire branches of employment.

Jarle Nordby-Bøe of Texas Instruments began by explaining how the Internet of Things might change the future. His presentation included practical examples of the future impact of IoT, how it differs from other technologies, and why it triggers so much debate.

Lars Lydersen of Energy Micro/Silicon Laboratories was tasked with problematizing development, and his theme was "the Internet of Things: sleep walking toward a digital catastrophe?" He pointed out that the Internet of Things could enable a few large companies to monitor every step we take, everything se do, and what we think. Who shall own all the data from all the sensors, and how can we balance the utility of this new technology without it endangering our private lives?

At the meeting it was made clear that IoT is a technology of enormous potential as it now enters ever more new branches and processes. IoT offers great benefits in efficiency and security, but at the same time it's clear that the technology also undergirds possibilities of increasingly invasive control and investigation of individual doings.

*Kilde: Dootrix.com*


*Disruptive Industries is a fast expanding supplyer of small chips who shall be attached to different objects in the world of IoT.*


*Will hacking be an even bigger problem with the introduction of Internet of Things? (A picture from the presentations.)*

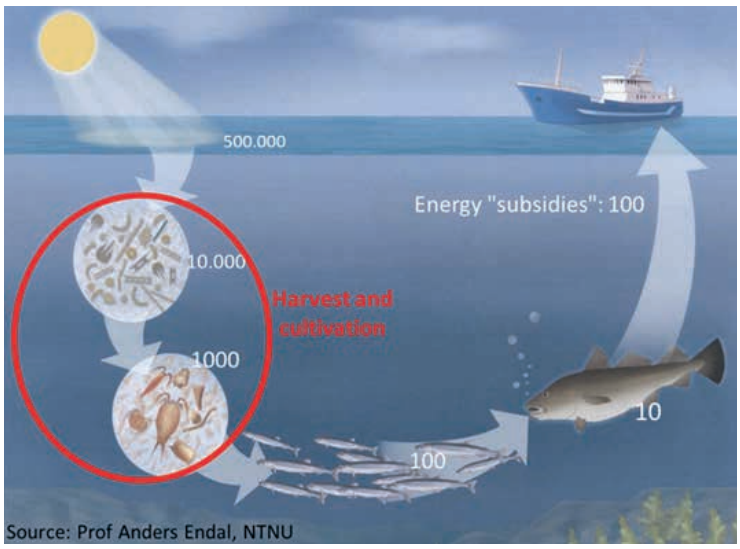
# NTVA **IN STAVANGER**

## OUTLINES OF COMPLETELY NEW MARINE INDUSTRIES

**At the NTVA meeting in Stavanger on Wednesday, 23rd November, senior advisor Karl A. Almås of SINTEF gave a lecture on new ocean-based activities. He said that we now can see the outlines of completely new industries.**

Use of the ocean space has recently been on the political agenda, both nationally and internationally. In April this year the OECD released the Ocean Economy 2030 report that addressed the collected ocean-based industries that can lead to value creation in the years to come. Norwegian authorities have begun developing a comprehensive ocean strategy that shall be finished in the spring of 2017. Within technological research and development there is considerable emphasis on cross-over effects, what one ocean-based industry can learn from another. The established ocean-based industries, including oil/gas, maritime, fisheries and aquaculture, now account for about 70% of Norwegian exports income. Along with oil production, growth is declining in other ocean-based industries, such as fisheries and aquaculture.

Beyond what we know about ocean-based industries today, we see the outlines of completely new ("unborn") maritime industries, including seaweed farming, mineral extraction from the seabed, harvesting and cultivation of "marine insects". The lecture pointed out future possibilities associated with exploitation of the entire ocean space.




*Kilde: SINTEF Ocean*

# NTVA **IN TRONDHEIM**

## TECHNOLOGY CHANGES SOCIETY:

### What challenges arise in medicine as a result of new, more expensive diagnosis and treatment methods?

On 19th April NTVA Trondheim held a meeting at the Medical Technical Research Centre of St. Olav's Hospital, Campus Øya. The theme was the implications of the developments of new technologies on the framing of Norwegian healthcare and in particular on the division of tasks between smaller and larger hospitals.

**Erik Fosse**, an University of Oslo professor of medicine and specialist in general surgery and thoracic surgery and principal doctor of the Intervention Centre of the National Hospital, opened with the theme of resource-demanding surgery. Fosse has advocated research and technology-based renewal of imaging and clinical practice. Fosse has experienced that the activities of traditional surgeries require increasingly more technological equipment and support personnel. Good exploitation of resources calls for high degrees of occupancy and surgeries that can be used by several medical specializations.

