

# NANO CONNECT SCANDINAVIA

2009-2012

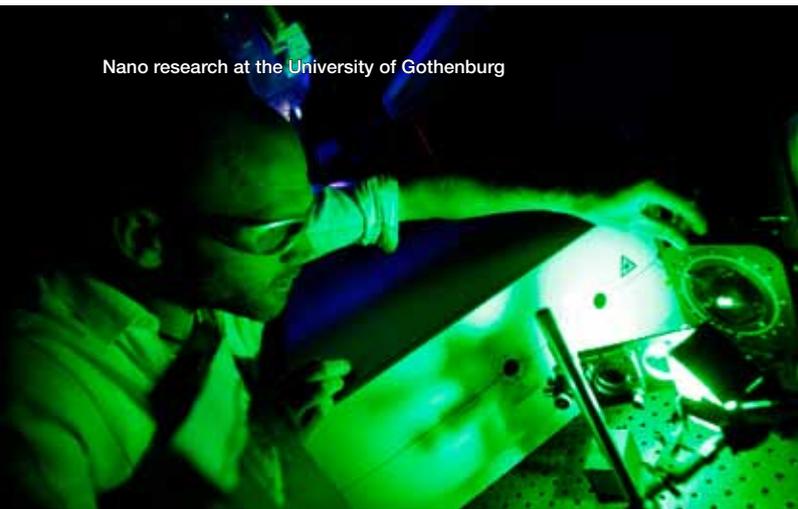
OVER 2 500  
PROFESSIONALS  
FROM ACADEMIA  
AND INDUSTRY  
CONNECTED

NANO CONNECT SCANDINAVIA | [www.nano-connect.org](http://www.nano-connect.org)  
Chalmers University of Technology | DTU | Halmstad University | Imeko  
Lund University | University of Copenhagen | University of Gothenburg





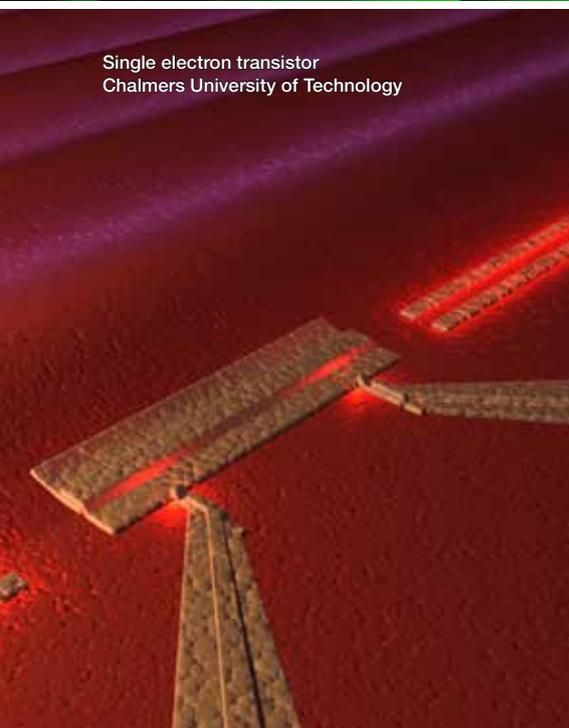
The first Nano Connect Scandinavia board meeting, 2009.  
Photo: Markus Lindberg



Nano research at the University of Gothenburg



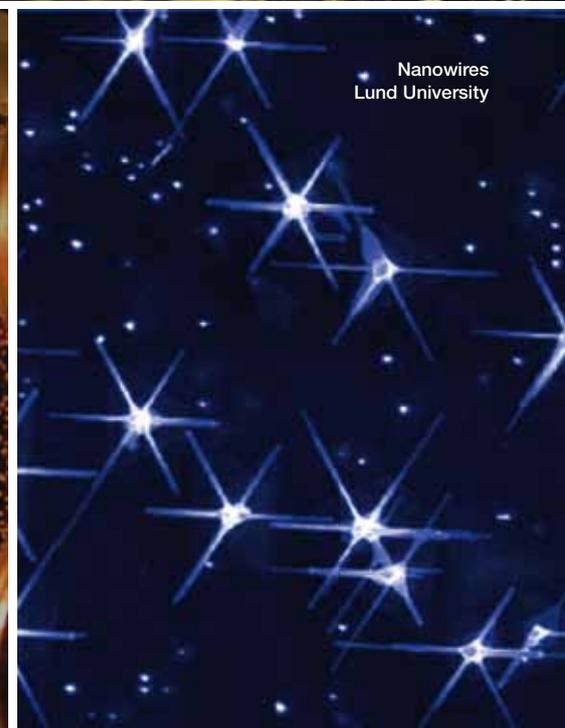
Lab-on-a-chip device at DTU. Photo: Jesper Scheel



