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Understand, explain, improve

THEMATIC COLLABORATIONS | LUND UNIVERSITY





Understand, explain, improve

Significant societal challenges within our health, our environment and our society have made it increasingly important for universities, together with surrounding stakeholders, to explore new solutions. Lund University has a unique opportunity to contribute with its research and education.

For a long time, the University has had many collaborations enabling utilisation of its knowledge and its own development through tight interaction in dialogue with societal stakeholders. Extensive subject knowledge serves as a foundation – and it is this breadth, specifically, that is the University's greatest strength. Through this, we can participate in multifaceted collaboration around the distinct challenges of today, which demand significant subject expertise to find solutions.

To create incentives to collaborate, stimulate and facilitate forms of collaboration and new interdisciplinary collaborations within and outside the University, we have launched special thematic collaboration initiatives through competitive calls for funding. These bring researchers together from at least three faculties and at least one external partner in new initiatives focused on future challenges. The investment of close to SEK 60 million is significant. The initiatives facilitate conditions, not just for collaborations, but also for the University to have a joint focus.

On the following pages, there are descriptions of the sixteen initiatives that are launched. We have great hopes that these collaboration initiatives will collectively work with the University's aim to understand, explain and improve our world and the human condition.

Bo Ahrén

Pro Vice-Chancellor with special responsibility
for external engagement at Lund University

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AI impacts on all of society: from healthcare to deepfakes

From self-driving cars to more accurate medical diagnoses, digital home assistants and faster online searches. The development of artificial intelligence, AI, has exploded in the past decade.



Kalle Åström, professor of mathematics at Lund University and one of the initiators of Artificial Intelligence and Machine Learning, AI Lund.

However, the new technology is also behind phenomena such as the so-called deepfakes and fake electronic accounts that threaten both legal security and democracy in the modern platform society. Are we facing a technical revolution or will the robots take over the world?

“It is a risk that should be taken seriously”, says Kalle Åström, professor of mathematics and one of the initiators of the open network for artificial intelligence and machine learning, AI Lund, at Lund University, but points out that he does not see it as a threat in the near future. The opportunities offered by the technology hopefully outweigh the risks.

MANY DIFFERENT RESEARCH AREAS

Artificial intelligence spans many different research areas. In simple terms, it concerns electronic systems, e.g. a computer or machine that demonstrates intelligence or human abilities – an ability to draw conclusions, solve problems, plan and be self-learning. Research on AI takes place on many fronts, e.g. in mathematics, statistics, numerical optimisation, computer science, automatic control engineering and others, including biomedical engineering and computational linguistics. In other words, it is a very broad area.

“AI has developed in waves since the 1940s”, explains Kalle Åström. “During World War II, when Alan Turing started building what turned out to be one of the first computers, he did not use the term artificial intelligence, but he did have ideas on what machines were going to be able to achieve.”

LITTLE INTEREST DURING AI WINTERS

In the 1950s and 1960s, the interest in artificial intelligence escalated, and then emerged as its own area of research. However, the high expectations were not fulfilled and research came to a halt.

“When the hype around AI waned, it became the start of the first of the two so-called AI winters”, explains Kalle Åström. “There was little interest in wider society at the time and not much funding was allocated to the research. The first winter lasted from 1974 to 1980 and the second between 1987 and 1993.”

However, despite the fact that there was little research on AI during this time, other advances were made in technology and our computers have gradually become better and better, which has enabled the fast development we are seeing today.

“The initial impetus came sometime around 2012, when we started seeing much better results, for example in image recognition”, says Kalle Åström.

AI – ALMOST EVERYWHERE IN OUR DAILY LIVES

Specifically image recognition, which is Åström's own area of research, has many areas of use, not least in healthcare where it can contribute to better and more accurate medical diagnoses. For example, with the help of AI it would be possible to analyse an image of a skin spot and determine whether it was dangerous or not.

Different kinds of artificial intelligence are already in use today:

in our mobiles, when we use online search engines, language services and digital home assistants such as Google Home.

Kalle Åström believes that artificial intelligence, in different forms, will become a tool and a component almost everywhere in our daily lives.

