



CHALLENGE INNOVATION





CHALMERS INITIATIVE

– A ROAD TO THE FUTURE

Chalmers Initiative is a long-term strategy for how Chalmers will increase co-operation across boundaries when conducting research and education in order to meet future global challenges and opportunities. The strategy is based on Chalmers playing an active role in social developments and showing the way towards the vision “Chalmers – for a sustainable future”.

Chalmers Initiative comprises a number of development areas of strength across Chalmers’ departments, where profiled research within the area of strength is closely linked to education and collaboration with industry.



ENTERPRISING PRESIDENTS

Chalmers Initiative has highlighted the need for increased co-operation between scientific disciplines, which has proved to be an important preparation when we apply for strategic faculty funds. From the left: Stefan Bengtsson, First Vice President, responsible for the Materials and Bio initiative, John Holmberg, Vice President, responsible for the Systems and Environment initiative, and Anna Dubois, Vice President, responsible for the Industry and Communication initiative.



The initiative seminars and associated workshops have provided students and doctoral students with the opportunity to meet and discuss matters with international researchers. From the left: Regina Ciancio and Johan Börjesson listen to Christian Kisielowski from the National Center for Electron Microscopy, Lawrence Berkeley National Laboratory in California.

NEW INNOVATIVE MEETINGS

Chalmers Initiative is a process for enhancing growth in Chalmers' areas of strength. Chalmers Initiative was launched by the President and is a methodology for identifying opportunities by observing all of Chalmers' activities from different perspectives. Growth in the areas of strength is stimulated by creating incentives and support structures at all levels.

In 2008, Chalmers initiated the process by identifying and developing 5–10 areas of strength with the greatest relevance for growth and competitiveness. There are numerous methods for this. The areas of strength can e.g. be developed through

- collaboration between dynamic competence centres and intra-scientific environments
- co-ordination of Master's programmes in industry-orientated Academies
- graduate schools that open up opportunities for interaction between the various parts of an area of strength
- profiled innovation nodes that are shaped for specific needs within the different areas of strength.

There are currently three perspectives within Chalmers Initiative: Materials and Bio (led by First Vice President Stefan Bengtsson), Systems and Environment (led by Vice President John Holmberg) and Industry and Communication (led by Vice President Anna Dubois). The first word in each pair represents a broad starting point and the second word is a more specific ambition. The perspectives are based on unique knowledge and expertise, and all aspects of Chalmers' activities are affected through them.

The Initiative strategy utilises internal and external synergy effects to support long-term development. Central to the strategy are the meeting places between research, industry and society that Chalmers is providing, and where the students, teachers and researchers interact with and develop their networks and are exposed to the needs of the outside world.

The work during the year has largely been targeted at producing a common view of Chalmers and a shared notion of the University's role in the world. The aim is an even more dynamic operational culture at Chalmers, with an optimum desire for research, education and co-operation. Individuals and groups must enjoy what they are doing and must be able to enter new territory and new situations more easily, where they can use their depth of knowledge in new areas.

CHALMERS AND THE OUTSIDE WORLD

Research around the world is growing and creating new, strong research nations, including in Asia and Latin America. This creates increased competition, as well as new opportunities for collaboration. As a university of technology, Chalmers ought to be able to fulfil an important role in leading and developing new meeting places, organisational forms and types of collaboration that bring together various players from the academic world, industry and society in general. At the same time, the role of the individual researcher is changing, which is placing new demands on existing research organisations as well as on self-reflection among scientists regarding the role they play and how it will change in the future.

The Government's historic research and innovation bill, which was presented in October 2008, contains several components that show strong similarities with the fundamental ideas behind Chalmers Initiative and that support and promote the development that Chalmers has already launched – to reorganise its research in order better to support the development towards a sustainable future. One example is the new concept of multi-disciplinary and inter-disciplinary strategic areas, which will be supported with strategic research funding that universities apply for in competition. The bill's focus is on quality and excellence, while emphasising that research must be of value to Swedish industry. Universities are expected to apply

for strategic funding within their respective areas of strength and the allocation of research funding will be tied to a national responsibility to build up Swedish research within each of these areas to the highest international standard. Explicit strategies regarding how the research is to be carried out in co-operation with companies and other stakeholders in society are to be included in the universities' applications.

