

ATV Anniversary Conference 2012



Recommendations and Presentations



From left to right: ATV's Managing Director Lia Leffland, Lene Lange, Jacob Steen Møller, Thomas Bjørnholm, Keld Fuhr, Leo Alting, Maja Horst, Stig P. Christensen, Lone Rossen.

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The ATV Academy Council appointed an Organising Committee with the task of developing and implementing ATV's anniversary activities, including the Anniversary Conference. Its members are:

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Photographs: Tom Jersø

Introduction

The Danish Academy of Technical Sciences (ATV) celebrated its 75th Anniversary in 2012 with a conference under the title “The Global Challenges and Technical Sciences: Joint Efforts to find the Solutions for the Future”.

At the conference, leading Danish and international experts gave presentations on issues and solutions within the field of technology, sustainability and cooperation between business and universities; while the Danish Minister for Science, Innovation and Higher Education, Mr. Morten Østergaard presented the opening address.

A separate part of the conference focused on ATV’s historical impact as well as on two of the Academy’s most important achievements, the Industrial PhD programme and the GTS-network (the Advanced Technology Group).

This document aims at divulging the knowledge from the conference and ATV’s recommendations to a larger audience.

The conference was live-streamed on the Internet and the presentations have subsequently been embedded on Youtube.com where it can be found on this channel:

http://www.youtube.com/playlist?list=PLE9D126A0D8EFE4F3&feature=view_all

On the following pages you will find a brief introduction to the presentations and links to the TV-clips on YouTube. The document consists of three main parts:

Part 1: Recommendations

Part 2: Sustainability and Technology

Part 3: ATV’s Impact on Society

Finally, we wish to express our gratitude on behalf of the Academy to the sponsors who made it possible to organise the Anniversary activities:

- COWIfonden
- The Carlsberg Foundation
- The Technical University of Denmark (DTU)
- GTS – Advanced Technology Group
- Nordea-fonden
- Knud Højgaards Fond

Kgs. Lyngby, June 2012.

Martin P. Bendsoe, Chairman of ATV

Jacob Steen Møller, Chairman of the Organising Committee

Recommendations

Based on the outcome of the Anniversary Conference, the Danish Academy of Technical Sciences (ATV) announces the following recommendations:

- ***Sustainability and Technology***

At a global scale, the growing population and scarcity of natural resources are huge challenges. A key factor in solving these issues and mitigating their consequences is to achieve technological breakthroughs which may come from significant local growth drivers in industry, universities or the public sector.

ATV recommends that technological solutions are viewed as the key factor in solving the global challenges that stem from an ever growing population, limited resources, environmental and climate issues.

- ***Innovation***

Innovative solutions and concepts are vital in creating growth, jobs and sustainable solutions. Innovation must be viewed in context with academic research, education and business opportunities, and scientific results should be applied whenever possible.

ATV recommends an immediate change in concept and perception from ‘knowledge society’ to ‘innovation society’. This includes fostering and nurturing innovation throughout the educational system.

- ***Human Resources***

ATV has consistently worked towards promoting ‘circulation’ creative people with knowledge between companies and universities. This concept has worked extremely well and increased Denmark’s innovation capacity.

ATV recommends that knowledge is shared among corporations and academia by ‘circulating’ Human Resources. Excellent researchers and managers from universities should be encouraged to work in private sector companies and vice versa.

Morten Østergaard

Denmark in the innovation age

Morten Østergaard defined how he believes we must face a future transformation on par with industrialisation. We are leaving behind the logic and mentality of the industrial age to transform our society into an innovation society.

There are three must-win battles:

- We must educate more.
- We need better cooperation between researchers and companies.
- We must increase our innovation capacity.

Conclusions and recommendations

- We need to help knowledge from the universities and research institutions pass through the 'Valley of Death', which is the chasm between our ability to create new knowledge and our ability to translate that knowledge to products, services and growth.
- In a constantly changing society our most important resource is brain power. Therefore we can never become too educated.
- Solutions to the challenges must be created on a foundation of high quality education, excellent research and innovation.
- We need to create a new culture of cooperation between the public and private sectors.