IMPORTANT TO REVIEW THE DEVELOPMENT FROM SEVERAL PERSPECTIVES

Significant changes in society are almost always accompanied by risks, which can be difficult to predict, even if the changes ultimately lead to something positive. The fact that the development and implementation of AI is taking place so quickly, is a risk in itself, says Kalle Åström.

“When many things happen at once, there is a lot that can go wrong”, he explains. “Things that we do not get right in society from the beginning can have unforeseeable consequences. That is why it is important to review the development from several perspectives.”

For example, what will happen to professional drivers when we get self-driving cars? How will the welfare state be affected by the fact that more activities are automated and depend more on AI components than human expertise? And how will the concept of legal security be affected if it becomes impossible to determine if a film clip is real or not? The ‘deepfake’ phenomenon, in which AI technology is used to manipulate film is an increasingly topical problem. For example, politicians or other celebrities may appear to say or do almost anything without there being any truth behind the clip.

“We have grown accustomed to being able to trust certain types of information”, says Kalle Åström. “However, with the new technology comes the need for us to learn to make a new kind of assessment when it comes to things such as films, images and sound recordings. This is something we will need to take a position on.”

REQUIRES BOTH BREADTH AND DEPTH

However, to not welcome change also has its risks, says Kalle Åström.

To take advantage of the opportunities and handle the complexity of the discipline and how it affects society requires expertise within many different areas – not just in science and different branches of engineering, but also within the humanities, social sciences, law and economics, among others.

“It requires both breadth and depth”, says Kalle Åström who says that this is one of Lund University's strengths.

Within the open network, Kalle Åström hopes there will be increased contact between several different faculties and that collaboration will generate favourable research environments – for example, one ambition is to create an interdisciplinary graduate school and also create an AI laboratory and so-called maker space for students in which they are given scope to experiment and create new innovations.

Text: Catrin Jakobsson

Photo: Kennet Ruona, Shutterstock

“ With the new technology comes the need for us to learn to make a new kind of assessment when it comes to things such as films, images and sound recordings.





On high altitude

► Drone technology is already transforming our world in a myriad ways. In Rwanda, they are used to deliver blood to hospitals in the countryside, thereby saving hundreds of lives a year. And in the field of agriculture, drones measure the height of crops and detect the temperature of water. But more research into how drones could, and should, be used is needed as the new technology is developing fast.



“ Drones are a tool
to expand
the imagination.



Nicoló Dell'Unto, archeologist at Lund University and coordinator for The Future of Drones: technologies, applications, risks and ethics.

Drones are a tool to expand the imagination. Their uses stretch the boundaries of research as we know it. But at the moment we do not have the framework to fit the development”, says Nicolás Dell’Unto, archeologist at Lund University and coordinator for The Future of Drones: technologies, applications, risks and ethics.

He explains that there are currently two frontiers in drone technology. One is centred on what you can do with drones; and in this area the field is almost uncharted as more and more sectors and researchers are starting to look into ways of using the technology. The other one is focusing on rules and regulations.

“These two things go hand in hand. Rules and regulations will set limits on how we can use drones and remote sensing technology.

THE AIRSPACE

One such framework, and an area that the research collaboration group, will investigate, is the U-space. The U-space occupies the airspace beneath the fly zones in the European Union. Today, this space is uncolonised, and is not formally owned by neither nation states nor private property owners.

“Who can fly over this space? Will it be up to residents to decide over the air above their house, or the nation state? Depending on how you decide to regulate, it will impact on where drones can fly and deliver goods and services.”

NEW TECHNOLOGY – NEW CONSIDERATIONS

There are also current regulations and ethical considerations to take into account as the new technology is developing. As a general rule, photography from a drone in Sweden is not allowed if it could be seen as violating for the person that has been photographed or filmed – which means that it can be difficult to film on people’s property. Many people would also feel unease at being surveilled by driverless drones.

Another issue is that of accountability, who is responsible if a drone accidentally hurt or injures a person or someone’s house?

The technological limits of drone technology are almost endless, on the other hand. Examples of things you can already do include using drones to assess water quality, track and map wild fires, assess the health of plants and take air quality readings. In the field of archeology, laser scanners mounted on drones can be used to digitally remove forests and vegetation to identify new archeological sites without digging. And the list of usages is growing fast.