Single electron transistor  
Chalmers University of Technology



Nano research at the University of Copenhagen



Nanowires  
Lund University

## The goal

The goal of the 4,3 M€ Nano Connect Scandinavia project launched in 2009 was to create sustainable economic growth in south western Scandinavia by:

- achieving better coordination and more optimal use of the region's resources related to nanotechnology and nanoscience,
- developing the industry sector and stimulating entrepreneurship by mapping industry needs with the nano-related competence of the region as a whole,
- making the region and its strengths within nanotech known to investors, companies etc outside the region.

Partly funded by the European Regional Development Fund's Interreg IVA programme, all project activities were designed to be cross-border in nature. This could mean inviting Danish scientists to a workshop aimed at Swedish companies or matching the needs of a Danish company with knowledge created by a Swedish team of researchers. In addition to Interreg IVA, Nano Connect Scandinavia was also financed by five regions and contributions from the seven partner universities and institutes.

## The Network

The Nano Connect Scandinavia project team was the driving force behind the project activities. It consisted of 5-6 project coordinators employed by and placed at the partner universities. This approach created grounds for intelligent match-making between research carried out in the region and local companies. The coordinators had regular meetings to look for cross-border solutions to local problems and to discuss ideas for collaboration. Project activities were coordinated by a project management function located at Lund University, the lead partner in the Nano Connect Scandinavia initiative.

The Nano Connect Scandinavia network grew over time. By february 2012, the project database contained more than 2300 scientists, company representatives, PhD students and decision makers who had shown an interest for, or participated in, different nanotechnology related activities.

Halland Regional Development Council  
Region Skåne  
Region Västra Götaland  
Region Zealand  
The Capital Region of Denmark

Chalmers University of Technology  
University of Gothenburg  
Imego  
Halmstad University  
Technical University of Denmark  
University of Copenhagen  
Lund University

### WHY NANOTECHNOLOGY?

Broad and interdisciplinary, nanotechnology is changing many traditional industries and allowing the creation of new products and companies.

For example in life science, nanosized drug carriers allows better cancer treatment, and the entire field of energy will be affected, from usage to supply, conversion and storage. It enables new electronic components, energy efficient LED lights, lightweight nanocomposites, low friction surfaces and nanolubricants and much more.

Particularly relevant to the Øresund region, nanotechnology development is catalyzed by development of new tools and the ESS and MAX-IV laboratory will be giant microscopes allowing unparalleled study of matter and processes on the nanoscale.



# Connecting science and industry

The role of Nano Connect Scandinavia was to act as a facilitator, creating forums where industry and academia could meet as well as proactively seeking out opportunities for collaboration across border, disciplines and sectors.

## Results in short:

2 500 professionals connected	30 project ideas analysed
338 new partners met at match-making activities	14 projects of different types generated
30 seminars with more than 20 participants, workshops and conferences arranged	260 participating companies
2 partnering missions (Grenoble and Boston)	100 participating universities and institutes
	60 participating public organisations



*We believe that a consortium like this is the right way to initiate activities between companies, universities and institutes, which will most likely also increase the competitiveness for the companies in this region. For Dyrup this has (at this stage) led to one collaboration and several presumptive projects with companies and universities.*

David Lóf Dyrup A/S, PPG Industries, Danish coatings manufacturer

## Bringing people together

Sometimes, all it takes for a new idea to be transformed into something tangible is for the right people to meet over a cup of coffee. But finding those people to begin with - and then convincing them to make time in their busy schedules for yet another meeting - requires that you first create an interesting forum for interaction. Nano Connect Scandinavia arranged or co-hosted over 30 seminars, workshops and conferences to facilitate knowledge transfer between academia and industry. See the center fold in this brochure for some event posters.