The technical solutions of the future must have a clearer focus on the living conditions of people and on the sustainable development of the Earth from a global and long-term perspective. Major changes to the overall infrastructure can probably be anticipated, for example within areas such as energy, transport and building construction. Today's technical solutions must be converted to fit better into the complex interplay between ecological, social and economic systems. Chalmers' activities must be in line with this focus if we are to be entrusted by society to contribute to the future solutions.



A common feature of the initiative seminars are the creative meetings between people from industry, social institutions, researchers, students and the general public. We are particularly proud of having succeeded in attracting many young people to our seminars.

◀ Rebecka Laggren from Sollebrunn School instructs Johan Carlsten and Anna Dubois in the art of building cities in the game Sim City.

INITIATIVE SEMINARS 2008

Initiative seminars form a part of the strategy to promote prominent efforts and new areas of strength. Through the participation of nationally/internationally leading researchers or debaters, an initiative seminar challenges Chalmers and Chalmers' researchers in a new and unconventional way. The seminars must highlight challenges where Chalmers' knowledge can positively contribute to developments towards a sustainable society. During the year, a large number of world-leading researchers have come to Chalmers to present their latest findings in initiative seminars and to meet international colleagues, Chalmers' researchers, students and the outside world.

The seminars will increase Chalmers' visibility and encourage new collaborations within the University and with society, industry and other players and organisations around the world. During 2008, initiative seminars have been held on four subjects, which are described below:

- Development of sustainable urban development
- Visualisation – a global language
- The human factor
- Technology and housing for an ageing society.

DEVELOPMENT OF SUSTAINABLE URBAN DEVELOPMENT

More than half the people of the world live in cities. The majority lack basic quality of life. Acute problems include the lack of accommodation and clean water. At the initiative of the Department of Architecture and the Department of Civil and Environmental Engineering, representatives from society, industry and the academic world met over two days to share experiences and discuss the driving forces for sustainable urban development. With support from international guests, the seminar looked ahead in an important discussion on the future of our children and grandchildren.

During the first day, global challenges were discussed with e.g. the architect Gert

Wingårdh, Larry Toups (senior architect at Nasa) and Marco Keiner (manager of UN-HABITAT, the UN's body for human settlements). Students from Sollebrunn School and the documentary film-maker Bengt Nilsson also participated. The journalist Alexandra Pascalidou was the moderator. On the second day, corresponding issues at a regional level were discussed with representatives from the Passive House Centre, West Sweden Chamber of Commerce and Industry, Region Göteborg, Förvaltnings AB Framtiden and Chalmers.

The international part of the seminar was recorded, and Chalmers' partner universities within the Alliance of Global Sustainability (MIT, ETH and the University of Tokyo) were able to watch the meeting via a webcast. The seminar will serve as a foundation for the building of Chalmers' Urban development node – a meeting place for education, research, innovation and debate.

VISUALISATION – A GLOBAL LANGUAGE

In April 2008, the annual Visual Forum conference was arranged jointly with an initiative seminar. Regional leading-edge expertise from both user and researcher perspectives was presented, together with the latest findings from around the world. Digital visualisation is a powerful tool that helps to make complex issues visible, from the mysteries of science to dreams about the future. Product developers can already test their products virtually, and doctors can perform autopsies without a single incision. Visualisation is a hot topic for both companies and researchers. In the virtual reality, it is possible to cooperate simply and quickly, even over long distances. Visualisation has links to many areas at Chalmers. It is a growth area for the region and provides the potential for the rapid transfer of knowledge, e.g. between the experience industry and research. Visualisation is also an important tool for crossing boundaries within education and for handling complex processes in the sustainable society

of the future. Artists and games developers, product developers and researchers met at the conference, at which 31 speakers from five countries gave presentations within four theme areas: education, marketing, virtual development and virtual worlds.