MULTITUDE OF WAYS

Nicoló Dell’Unto explains that reason why drones can be used in such a multitude of ways is that they can fly very low and carry a range of different equipment such as high resolution cameras, instruments for remote sensing, heat sensors and multispectral instruments. This makes it easy for drones to collect different data at a very high resolution.

ORGANISING TARGETED ACTIVITIES

The research project’s aim is to explore both how drones can be used to address societal challenges and related frameworks and regulations. They will do so by organising targeted activities together with industry, authorities and interested researchers. As part of the work, researchers from different fields will try out new technology developed by participating companies. The companies are at the forefront of using drones in Skåne.

“The private sectors is vital to push the field forward. They can tell us what society wants, and that is an immediate advantage. By working collaboratively, we can be part of a creative endeavor and together explore the many issues surrounding how drones could and should be used”, he concludes.

Text: Noomi Egan

Photo: Kennet Ruona, Shutterstock





“ Who can fly over this space?
Will it be up to residents to
decide over the air above their
house, or the nation state?



Lizette Gradén, researcher in ethnology at Lund University and coordinator of the collaboration initiative Heritages of Migration and Mobility in a Democratic and Inclusive Society.

Cultural heritage as a meeting place or border guard

► Can we understand cultural heritage in new ways if we view migration and mobility as part of our joint heritage? Can cultural heritage issues create new meeting places and in what way do they act as border guards? A new collaboration initiative at Lund University is investigating the role of cultural heritage in society.

Paradoxically, today there is probably an idea of cultural heritage as being something that is fixed and permanent, despite the fact that mobility and migration, are increasingly being seen as part of the cultural heritage of today”, says Lizette Gradén, researcher in ethnology at Lund University and coordinator of the collaboration initiative Heritages of Migration and Mobility in a Democratic and Inclusive Society.

Cultural heritage is often associated with phenomena of cultural and historical value; material things such as objects, buildings and monuments, or intangible expressions such as music, traditions or food from a particular place.

NEW OPPORTUNITIES

Within the collaboration initiative, cultural heritage is seen as an opportunity to identify how different actors attach different cultural meaning related to migration and mobility to the term. What is seen as cultural heritage can therefore be renegotiated and change over time.

The initiative is based on the government bill from 2017 “Cultural heritage policy for a Sweden that stands together” – a text that describes the growth of the area of cultural heritage in Sweden and identifies a series of societal changes that have led to cultural heritage issues becoming more pressing than previously. One of the social challenges is migration.

“Migration changes the role of cultural heritage in society. And it places demands on the universities and other actors to research cultural heritage based on mobility and relocation”, says Lizette Gradén.

MULTIFACETED IMAGE

The collaboration initiative brings together researchers from Lund University and staff working at the Regional Museum in Kristianstad, Kulturen in Lund and the Museum of Movements in Malmö. In addition to these, the collaboration initiative also works with cultural institutions in the US – where the view of cultural heritage is more dynamic than in Sweden, and cultural policy is constantly being negotiated. In the US, the cultural heritage of different groups is given room and it is normal, for example, for ethnic groups to establish their own museums and meeting places. At the same time, ethnic cultural heritage is strongly associated with a sense of American citizenship and becomes, in a way, part of the joint heritage. It becomes a multifaceted image.

“We all know migration is not a new phenomenon, however, in recent years the idea of freedom of movement within Europe has come to a head. In Sweden, many people have reported that it can be hard to be both Swedish and an immigrant, to be able to identify yourself with different groups at the same time. A person’s expe-

riences and cultural heritage do not become a building block in a joint new sense of community in the same way as it does in the US”, says Lizette Gradén.

SOFT POWER

She says that a discussion on what cultural heritage is and what it could be is especially important since cultural heritage can be likened to soft power. The actors privileged to define cultural heritage, and decide what is worth preserving, also affect how we will live in the future. This is why discussions are needed on the role cultural heritage can play as a force for understanding and meetings.

SIGNIFICANT SOCIAL RELEVANCE

The discussions have significant social relevance, says Lizette Gradén, given that today’s society is defined by extensive migration across national borders and mobility within borders. At the same time, there is increased support for nationalistic tendencies in Sweden and Europe; political parties that often protect what they identify as the country’s cultural heritage and are scared of traditions and customs being lost.