## Targeting industry

In order to raise the interest among companies for nanotechnology, a number of publications were produced, such as:

- The Nano Guide: a “yellow pages” of nano related research groups at the NCS partner universities. This 50 page magazine was printed in two editions and sent via direct mail to over 600 company representatives
- Using concrete examples the thematic brochures act as appetizers, showing that embracing nanotechnology is not necessarily a major step to take. A total of five brochures were produced, describing the areas life science, materials, electronics and sensors, energy and safety. Sent out to more than 1500 companies in relevant industry sectors in Sweden, Denmark and Norway, the brochures can also be downloaded from the web: [www.nano-connect.org/downloads](http://www.nano-connect.org/downloads).

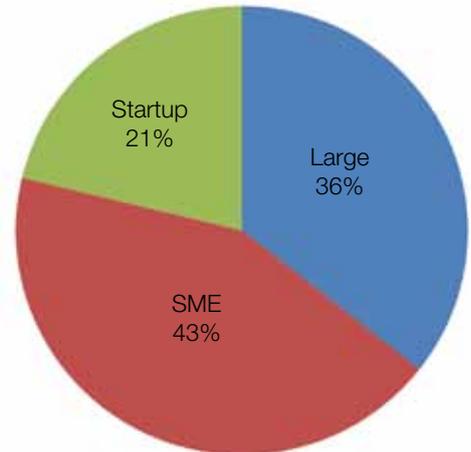


## Examples of participating companies

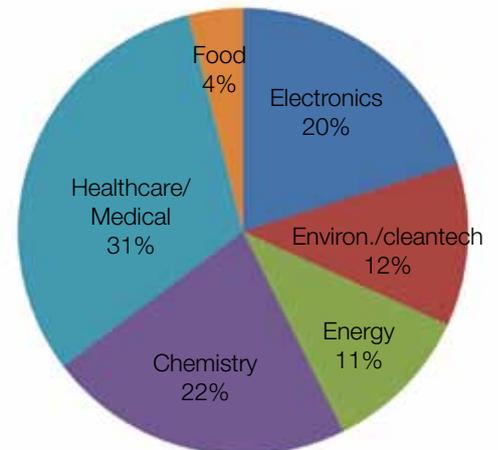
MiniFAB    Fingerprint Cards    GustaviaDavegårdh Fonder  
 Cochlear BAS    Smoltek    SunFlake    Layerlab  
 ABB Corporate Research  
**AB Volvo**    Eka Chemicals  
 CR Competence    Höganäs    LGC Standards  
**Coloplast**    Nanofactory Instruments  
 Polygiene    Dinair Filton    ST Instruments  
**Haldor Topsøe**    Teamator  
 Camurus    **Tetra Pak**    Obducat  
 GS Development    Sol Voltaics    Widex    NeoZeo  
 Promimic    SPAGO Imaging  
**LEO Pharma**    Bactiguard  
 Sympatec Nordic  
**LEGO**    Dentofit    Hempel    **Fiat**  
 NanoSteel    PowderPro    Genovis  
 Inspiorion    Bioneer    FOSS    BIM Kemi  
 Awapatent  
**BYK**    Plougmann & Vingtoft    BD Medical  
 Sigma Aldrich  
 Volvo Technology    Chr. Hansen  
 IRD Fuel Cells    Quflow    **Dyrup**  
**IBM Research**    Biolin Scientific  
 Hemocue  
**SP Group**    **DONG Energy**  
 Applied Nano Surfaces  
 Gammadata Instrument  
**Siemens**    **Borealis**  
 NIL Technology    Saint-Gobain Recherche  
 European Nano Invest    BT Biomedical Technology  
**Volvo Car Corporation**  
 Sophion Bioscience    Emerson Process Management  
 Statens Vegvesen Norge    Small Particle Technology GBG

## Company profiles

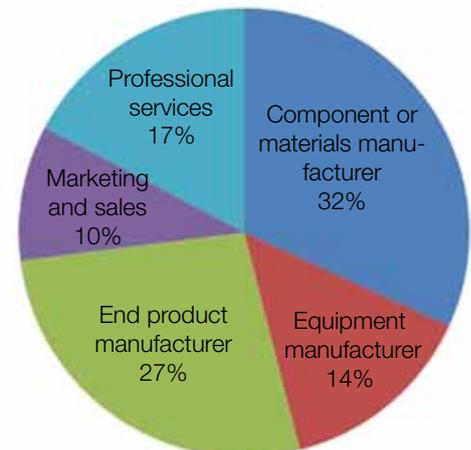
### Company type



### Industry sector



### Value chain position





AB Volvo Senior Vice president Jan-Eric Sundgren speaking at Update 2011. Photo: Markus Lindberg

# The Update conferences

With close to 500 participants in total, half of them from industry, the Update conferences 2011 and 2012 were excellent forums for interaction between academia and industry. In particular, the matchmaking function made it easy to book meetings with any other participant to discuss almost any relevant topic.