THE HUMAN FACTOR

Man-machine interaction (MMI), man-computer interaction (MCI), man-machine systems and man-technology systems are terms that describe the area of research in which the interaction between man and technology is studied. This can involve designing the control room in a power station, an aeroplane cockpit or the user interface for a cardio-pulmonary machine, as well as everyday products such as mobile phones, DVD players, microwave ovens and parking meters. The objective is effective, safe and satisfactory design, as well as improved competitiveness.

The seminar attracted many participants from industry and the general public. The organisers were able to welcome around 190 delegates, who had the opportunity to learn more about current research in the field. Representatives from e.g. Saab Microwave Systems, Vattenfall, Volvo Cars, Volvo 3P, the Swedish Rail Administration, Philips and Stena Line met with researchers, teachers and students from Luleå University of Technology, the University of Gothenburg, Linköping University, the School of Engineering at Jönköping University and Chalmers.

TECHNOLOGY AND HOUSING FOR AN AGEING SOCIETY

Sweden is facing a dramatic increase in the proportion of elderly people in the population, which will entail considerable challenges for all parts of society. This requires research and collaboration across many scientific disciplines. The purpose of the seminar was both to highlight how the problematic demography can be handled at the same time as creating good living conditions for people, as well as establishing links and collaboration between the research community, business

and the public sector. The first day of the seminar was open to the general public and dealt with the way elderly residents of Göteborg view their future housing. Day two was targeted at researchers, industry, the public sector and journalists. Questions concerning the ageing society are topical throughout the industrialised world, particularly in Asia.

Professor Junichiro Okata at the University of Tokyo and Professor Jung Shin Choi at The Catholic University of South Korea described the research regarding the situation of the elderly in their respective countries. The areas that were covered at the seminar were health/medicine and food, traffic and transport, housing and construction, as well

as IT and communication. Like everyone else, elderly people want to keep their health, to enjoy as much mobility as possible, and to have good opportunities for communication and social contacts. One important conclusion was that technical solutions that are good for elderly people are usually good for people of all ages.

OTHER CHALMERS INITIATIVES DURING THE YEAR

Many initiatives are taken at Chalmers. Some are large, others smaller, but all with considerable potential for the future. A selection of the initiatives that were developed in 2008 within research and education is presented below. A common feature for all of them is that they represent breadth, multi-disciplinary thinking and approaches, and a tangible utilisation perspective.

“ACADEMIES”

The Chalmers Automotive Academy was established in 2008, based on the insight that many of Chalmers' new Master's programmes are of relevance to the automotive industry in various ways. The concept involves grouping and presenting related programmes from an industry perspective. The concept has become a role model for similar initiatives, and current discussions are aimed at establishing a Chalmers Energy Academy and a Chalmers Academy of Built Environment.

Academies of this type have proven to be able to meet several needs. When the courses are presented by industry, this provides a better overview, both for interested students and for industry representatives. A web portal gathers the range of courses that are relevant for a particular industry. With annual meetings between industry and Chalmers, the feedback becomes more effective and the potential to meet external needs increases.

The structure effectively broadens the students' contacts with industry and creates more opportunities for work-life integrated learning, study visits, projects and degree projects. For industry, this becomes an arena for more efficient recruitment and information about Chalmers' educational programmes. For Chalmers, it facilitates student recruitment by clarifying potential career paths. An academy is primarily an arena for education, although it also helps to demonstrate the education's links to research as well as the research's industrial relevance.

EDUCATIONAL LIFT

Chalmers has responded to external needs within the educational field through rapid responses both to an invitation from the National Agency for Education regarding continuing professional development for teachers (the Boost for Teachers), as well as to how Chalmers can help in the sudden crisis in the automotive industry that is severely affecting Western Sweden (the Boost for Engineers).