Morten Østergaard's presentation can be viewed on the Internet here:

http://www.youtube.com/watch?v=seJsjDQMGvc&list=PLE9D126A0D8EFE4F3&index=1&feature=plpp_video

Short Biography

Morten Østergaard was appointed Minister of Research, Innovation and Higher Education in October 2011. He holds a M.Sc. in Political Sciences from Aarhus University and has worked as a Market Manager for e-government, Dafolo A/S (Aarhus). In 2005 he was elected Member of Parliament for the Social Liberal Party and from 2007 he was Vice Chairman of the Social Liberal Party's parliamentary group.



Povl Krogsgaard-Larsen

Mobilisation of Research Resources for Future Technological Development: Focus on Academic/Industrial Interaction

Povl Krogsgaard-Larsen showed and defined possibilities for Danish technology and the development of research resources with a focus on academic/industrial interaction.

Danish research generally holds a strong position in the international research landscape. However, in terms of transforming basic scientific results into innovative industrial inventions, Denmark lags behind. In order to change this, profound and continuous educational initiatives should be launched.

Conclusions and recommendations

- Scientific educational initiatives must critically analyse the student syllabus.
- Scientific Social responsibility (SSR) has been developed as a new academic mindset. It is analogous to Corporate Social Responsibility (CSR) and should be seen as a code of practice.
- GTS is an advanced technology group which accelerates innovation in Danish companies through applied research. GTS can facilitate transformation of basic scientific results into applied research and industry value creation. GTS can also work as a strategic asset for Danish universities.
- To carry the intentions forward, it is necessary to develop academic leadership.
- A challenge to scientific leaders: ‘Scientific drowning’. Scientists ‘drown’ in the hectic flow of information and data.

Povl Krogsgaard Larsen’s presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=cYYKuwoQe3s&feature=BFa&list=PLE9D126A0D8EFE4F3>

Short Biography

Professor Povl Krogsgaard-Larsen achieved his lic. Pharm. (PhD pharm.) degree in 1970, followed by his Doctorate (pharm.) degree in 1980. He was Rector at the Pharmaceutical University from 2001-2003. In 2003 he became Chairman of the Carlsberg Foundation and subsequently of Carlsberg A/S. In 2012, he retired from these positions. He continues his professorship at the Pharmaceutical School at University of Copenhagen. He is also a member of the boards of the Lundbeck Foundation, the Benzon Foundation, and of Bioneer A/S.



Kevin Noone

A Safe Operating Space for Humanity

Kevin Noone argued for the necessity for identifying the boundaries for the sustainable use of our planet's resources. Defining safe operating spaces within these can help us not to cause unacceptable environmental changes.

The planetary boundaries identified are: freshwater consumption, chemical pollution (not yet quantified), land use, biodiversity loss, nitrogen & phosphorus flows, climate change, ozone depletion, atmospheric aerosol loading, and ocean acidification. Unfortunately, three of the nine limits have already been exceeded - biodiversity loss, nitrogen flow and climate change.

Conclusions and recommendations

- Applying the same technology that gave us the green revolution will not work to sustainably produce food for 9 billion people
- We must invest in R&D for more efficient use of fertiliser and irrigation water; novel farming techniques
- We must promote less resource-intensive diets
- We must concentrate on optimising food *systems*; diet, production, distribution, marketing, disposal – not just agriculture
- We must re-examine agricultural subsidies; support sustainable food systems

Kevin Noone's presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=MOv0LOG68ks&feature=BFa&list=PLE9D126A0D8EFE4F3>

Short Biography

Professor and researcher: Atmospheric chemistry and physics, earth system science. Advocate of an interdisciplinary approach to obtaining a solid scientific basis for decisions on environmental and climate issues.

2008 - Joint appointments at the Dep. Applied Environmental Science and the Stockholm Resilience Centre; Director of the Swedish Secretariat for Environmental Earth System Sciences (SSEESS), Royal Swedish Academy of Sciences.