“However, the creation of cultural heritage has always been about selecting and discarding. Take folk costumes for instance, when the museums started collecting them in the 1800s the most commonly selected were those that were the most beautiful and grand and those are the collections we associate with textile cultural heritage today”, says Lizette Gradén.

INTANGIBLE CULTURAL HERITAGE

The collaboration initiative will, among other things, work with intangible cultural heritage that sometimes connects people in other ways than the material one. The museums in the collaboration initiative report that many newly arrived immigrants do not have many cultural belongings with them, particularly if they have fled from situations of conflict. Researchers in Lund will work together with the museums in the region to support them in their work.

“Cultural heritage can become a meeting place to highlight both similarities and differences. People are brought together by difficult experiences of loss but also by positive aspects such as a common passion for e.g. music, theatre, tastes, cooking, art or other traditions. And in this way initiate a larger discussion around a multifaceted and shared cultural heritage – as well as how it is preserved and made relevant for future generations”, concludes Lizette Gradén.

Text: Noomi Egan

Photo: Bodil Malmström, Shutterstock

“ The creation of cultural heritage has always been about selecting and discarding.



Sweden's ambition: to be best in the world at eHealth

► Digital health and welfare transforms society and our way of living. We can access care from 'digital doctors', read our medical history online and track our wellbeing through apps on our mobile telephones. eHealth provides us with many new possibilities, but is the technology development in line with the times? Are we on the right path?



Gudbjörg Erlingsdóttir, associate professor in work environment engineering at the Faculty of Engineering and coordinator of Lund University's collaboration initiative on eHealth.

“A few years ago there was a lot of talk about eHealth, but now things are really starting to happen. So, we are on the right path but we are yet to reach our destination”, says Guðbjörg Erlingsdóttir, associate professor in work environment engineering at the Faculty of Engineering and coordinator of Lund University’s collaboration initiative on eHealth.

BEST AT EHEALTH 2025

Our ‘destination’ is 2025 when Sweden, according to the government’s ‘Vision on eHealth 2025’, is to be best in the world at eHealth. One way of being the best, according to Guðbjörg Erlingsdóttir, is to collaborate more – across disciplines and professional borders.

The collaboration platform on eHealth was established in 2017 to approach eHealth from different perspectives, experiences and expertise. The platform aims to contribute to a positive and sustainable digital development of health and welfare, and to address eHealth challenges with a broad approach.

“How are citizens and patients of the new technology affected? How does the digitalisation of the work environment change the healthcare profession? Do legislation and new technology go hand in hand? How can the technology developers test their products? And what happens with all the data – is eHealth safe? Guðbjörg Erlingsdóttir mentions a few of the challenges that the collaboration platform tackles, with the hope of discovering sustainable solutions – for both society and the individual.

DISSEMINATING KNOWLEDGE IS ONE OF THE TASKS

Researchers, health care professionals, authorities, politicians, municipalities, technology developers and business come together on the platform. Guðbjörg Erlingsdóttir describes the collaboration initiative on eHealth as a meeting place for everyone who wishes to contribute knowledge to the digitalisation of healthcare.

And, it is specifically the aspect of knowledge that is an important part of the work on the platform – both its formation and its dissemination.

“The network can be seen as a bank to gather insight and knowledge for the sustainable development of digital health and welfare. Challenges such as the procurement

of eHealth systems, the use of AI and the implementation of electronic medical record systems require a deep delving into the knowledge bank. They are difficult issues that we need to consider from many different angles”, says Guðbjörg Erlingsdóttir.

EHEALTH SERVICES AND WORK ENVIRONMENT

As an eHealth researcher specialising in work environment, Guðbjörg Erlingsdóttir personally contributes to the collaboration platform with knowledge of how digitalisation affects the work environment of users – aspects that eHealth technology does not normally address.

“Digital support systems can be a way to facilitate and improve the work environment through domestic healthcare and assistance”, says Guðbjörg Erlingsdóttir, who adds that one of the research projects being conducted by members of the collaboration platform on eHealth asked in-home nurses and in-home assistance staff to write wish lists for digital services they would most like to use in their work.