The goal of the Update conferences was to bring the scientific community and industry closer together. In addition to plenary sessions and in-depth seminars on life science, energy, surfaces and materials, these conferences also included more industrially related topics, such as production, safety as well as sessions considering challenges of bringing science to business and practical aspects of actually “going nano” (see below). The organized matchmaking at separate sessions, lunches and breakfasts, allowed participants to book face-to-face meetings with interesting companies and researchers in advance.

## Small improvements, big money

A number of “pure” nanotechnology companies like LayerLab, Obducat, NIL Technology, Insplo-ri- and Applied Nano Surfaces presented their work. Another type of company that were active in the matchmaking sessions were the service providers and institutes that assist in the development

process. Major corporations such as AB Volvo, Fiat and Tetra Pak came with “big ears” as AB Volvo Senior Vice president Jan-Eric Sundgren put it. For companies like this, nanotechnology does not necessarily need to turn everything upside-down to be relevant. An incremental improvement in a product or process could mean millions of dollars saved, or a competitive advantage gained.

## Going nano

In the Going nano session at Update 2011, talks were given on safety, the regulatory framework, and the possible benefits of embracing the new technology. A partner in the NanoPlast project, LEGO hopes to replace chemicals with nanostructured surfaces to produce its brightly coloured toys. Per Høvsgaard, Senior director of mechatronics & prototyping at LEGO articulated what the company hopes to gain, and DTU researcher Rafael Taboryski discussed how to make it happen. Equal parts entrepreneur and scientist, Genovis CEO Sarah Fredriksson took a step back from the tech-talk and stressed the importance of communication, when it comes to selling a new technology or product.

– The customer buys a solution to a problem. The technology used is of secondary importance to the customer.



Anja Boisen on sensors for detection of explosives at Update 2011



Christer Fuglesang presented an astronaut's view on space and nano-technology at Update 2012



Matchmaking is an essential part of Update conferences



Professor David Quéré, ESPCI ParisTech, at Update 2012



Exhibition at Update 2012



Poster session at Update 2012

# The PhD Nano conferences

The PhD Nano conferences at 2010 and 2011, primarily designed for PhD students, attracted around 100 participants each and had a fraction of participants from industry of below 20%. Here, the focused discussions around real cases from companies in the “Inside Industry Innovation” workshops were much appreciated - both by PhD students and company representatives.

The PhD Nano concept offers graduate students with an opportunity to meet fellow students from other universities, and meet with representatives from R&D intense companies. Thereby, PhD students can expand their professional network, and companies are presented with potential future employees and new ideas for their ongoing projects.

The conference programme contains a few plenary talks, Ph.D. students’ project (“shotgun”-) presentations, a poster session and the Inside Industry Innovation workshop (described below). The conference duration was two days.

## Inside Industry Innovation workshops

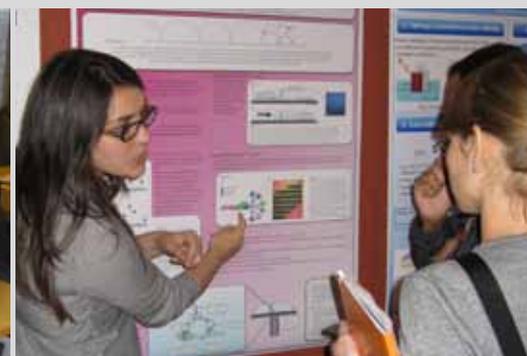
Inside Industry Innovation was developed as a concept during 2010 (Gothemburg) and 2011 (Copenhagen) and the number of industry cases increased from 4 to 6. Companies such as Fingerprint Cards, LEO Pharma, Dyrup and Borealis brought live cases and hosted brainstorming sessions where PhD students contributed with input from their individual areas of expertise within nanoscience and nanotechnology. □



“Shotgun” presentations by PhD-students at PhD Nano 2010



“Inside Industry Innovation” discussion in smaller groups at PhD Nano 2010



Cassandra Niman presenting her poster at PhD Nano 2010





# Nanoparticle safety drew a big crowd

**The room was packed with medical doctors, scientists and policy-makers when Nano Connect Scandinavia co-hosted a seminar on nanoparticle safety at Ekocentrum in Gothenburg on November 2<sup>nd</sup>.**

Moderated by Rickard Arvidsson, the event was opened by Bengt Kasemo, professor in chemical physics at Chalmers, who gave a general introduction to nanotechnology. He spoke about its promises for the future as well as the need for the governing bodies to step up to the challenge when it comes to creating a regulatory framework to manage risk.