2004-2008 Executive Director of the International Geosphere-Biosphere Program (IGBP), and member of the Earth System Science Partnership (ESSP)

2000-2004 Professor of Meteorology and head of the Atmospheric Physics Division at the Department of Meteorology, Stockholm University.



Bernhard Palsson

Healthy and Sustainable Future: How does Biotechnology Create a Basis for a Healthier Global Future?

Bernhard Palsson first stated the four basic assumptions that:

- GDP is proportional to energy use
- The power output of a human is small
- Hubbert's peak exists – and it may have passed
- Not all forms of energy are equivalent – oil as transportation fuel is very special and hard to replace

The Biosustainability Center, DTU, 2011, has as its overall goal to help transforming the industry by determining the spectrum of chemistry that can be produced biologically and to shorten the strain design and development process.

Professor Palsson elaborated over some relative magnitudes concerning energy usage and carbon footprint.

Conclusions and recommendations

- The time scale must be measured in decades; we must act, not panic
- To maintain growth in the short term, we must develop energy efficiency
- To maintain growth in the long term, we must find alternative sources of energy and replacement
- Technology Innovation will be 'the issue of issues'
- Fantastic time to be young and entrepreneurial
- The 'world order' and 'social order' are likely change notably

Short Biography

Bernhard Palsson is Galletti Professor Bioengineering and Adjunct Prof. Medicine at the University of California, San Diego

2012 (to come) ASM Promega Biotechnology Research Award

2010 - Designated CEO of the Novo Nordisk Foundation Centre of Biosustainability, DTU.

2009 – Doctor honoris causa from Calmers University in Gothenburg



Richard McCullough

New Materials will Revolutionise the World

Lord Professor Richard McCullough gave an overview of new materials and their major current and future applications that will have a tremendous impact on the global environmental challenges.

McCullough emphasised that basic science in materials' functions and the discovery of conductive polymers has led to new innovation. Conductive polymers allow us to make printable organic transistors, electronics, displays and solar cells. These devices are flexible, small, inexpensive and efficient.

Future applications include covering of surfaces of buildings with printable, transparent plastic solar cells and generation of electricity almost anywhere.

Conclusions and recommendations

- Basic science has a huge impact on changing the world (e.g. invention of the Internet , MRI technology, Niels Bohrs' investigations of atomic structure)
- New materials will revolutionise the world (printable solar cells, transistors, lightning etc.)
- We need innovation in the field of organic printable solar cells to make them even more efficient

Richard McCullough's presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=6e608Vtj69w&feature=BFa&list=PLE9D126A0D8EFE4F3>

Short Biography

Richard McCullough, Lord Professor of Chemistry, Vice President for Research, Carnegie Mellon University, Pittsburgh.

Chief Scientist and founder of Plextronics Inc., and is one of the world's leader in developing active layer technology for printed electronics devices.



Michael R. Nelson

Leading the Internet of the Future – the Cloud of Things – in the Right Direction

Michael R. Nelson pointed out that we stand in front of a third phase of the Internet revolution which will be as profound as the World Wide Web.

Michael R. Nelson predicts that within 5-10 years, 100 billion devices and sensors can be connected to the Internet and that 80 per cent of all computing will take place in the Cloud. This will have a great impact on our daily lives and areas such as environmental monitoring, agriculture, health care, public safety, transportation, home networks etc.

The Cloud of Things requires that we make the right decisions within the next 3-4 years in order to facilitate widespread innovation in order to lead the internet of the future in the right direction and to make the most out of the Cloud of Things.

Conclusions and recommendations

- The next 2-3 years will define the Cloud of Things – we must take action
- We need a broad agreement and adoption of technical key standards
- The suppliers of the clouds must cooperate around open source software
- Users must be able to trust the cloud – a need for reliable security and privacy
- We need policies for privacy, transparency, online copyright, liability for cloud service providers, international data flows and competition policy

Michael R. Nelson's presentation can be viewed on the Internet here:

http://www.youtube.com/watch?v=ewrzWpBScRo&list=PLE9D126A0D8EFE4F3&index=12&feature=plpp_video

Short Biography

Professor Michael R. Nelson analyst, technology policy at Bloomberg Government. He is Research Associate at CSC Leading Edge Forum and Adjunct Professor, Internet studies, Georgetown University. He is former Director of Internet Technology and Strategy at IBM and former Special Assistant for Information Technology at the White House.