**Daniel Haga** is the Director of Interaction of Health Mid Norway. He worked in primary health services for many years, and then was chief municipal physician and community physician. His theme was the needs and challenges of local hospitals. Haga has been taken up with arranging for decentralized health services and interaction between levels. Haga confirmed the challenges that Fosse identified, but also provided examples of smaller hospitals being able to contribute well at qualified levels in selected tasks. The challenge then is to select service and arrange for cooperation between levels of health service.

**Hans Torp**, a Professor of the Department of Circulation and Medical Imaging at St. Olav's Hospital, spoke on advanced, precise diagnoses at smaller hospitals. Torp is the leader of a group working with medical ultrasound technologies. He pointed out that as medical equipment and processes are increasingly more costly and demanding of resources, fast-paced technological developments are making diagnoses and medical treatment more available at smaller, local entities.

*Hans Torp*

*Daniel Haga*

*Erik Fosse*

# NTVA **IN KRISTIANSAND AND TROMSØ**

**KRISTIANSAND**
Three meetings were held in Kristiansand in 2016, including one visiting the Glencore Nickel Works.

Glencore Nickel Works, formerly Falconbridge Nickel Works, is a metal refinery. With 500 employees, it is one of Southern Norway's largest industrial workplaces.

Glencore Nickel Works is the largest nickel works in the EU/EEA, and delivers 5% of world nickel production. It produces ultra pure nickel and cobalt that are used in jet engines, batteries, mobile phones, cutlery, medical equipment,and much more. Recently the Nickel Works has developed new energy-efficient and fully automated copper processes.

The other meetings were held at Gimle Gård jointly with the Agder Academy of Science.


*Some of the participants at the meeting av Glencore Nickel Works in the Operation Centre. In the middle the technical director Per Ramsdal.*

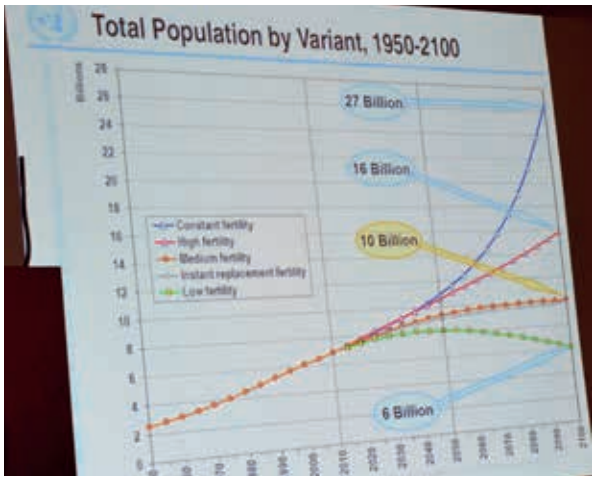
**TROMSØ**
NTVA had two well attended evening seminars at the premises of the former Norwegian Fisheries College, Campus Breivika.

On 5 April, the seminar dealt with bioeconomics. On 10 November, the seminar addressed issues associated with climatic and environmental changes in the seas of the high north. Prof and dean Edel Elvevoll and prof Bjørn Hersoug were two of the speakers.

The themes of the seminars are within the core area of the University of Tromsø (UiT), which provided the lecturers. The events were held cooperatively with UiT Norwegian Arctic University.


*Edel Elvevoll*

*Bjørn Hershoug*




*The population challenge illustrated by different scenarioes.*

# EUROPEAN COUNCIL OF APPLIED SCIENCES AND ENGINEERING – EURO-CASE

**In 2016 Euro-CASE comprised 23 national academies. Euro-CASE is the best possibility for NTVA to meet and cooperate with other national engineering academies with similar conditions and challenges. In 2016, Euro-CASE focused more on the EU agenda and the possibilities of influence within the European Community.**

Euro-CASE originally worked on actual EU cases through a European technology advisor working in the EU Commision. This approach to a coordinated effort ceased when the EU withdrew the position in 2015.

In its place, Euro-CASE initiated a Scientific Advice Mechanism(SAM). Together with EU and four other European Academy organizations, Euro-CASE then established the SAPEA Project (Scientific Advice for Policy by European Academies). Its aim is to develop coordinated an science-based recommendations and input to the EU. The EU has appropriated appreciable support for the project work over time.

The SAM-project was formalized in 2016. On 13 December there was a public presentation of the SAPEA-system by the presidents of the five European Academy organizations and Dr Robert-Jan Smits, the EU Director General for research and development.
The EU Commision has granted six million Euros to cover travel expences and administration.
The project is in the first round of in all four years. SAPEA can advise on call from the EU and also can respond to appeals from the academies.
This new channel for scientific advice has elicited expressions of confidence and trust. In the autumn of 2016, several projects were started under the SAPEA panoply.