“Risk equals hazard times exposure. It is important to consider both.”

Ethel Forsberg, partner at U&W and former Director General of the Swedish Chemicals Agency, concluded that regulation is lacking.

– Today, we focus on the substances that are being produced in the largest amounts. The substances that nanoparticles are made up of do fall under the regulation of the REACH framework. However, since the volumes are so small the bar is set to low when it comes to nanoparticles.

She emphasised that one should not view nanotechnology as a problem, since it has potential to

help solve some of today's major concerns, such as climate change. But it would be foolish not to consider risk, in order to steer development in a positive direction.

– We are still stuck at the first step of the legislative process: to map and understand the risks. We have a lot of work ahead of us.

Professor and medical doctor Lars Barregård gave a presentation on pollution and how it affects our health. He said that even though the mechanism is not fully understood, most researchers would agree that it is the particles that we should be most concerned about.

– Risk equals hazard times exposure. It is important to consider both, said Steffen Foss Hansen, researcher at DTU Environment. He then proceeded to give an overview of the studies that have been carried out this far on nanoparticles and human- and ecotoxicology.

Hansen was followed by Ulla Birgitte Vogel, professor in nanotoxicology at The National Research Centre for the Working Environment in Denmark.

– On the nanoscale, it is surface area that is relevant to discuss, not mass, she said and explained that experiments on mice have shown how exposure to nanoparticles can cause inflammation and congested arteries.

The last speaker, Åsa Boholm, professor in social anthropology, gave a presentation on how the general public perceives the risk associated with nanotechnology.

– If you feel that there is something to gain from the technology, you will tend to perceive the risk as lower. That is why the word "nano" is used as a sales pitch for products like car polish, but is seldom mentioned when it comes to cosmetics. □



# Tying universities and resources closer together

## The Nano Connect Scandinavia Cleanroom Network

A cornerstone of the Nano Connect Scandinavia project was the idea that all universities and institutes in the region would benefit from being part of a regional nano community. This was very apparent for the cleanroom. Chalmers MC2 Nanofabrication laboratory was already part of the Swedish Myfab network of cleanrooms, but no such network existed across borders. Some cross-border collaboration existed nevertheless: Lund University spin-off company Glo was just about to establish a pilot production line at DTU Danchip in Lyngby.

Lund Nano Lab, Chalmers MC2 Nanofabrication laboratory and DTU Danchip concluded that by exchanging knowledge and moving towards standardised education programs for cleanroom users, they would make it easier to use the services of more than just “their local” cleanroom. The Nano Connect Scandinavia Cleanroom Network gave management and personnel at the region’s cleanrooms the opportunity to travel and spend time at each other’s facilities, discussing best practice.

## PhD NANO

Since PhD students tend to be both open-minded and in need of expanding their personal networks, they are key when it comes to creating a coherent nano community in south-western Scandinavia in the long term. The PhD NANO conferences in 2010 and 2011 in Gothenburg and Copenhagen respectively were a first step towards a Scandinavian network of PhD students.

## Reaching out with science

Nanotechnology is a field that is both complex and diverse, making it challenging to communicate. Nano Connect Scandinavia worked with outreach activities through different channels, including seminars, creating education packages for the high school level, providing examples for a exhibition of technology at Malmö museer and producing a movie explaining nanotechnology which can serve as an introduction when presenting nanotechnology to new audiences.



Ivan Maximov, Lund University, presents the Cleanroom network at the NCS General assembly in Copenhagen, 2010.

## On the international arena

### Bringing the nanoworld to Scandinavia...

Science knows no borders. A Danish researcher is as likely to collaborate with a fellow scientist in, say, China, as in Sweden. But in addition to personal, ad hoc contacts, there is a need to market the region as a whole to an international audience. Nano Connect Scandinavia presented and represented nanoscience in south-western Scandinavia to several delegations of scientists and companies, from countries such as the US, the Czech Republic, Japan, France and Russia to name but a few. The Update conferences were international both in terms of speakers and participants. Update 2011 had delegates from 15 countries.