On the lists were a comprehensive, easily accessed and updated list of medications, a single system for ordering supplies, a better system for information sharing and electronic delegation.

“For a better understanding of how digitalisation affects work and the work environment, healthcare staff should be involved early on in the development of new eHealth services. In that way we can learn more about what works, and organisations and staff will be better prepared for a digital work environment.”

INTERNATIONALISATION NEXT ON THE LIST

In the future, Guðbjörg Erlingsdóttir is looking forward to broadening and specialising the network’s international contacts to follow the development of eHealth in other countries as well.

“Many research teams in other countries are working in similar ways with collaboration in both the public and private sectors and, in addition to learning from interesting experiences, the international exchange can inspire new joint areas of interest and projects”, says Guðbjörg Erlingsdóttir.

Text: Jessika Sellergren

Photo: Kennet Ruona, Shutterstock

A close-up photograph showing a healthcare worker in blue scrubs holding the hand of an elderly patient sitting in a wheelchair. The worker's hand is gently gripping the patient's hand, which is resting on the wheelchair's frame. The patient's hand is wrinkled and aged. The background is blurred, showing the blue fabric of the wheelchair and the patient's clothing.

“ For a better understanding of how digitalisation affects work and the work environment, healthcare staff should be involved early on in the development of new eHealth services.





Making room for later life

► **We are growing older in Sweden and longer lifespans are often positive as more active years are added. However, not everyone's latter years are filled with grandchildren, golf and long holidays in Portugal. Older adults need good housing to grow old in, no matter their health status. The thematic collaboration initiative A Social Rights and Social Policy Perspective on Housing for the Ageing Population wants to make an impact on future housing policies and housing.**

"When we stop working, our homes become an important arena upon which our entire lives are based", says Susanne Iwarsson, professor in gerontology and care for older people and coordinator of the initiative. "And there is a lot of research showing that how we live has an impact on our health. Depression is more common among those who cannot get out and about and if you cannot do enough physical exercise there can be medical consequences."

The municipality has an overall responsibility for planning the housing supply. Everyone should be able to live in good quality housing. When it comes to the older adults, the principle of continuing to live at home has had direct consequences on housing policies. On the one hand, the municipality would like to enable aging residents to continue to live at home, within the ordinary housing stock while; on the other hand, there are not enough suitable housing options on the housing market. Currently, there are only 13 % of people over 80 years of age in special housing for older adults and people with physical or mental disabilities. The question is the kind and number of assisted living options or other housing options that will be required in the future?

"It is an outrage that we still do not have a housing stock that matches our population", states Susanne Iwarsson emphatically. "It is simply not on the cards for the municipality to build enough special housing for the entire older population."

WEAK COLLABORATION

Susanne Iwarsson and her research colleagues want to reduce the 'silo mentality' that separates the social planning of health and welfare and the best way for the construction sector and housing market to create suitable housing for the aging population. In practice, the collaboration between the sectors is weak.

Through the thematic collaboration initiative the researchers want to get decision makers to understand that investment is not only required in staff who deliver traditional care. Investment is also required in staff who have expertise to be able to contribute to the transfer of research-based knowledge within medicine, health,

technology, law and architecture to practical activities, primarily within the municipalities. All in order for older adults to be able to age actively and positively and live in ordinary housing stock more so than is possible today.

"There are not many politicians who speak with an understanding of knowledge transfer", says Susanne Iwarsson. "It is common for them to act reactively to fix the issues within the care sector – there is a lack of understanding of the bigger picture. Preventative actions are unusual, maybe due to the fact that the benefits are only seen in the longer term."

"Sweden is one of the countries with the highest standards of housing in the world; however, we have distinct problems relating to social rights. Loneliness, alienation, insecurity and poverty are a few examples."

NO LONGEVITY

Susanne Iwarsson is critical of the fact that for many years and without any follow-up of the effects, the government has invested millions on incentive funding to municipalities and counties.

"There are good examples of projects with interesting angles of approach, however, when the project funds run out the conditions are such that it is not possible to benefit from the knowledge that was being created. There is no longevity in short-sighted investments."