THE BOOST FOR TEACHERS

The Government has decided to invest SEK 3.6 billion over four years in order for 30,000 compulsory nine-year and upper secondary teachers to have the opportunity to continue their professional development at universities and university colleges. The investment is being organised by the National Agency for Education and is called the “Boost for Teach-

ers”. Chalmers has granted funding for two areas: Chemical and biological engineering and the Meeting between architecture and engineering. The training is provided part-time as a mixture of distance and campus education, so that it fits in with the teachers' regular schoolwork.

The first module, 15 higher education credits, is common to both focus areas and was carried out during the autumn of 2008. This module emphasises various perspectives on just what is considered to be sustainable development, along with the challenges facing mankind. These include climate issues, for example, and a broad systems approach permeates the course to make it solution-oriented. Together, the participants' combined skills and experiences will be utilised to generate educational methods and tools that can develop the forms of teaching.

To date, relatively few school teachers have applied to the courses arranged within the Boost for Teachers. Nine teachers have attended Chalmers' two courses in the first round. For Chalmers, however, it is important to establish itself as a player for the Swedish school system. In the long term, all those who have attended continuing professional development will become a type of ambassador for Chalmers and for technology's potential to contribute to a sustainable world.

During the year, Chalmers has decided to establish a Learning Centre for Sustainable Development in Engineering Sciences, with Associate Professor Magdalena Svanström



Chalmers' vision guided the choice

Guoquo Lui from China came to Sweden in 2007, inspired by a friend who had studied at KTH in Stockholm. Chalmers' sustainable development profile led her to choose Göteborg and the Master's programme Design and Construction Project Management.

“I think that Chalmers is an excellent university with a great international network. For example, I have come into contact with the Alliance of Global Sustainability, AGS, when I attended a conference in Zürich. At one of the Chalmers Initiative seminars I was able to give a brief address about how construction prior to Shanghai Expo 2010 is being targeted at sustainable building. This is a new trend in China, where there is growing interest in demonstrating that you care about the environment,” explains Guoquo.

◀ Guoquo Lui, Master's student from China.

working part-time as director. The Boost for Teachers courses will become an important component in this Centre, which will get going in earnest during 2009.

THE BOOST FOR ENGINEERS

When the crisis in the automotive industry took hold during the autumn, Chalmers was able to use new and supplementary resources to offer a comprehensive knowledge lift to many affected individuals and companies and the region as a whole. By announcing the "Boost for Engineers", a differentiated range of courses is being provided with varying goals that build on the individual's knowledge and level of education. A specially designed engineering preparatory semester is targeted at a large proportion of those who were given notice/released, as it only requires upper secondary education. The preparatory semester focuses on electronics and computer science, and offers a guaranteed place on the engineering programme in these disciplines.

Other particular opportunities within the Boost for Engineers are the supplementing of a previous engineering education with a modern Master's degree, as well as allowing individuals who have started work without completing their undergraduate studies (architectural or engineering programmes) to utilise the economic situation to complete their degrees with an individual plan.

Chalmers has also made preparations to establish a graduate school for sustainable and efficient transport. This could make a strong contribution towards a reorganisation of vehicle and transportation systems, as well as towards the development of the automotive industry and its links to the energy system and other related areas.

In total, almost a thousand people can be provided with education through the various components within the Boost for Engineers.

ALTERNATIVE FUELS

Questions are being asked by industry, politicians and consumers regarding the benefits of various fuels from efficiency and climate perspectives, as well as how the various alternatives can be ranked. It is also interesting

to know what fuels could become financially interesting under various conditions in the short and long term.

In order to answer these questions, it is necessary to compile and evaluate information and research results. Sweden has numerous strong research environments that are working in various ways on the production of alternative fuels. A large number of research projects are in progress aimed at developing processes and technology or studying system consequences, all at various levels. The problem is that they often work independently of each other.