### ... and bringing Scandinavia to the nanoworld

Nano Connect Scandinavia representatives networked and spoke at conferences such as Industrial Technologies 2010 in Brussels and ImagineNano 2011 in Bilbao. The project team also co-organised extensive networking and study trips to the nano cluster in Grenoble with visits to MINATEC micro and nano technologies innovation campus and the European Synchrotron Radiation Facility (ESRF), as well as to the nanomedicine clusters in North Carolina and Massachusetts, USA.

“

Nano Connect Scandinavia is a remarkable success. Within the space of two years, it has increased awareness in the United States of the quality and extent of nanoscience and nanotechnology in Scandinavia. It has become exclusive and indispensable source of information about nanoscale research currently underway in Denmark and Southern Sweden. Its effectiveness is due to a staff of professionals strategically located in universities, institutes, and other research facilities, both public and private. Knowledgeable and always helpful, they have become an important means of learning about biomedical/health related projects having relevance to work taking place at CNSI and UCLA.

David Lundberg, PhD, Director, Global Partnership Program, California NanoSystems Institute (CNSI), University of California, Los Angeles



Networking at ImagineNano, Bilbao. Photo: Morten Christensen

# US Nanomedicine Partnering Mission

**The Nanomedicine Partnering Mission took place January 23rd – 27th 2012, and included two days in North Carolina and three days in Massachusetts.**

Nearly 30 persons from companies, universities, press and public organisations in south-western Scandinavia participated in this partnering mission, organized with joint effort from Medicon Valley Alliance and Nano Connect Scandinavia Nanomedicine - a rapidly evolving field – is of high interest to both the life science and the nanotechnology communities. In the US, this field has been supported by several large coordinating efforts, for example with the goal of using nanotechnology to diagnose and treat cancer or to advance biotechnology.

**“The US contacts (number + quality) would not have been possible to visit as an individual in such a time efficient and effective way”**

Sandra Wilson, Research Scientist at Sophion Biosciences A/S

The programme goal was to provide the delegates with a broad overview of research initiatives and other activities in eastern US. The programme not only included visits at top of the line universities but also visits at innovative companies and networking events hosted by nano- and biotech cluster organisations in both North Carolina and Massachusetts.

Targeted drug delivery using “immunosomes”, pulmonary vaccine delivery, new therapies for tissue regeneration, nanotoxicology and toxicological models simulating human organs (lung-on-a-chip or heart-on-a-chip) were some of the topics touched upon during this intense week.

## Results of the mission

The final number of collaborations emerging on basis of this trip is yet to be seen. As a delegate answers when asked if valuable connections were made: *“Yet to be known, but I see three different possibilities for collaboration. Two cross-Atlantic, one local”*. Åsa Sjöholm Timén, Director of Business Development at Spago Imaging says: *“All in all this partnering mission exceeded my expectations!”* □



Photo by Griff Kundahl/Johan Borgström

## The following organisations were visited:

### North Carolina

Duke University: Biomedical Engineering  
Liquidia Technologies (company)  
Research Triangle Institute (insitute)  
Center of Innovation for Nanobiotechnology (COIN): Networking event  
North Carolina State University: College of Engineering  
University of North Carolina

### Boston

Harvard University Science Center: Nanoscale Science and Engineering Center  
Boston University: Center for Nanoscience and Nanobiotechnology  
MIT–Harvard Center of Cancer Nanotechnology Excellence  
Northeastern University: School of Pharmacy  
Wyss Institute for Biologically Inspired Engineering  
Merrimack Pharmaceuticals (company)  
Harvard Innovation Lab (iLab)) (incubator)  
Massachusetts Biotechnology Council (MassBio): Networking event

# Long term R&D and use of large research facilities

**R&D managers and managers of large research facilities gathered on November 15<sup>th</sup> to discuss best practice for investment in long term R&D and the use of large research facilities.**

Bernard Cabane, CNRS Research director at ESPCI, Paris, gave a talk on “Industry and academia: experience from joint units”. He described how to create a joint industry-academia unit to work on new methods for industry. He was followed by Ed Mitchell, Head of Business Development at ESRF, Grenoble who spoke about “Frameworks for industrial R&D at the European Synchrotron Radiation Facility”. Anders Ola Karlsson, Research and technology manager at TetraPak Processing systems, Lund, provided an industry perspective.