Claus Hviid Christensen

The Danish Perspective: Sustainable Growth at Innovation Square

Claus Hviid Christensen summarised the input from the previous speakers and expanded further on the topics of the conference. He emphasised that our society needs to undergo a transformation from ‘knowledge society’ to ‘innovation society’: It is not enough to adapt to changes, we must drive the changes.

Conclusions and recommendations

- Innovation is the only lasting competitive advantage
- Innovation is more than creativity: It is new, useful ideas being implemented
- Global Grand Challenges (such as population growth) may be viewed as positive drivers for innovation
- We need to move from the ‘Knowledge Triangle’ (education, research and innovation) to ‘Innovation Square’ (education, research, innovation *and* business)
- It is meaningless to separate between basic and applied research; instead research should be viewed as either ‘capacity building’ or ‘innovation’
- Universities do well in building capacity in many research areas, but cooperation with companies is necessary to drive innovation and growth

Claus Hviid Christensen’s presentation can be viewed on the Internet here:

http://www.youtube.com/watch?v=3mjseESlfQE&list=PLE9D126A0D8EFE4F3&index=4&feature=plpp_video

Short biography

Claus Hviid Christensen is Head of Emerging Technology in Group R&D at DONG Energy. Previously, he was CEO at Lindoe Offshore Renewables Center (LORC), Vice President for Emerging Technology at Haldor Topsøe A/S, Professor at DTU and Director for the Danish National Research Foundation’s Center of Excellence, “Center for Sustainable and Green Chemistry”. He is the inventor of more than 35 patents and has founded several new companies based on his research.



Experts' Assessment (Panel Debate)

The panel debate outlined and expanded on the visions and ideas from the presentations held during the day. Main topics of the debate and the experts' Assessment:

- **Cooperation between business and Academia:** The professors agreed that it is vital for the innovation in society to enhance the cooperation between companies and universities. Issues such as bureaucracy and reluctance to leave 'the ivory tower' must be overcome; one solution is to 'go with the doers, not the lawyers' and to promote the concept of cooperation to students.
- **IPR** is an important aspect of business-university cooperation, but there is a need to have a realistic view on the outcome. Many patents come from excellent research results, but they may have limited commercial value, and universities will not necessarily gain substantial income from licenses.
- **Interdisciplinarity** and 'cross-fertilisation' between different sciences should be championed. This can for example be done by embedding interdisciplinarity into the promotional system of universities.

The panel discussion can be viewed on the Internet here:

http://www.youtube.com/watch?v=mkDH-r_uhU8&feature=BFa&list=PLE9D126A0D8EFE4E3



Participants in the panel debate (from left to right)

Professor Richard McCullough

Professor Bernhard Palsson

Professor Michael R. Nelson

Senior Manager Claus Hviid Christensen (moderator)

Martin P. Bendsøe

ATV's impact during the period 1937-2012

Martin P. Bendsøe gave a kaleidoscopic view of ATV's work and impact on society since the Academy's formation in 1937. He emphasised that ATV had played different roles at different times, but that ATV had strongly influenced the transformation of Denmark into a country based on technological development.

The presentation is based on the book about ATV, *Visioner, viden og værdiskabelse – en historie om Akademiet for de Tekniske Videnskaber* ("Visions, knowledge and value creation – a history about ATV"), written by Ph.D. Henrik Knudsen, Aarhus University.