The last Euro-CASE Annual Conference was organised by ATV (Denmark). It took place on 14 November 2016. The theme selected is: "Big Data – Smarter Products, Better Societies"

*New technologies are game-changers in today's as well as tomorrow's societies. Now you have the opportunity to gain insight in the latest technological developments and how they are applied. At ATV's Technology Day 14 November 2016, prominent research leaders, business leaders, and scientists who shared their knowledge and first hand-experience with technology development. All photos: ATV*

# INTERNATIONAL COUNCIL OF ACADEMIES OF ENGINEERING AND TECHNOLOGICAL SCIENCES – CAETS

**CAETS is a worldwide organization with 26 member countries in 2016. The national academy of New Zealand will soon be the 27th member.**

Dame Ann Dowling of The Royal Academy of Engineering (RAE) was the president of CAETS in 2016. The CAETS yearly convocation took place in London from 12 to 15 September 2016, with RAE as host.

An important theme for the CAETS-convocation was how to assist students of engineering and young engineers to share ideas, build networks and work systematically to promote ecological and economically-sustainable solutions. There were a special session on United Nations goals for a sustainable global development.

The RAE also presented its Africa Project, in which the Academy promotes engineering and female engineering in Africa. The motto for the convocation was "Engineering a better world".

In 2017 the Spanish Academy of Engineering (RAI) will be the host of the CAETS´ convocation "Engineering Challenges of the Bio-Economy will be its main theme. There will be a Norwegian session on the blue bio economy.

Vice president Karl A. Almås and secretary general Lars Thomas Dyrhaug represented NTVA at the London convocation.

# NTVA Review 2016

NORWEGIAN ACADEMY OF TECHNOLOGICAL SCIENCES

**NTVA'S INDUSTRIAL COUNCIL**

The NTVA Industrial Council consists of representatives from industries, public agencies, and research institutes. The Council assists NTVA in realizing its objectives and strengthening its links to industry by promoting research, education and innovation to benefit the Norwegian society.

The Council's Executive Committee had the following members in 2016:

Suzanne Lacasse, former Managing Director, Norwegian Geotechnical Institute (NGI), Chairman
Kari Nygaard, Managing Director, The Norwegian Institute for Air Research (NILU)
Hans Kåre Flø, Senior advisor, Tekna - The Norwegian Society of Graduate Technical and Scientific Professionals
Bjørn Sund, Project Manager, Lundin Norway AS
Torbjørn Digernes, President NTVA, Prof, NTNU (ex officio)
Karl Almås, Vice President NTVA, Managing Director, SINTEF Fisheries and Aquaculture (ex officio)
Lars Thomas Dyrhaug, Secretary General NTVA (ex officio)

The annual meeting for the Industrial Council in 2016 was held on 2 March in Oslo.

The theme of the professional meeting was Innovation and Restructuring: From speech to action

The speakers:
Dilek Ayhan, State Secretary, Ministry of Trade, Industry and Fisheries.
Walter Qvam. CEO, Kongsberg Group ASA.
Kåre Bjarte Bjelland, Manager, Eramet Norway
Pål Midtlien Danielsen, Manager of Innovation, NILU.
Lise Lyngsnes Randeberg, President Tekna and Prof NTNU.

**Member companies and institutions of The NTVA Industrial Council in 2016:**

Christian Michelsen Research AS
Norsk Romsenter
DNV GL
NTNU – Norwegian University of Science and Technology
Forsvarets forskningsinstitutt
Petroleum Geo-services ASA
Fred. Olsen & Co.
Rainpower Norge AS
GE Vingmed Ultrasound AS
Rolls Royce Marine AS
Innovasjon Norge
Schlumberger Information Technology Services
Institutt for energiteknikk
Selvaag Group AS
International Research Institute of Stavanger (IRIS)
Simula Research Laboratory AS
Kongsberg Norspace AS
SINTEF
Lundin Norway AS
Statnett
MARINTEK
Statoil ASA
Multiconsult AS
Stiftelsen NORSAR
NEXANS Norway AS
Tekna – Teknisk-naturvitenskapelig forening
Norconsult AS
Telenor Norge AS
Norges geologiske undersøkelse
UiT Norges arktiske universitet
Norges Geotekniske Institutt
Ulstein Group ASA
Norsk Hydro asa
Umoe AS
Norsk institutt for luftforskning – NILU
Universitetet i Bergen
Norsk olje og gass
Universitet i Stavanger
Norsk Regnesentral

Design og trykk: www.fagtrykk.no Miljømerket trykkeri, lisensnr. 2041 0811