## Checklist for successful R&D projects

The afternoon was ended with group discussions around the creation of a checklist for successful long-term R&D projects. Here are some of the points discussed:

Have the right person(s) in the right place(s)!

- Motivated and qualified staff
- Competence
- Age structure – ensure continuity
- Team diversity
- Effective networking

Setup a proper project management function!

- Open minded
- Should include a fund raising function
- Dedicated/specialised project management
- Risk analysis
- Plan with Toll gates

Setup the project properly!

- Limit number of partners
- Get commitment of partners
- Ownership defined and clear
- Expectations of industry involvement
- Common understanding
- Mutual benefit
- Objectives and deliverables well defined
- Proper business plan
- Clear responsibilities - good contracts

Other issues to consider:

- Scope
- Awareness
- Business of each other
- Stakeholders
- The fun factor!

“It would be extremely useful to continue the work. Partnerships with industrial partners are needed in order to fulfill the missions of large scale facilities. Experience with other facilities in Europe has shown that establishing of such joint programmes is a long term effort. Keeping the momentum is necessary.”

Christian Vettier, Senior Advisor to the ESS Director-General



Bernard Cabane on joint units.



Discussions about R&D best practice. Photo: Lina Löfmark

# Productive meetings in smaller groups

## A fruitful meeting is created not only by the speakers or the moderators

The preparation of a meeting, including a careful selection of the target groups, topics and speakers is crucial. In addition to this, it has proven fruitful to combine a traditional scientific seminar with options for participants to discuss in smaller groups (matchmaking meetings), for example during lunches or coffee breaks. Table 1 displays different concepts for enhancing the interaction at meetings. All concepts proved to be advantageous compared to traditional seminars/conferences.

Type of interaction	Moderator	Length of match-making meetings	Number of participants in match-making	Target groups	Meetings by Nano Connect Scandinavia
Traditional matchmaking (free booking by participants)	No	30-60 min	2-4	All company representatives and scientists participating in a larger scientific meeting.	Update 2011 Update 2012
Inside Industry Innovation	Yes (2010) No (2011)	2 h	6-15	Selected company representatives with specific "questions" and PhD students / scientists with interest in industry cooperation.	PhD Nano 2010 PhD Nano 2011
Speed dating (free booking, random)	No	10 min	2	Company representatives and scientists participating in smaller scientific meeting.	Nanotechnology for odontology Nanotechnology and medical devices
Custom designed workshops	No	4-6 h	10-20	One company with well defined interests.  Selected scientists with matching competences.	Dyrup and Volvo technology

Table 1: Examples of meetings with enhanced interaction using matchmaking. You find posters to some of these meetings on the center fold of this leaflet.

As a result of PhD Nano, the Update conferences and many other activities, more than 300 matchmaking meetings were organized over the total project period. At these meetings, detailed topics could be discussed in smaller groups (2-10 persons). The primary objective was to create meetings between academia and industry but also industry - industry as well as academia – academia meetings were facilitated. As can be seen from Table 2, nearly the same amount of matchmaking meetings were created between academia and industry as between industry and industry. This indicates that the meeting places organized by Nano Connect Scandinavia were highly attractive to industry.



	Total match-making meetings	Academia - Industry	Industry - Industry	Academia - Academia
PhD Nano 2010	4	4		
PhD Nano 2011	6	6		
Update 2011	99	42	49	8
Update 2012	117	20	91	5
Other match-making meetings	112	48	10	55
<b>Total</b>	<b>338</b>	<b>120</b>	<b>150</b>	<b>68</b>

Table 2: Matchmaking meetings performed in the Nano Connect Scandinavia project activities 2009-2012.

Image from matchmaking at Nano Update 2012.

Connecting people who

**think  
big**

about very

**small  
things**

Chalmers University of Technology  
Halmstad University  
Imego  
Lund University  
Technical University of Denmark  
University of Copenhagen  
University of Gothenburg  
Halland Regional Development Council  
Region Skåne  
Region Västra Götaland  
Region Zealand  
The Capital Region of Denmark

**Nano Connect Scandinavia**

[www.nano-connect.org](http://www.nano-connect.org)