In accordance with the initiative idea, Chalmers and other players have prepared a national knowledge centre for alternative fuels. The establishment is based on dialogue and active collaboration with all of Sweden's robust research environments and other interested parties that are active in the field. Dialogue is in progress with:

- universities and research groups, including pilot facilities for e.g. ethanol production, black liquor gasification and the gasification of biomass for fuel
- important industrial stakeholders within fuel production, such as the process industry, energy companies, the forestry industry, the transport industry and suppliers of process equipment
- robust consultancy environments that are involved in e.g. technical development, planning of facilities and strategic planning
- authorities within the fields of energy and the environment that are responsible for research and development, the design of controls, infrastructure issues and climate strategies.

SYSTEMS BIOLOGY

Systems biology is a new approach within biology and medicine that is awakening the hope of developing new drugs, medical treatments, food products and innovative biotechnology processes for e.g. biofuels. Systems biology has a holistic perspective of biology, studying entire systems of interactions between molecules, genes, cells and organs, instead of looking at separate components or individual interactions. Enormous amounts of data have to be collected, and the research

requires new, experimental methods, mathematical models and computer simulations that can handle the complexity. Systems biology is multi-disciplinary to a high degree and is based on perspectives and expertise from both engineering and natural sciences.

In conjunction with the midway-point evaluation of Chalmers' bio-investment, systems biology was identified as a new, exciting research area with considerable social relevance and where Chalmers, along with the University of Gothenburg, was uniquely suited to play a leading role. During 2006, the Chalmers Biocentre launched an initiative that received funding from the Wallenberg Foundation and the Chalmers Foundation. This made it possible to establish four new inter-disciplinary professorships at Chalmers as a scientific base for the investment and as nodes in the collaboration within and outside of the University. The initiative was consolidated in October 2008, when Chalmers established a centre for systems biology. The Centre now hosts some twenty research groups in Göteborg and aims to be an open meeting place for people from the academic world, institutes and industry.

NEW INVESTMENT IN MEDICAL ENGINEERING

Recent studies show that the important medical engineering industry in Sweden needs new ideas and proposals for bold projects. During 2008, the initiative was therefore taken to create a new medical engineering centre for western Sweden, MedTech West, which will promote multi-disciplinary co-operation between doctors, engineers and molecular biologists. The objective is improved conditions for research, development and innovations within the field of medical engineering, through increased collaboration between the academic world, medicine and industry. The partners involved in MedTech West are Chalmers, the University of Gothenburg, the University of Borås, the Sahlgrenska University Hospital and Region Västra Götaland. Within the framework of the investment, four new research positions will be funded during the period 2009–2011.



NEW MEDICAL ENGINEERING CENTRE

"MedTech West will develop into a dynamic and internationally competitive research and innovation environment in Western Sweden. This is an important area for growth and welfare in Sweden, and the environment will attract excellent researchers, doctors and engineers. We also anticipate being able to win major national and international research grants," says Olle Larkö, Dean at the Sahlgrenska Academy.

Photo: Magnus Gotander/Bilduppdraget.



SYSTEMS BIOLOGY

"If we can learn more about nature's ingenious technology and biology's wiring charts, we can change today's industrial processes and create new ones. The more we understand about why a disease arises, how a micro-organism breaks down pollutants in nature or how information from the surrounding environment is spread through a cell, the more skillfully we can utilise biology to benefit people. In the future, this new biology will revolutionise most of our current industries," states Catharina Hiort, co-ordinator for the Materials and Bio initiative.



VISUALISATION - A GLOBAL LANGUAGE

"Visualisation is gaining an increasingly important role in knowledge transfer and communication within and between organisations and individuals. It is a growth area that will become extremely important within research, development, experiences, employment and the transfer of knowledge. It is therefore clearly in line with Business Region Göteborg's overall goal, which is to contribute to economically sustainable growth, high employment and a differentiated business sector in the Göteborg region," says Lennart Olausson, MD of Business Region Göteborg.

Photo: Parasol.