Martin P. Bendsøe explained that ATV's history falls into six periods where the Academy played different roles:

- The Vision of an Academy (1937-1941)
- Trouble-shooter and Founder of Institutes (1941-1956)
- The Bridge-builder (1956-1971)
- Forum for Interdisciplinary Discussions (1971-1983)
- Invisible College (1983-1999)
- Think Tank (1999-2012)

Martin P. Bendsøe's presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=MrAQ4lAItHo&feature=BFa&list=PLE9D126A0D8EFE4F3>

The book (in Danish) can be read here: [http://issuu.com/westring-](http://issuu.com/westring-welling/docs/pdf_fil_til_issue_og_print?mode=window&backgroundColor=%23222222)

[welling/docs/pdf_fil_til_issue_og_print?mode=window&backgroundColor=%23222222](http://issuu.com/westring-welling/docs/pdf_fil_til_issue_og_print?mode=window&backgroundColor=%23222222) and downloaded here:

<http://www.atv.dk/da/publikationer/projekter/75-ars-jubilaeum?download=104:visioner-viden-og-vaerdiskabelse>

Short biography

Professor Martin P. Bendsøe, Chairman of ATV. He is Senior Vice President and Dean of Graduate Studies and International Affairs at the Technical University of Denmark (DTU).



Ragnar Heldt Nielsen:

The development from ATV-institutes to the present and future role of the GTS network

Ragnar Heldt Nielsen presented the history of the GTS and defined how GTS can help bridging the gap from research to market now and in the future.

Conclusions and recommendations

- Bridging the gap from research to market is crucial.
- The historical line for GTS: In the 1940's up to the 1960's a wide range of institutes was set up coming from different technological fields. In 1973, GTS was set up by law. 30 entities were approved as GTS Institutes at that time.
- From 2007 there has been 9 institutes covering a broad span in terms of technological fields: From high end measurement and calibration to advanced robotics and agricultural techniques. In total the institutes have around 3,700 employees.
- GTS's vision is to continuously accelerate business innovation by facilitating the meeting between knowledge and market.
- Fields of action for the future are strengthening the collaboration with the universities, SME collaboration, strengthening the international outreach with support to the Danish industries in their globalisation efforts and establishment of cross-disciplinary strategic partnerships to meet the grand societal challenges.

Ragnar Heldt Nielsen's presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=2XO6nrf3bQA&feature=BFa&list=PLE9D126A0D8EFE4F3>

Short Biography

Since 2007 Ragnar Heldt Nielsen has been the Managing Director of the GTS – Advanced Technology Group which gather the common interests of the nine GTS institutes. During the period 1999-2007 he worked as Manager in the Danish Society of Engineers (IDA). He also worked as a consultant at CTU - The Danish National Centre for Technology Supported Learning (1996-1999). He is M.Sc. in political science with specialisation in applied IT.



Thomas Alslev Christensen

The importance and role of the industrial Ph.D. programme now and in the future

Thomas Alslev Christensen presented the Industrial PhD programme (ErhvervsPhD-ordningen) which was created by ATV in 1971 with the aim of training younger researchers for a career covering both private sector companies and universities.

Conclusions and recommendations

- The Industrial PhD programme is open to all scientific areas. 85 per cent of the Industrial PhD graduates stay in the private sector, 15 per cent go to the public sector.
- The Industrial PhD programme is the most well-documented R&D scheme in the world. Both large companies and SMEs participate. 50 per cent of all projects are in SMEs.
- 12 per cent of all new Industrial PhD students are from abroad. The number of foreign PhD students with an Industrial PhD must increase.
- Companies benefit from hiring an Industrial PhD student, measured on profits and patent applications.
- More companies should take part in the programme. Approximately 200 applications a year are received, but 40 per cent cannot be approved.

Thomas Alslev Christensen's presentation can be viewed on the Internet here:

<http://www.youtube.com/watch?v=xL9izgOv1pI&feature=BFa&list=PLE9D126A0D8EFE4F3>

Short Biography

Since 2005 Thomas Alslev Christensen has worked as Head of Department for Innovation Policy at the Danish Ministry for Science, Innovation and Higher Education. He is also Head of Secretariat for the Danish Council for Technology and Innovation. Thomas Alslev Christensen has been an external Associate Professor at the University of Copenhagen. He is M.Sc. in Economics from University of Copenhagen and he obtained his PhD in 1992 in international finance and economics at Copenhagen Business School.



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