SEVERAL PARTNERS ARE REQUIRED

Within the new collaboration initiative there are many partners. A couple are public housing companies – Karlshamnshörsbostäder AB and Österlenhem AB. In Karlshamn there is a joint research project already underway. As part of the project an app is being tested that is used to reliably assess how accessible all homes actually are. How the stairs are built, is there a lift and where in the apartment are there narrow passages? Maintenance staff are trained by the researchers to be able to carry out this mapping so that the housing company receives a detailed overview. In this way, they receive informed decision support when they are going to renovate or offer different kinds of apartments to people seeking housing.



“When we stop working, our homes become an important arena upon which our entire lives are based”, says Susanne Iwarsson, professor in gerontology and care for older people and coordinator of the initiative.

Another partner is Helsingborg Municipality that wants to contribute the knowledge it has from contact with senior citizens living in ordinary and special housing.

Marina Asplund, process developer at Omsorg Helsingborg care services, wants to ensure that the options for how we can live in the final season of life are not so limited. Many feel forced to move to different kinds of special housing despite wanting to remain at home.

“I have a wish to see aging take place in society and to not be so discriminated against. If you are 45 and have some kind of disability you are compared with others of the same age who are healthy and active. However, if you are 75 and frail you are compared with other older adults who are ill. Older adults are not a homogenous group despite often being treated as such.”

Marina Asplund believes an increased digitalisation in home environments makes things easier for those in need of care as well as for staff. Night cameras, security camer-

as or reminders if staff have forgotten anything. Greater access to digital aids would create a more individualised home environment where it is possible to remain at home and feel secure longer.

GOAL – TO LIVE A POSITIVE LIFE

For 25 years Susanne Iwarsson has developed a deep understanding of the health of older adults and sees housing for ageing population as a great challenge for society. Her grandmother inspired her to become an occupational therapist and then to conduct research:

“I grew up with a grandmother who was severely disabled by MS but it did not stop her from being very independent. I want to contribute to people being able to live positive lives, despite diseases and disabilities.”

Text: Bodil Malmström

Photo: Johan Bävman, Kennet Ruona

Getting it right this time: circular biobased economy

► It has never been clearer that we must make drastic and global changes in how we treat the planet to stop our consumption from having catastrophic consequences in the future. Among other things, we need to stop depending on fossil raw materials and instead move toward a circular biobased economy.



“Today’s society is, for the most part, built on fossil raw materials”, says Josefin Ahlqvist as coordinator for the thematic collaboration initiative Circular Biobased Economy and goes on to say, “The fossil raw materials we use are admittedly also biological but they are precisely fossil, that is to say, it has taken millions of years for them to form. When we burn carbon and oil we release lots of carbon dioxide into the atmosphere and this accelerates global warming. We are also using them much too quickly and it is only a question of time before they run out. It is simply not sustainable.”

EXPLOIT BIOLOGICAL AND RENEWABLE STARTING MATERIALS

Josefin Ahlqvist says we are facing two main questions in this issue; fossil raw materials are going to run out and we have to stop burning them so as not to destroy the climate.

“What we mean by a circular biobased economy is that instead of using fossil raw materials we should exploit biological and renewable starting materials”, she says and explains it is not just vehicle fuels but also materials such as plastic.

“The idea behind a bio-economy is that we should consistently use renewable biobased raw materials for everything”, says Josefin Ahlqvist who adds that we should also strive for the use of renewable energy in the form of solar cells, wind and hydro energy, as well as other environmentally-friendly energy sources.

Biological material can come from many different sources: agricultural products, forest material, abattoir waste, compost heaps, seaweed from the ocean and so forth – any biological material you can regenerate in a reasonable period of time.



Josefin Ahlqvist, coordinator.

CONSIDER THE ENTIRE LIFE CYCLE

The circular way of thinking should permeate all of society. It also means we should use the resources we already have as efficiently as possible and place emphasis on recycling. Not least of metals. Josefin Ahlqvist raises the shipping industry as a good example in that it is common to repair and restore ships to a great extent before the decision is made to produce new ones. She says it must become an established practice to consider the entire life cycle before creating new products and materials.

“We must think circularly from the beginning – getting it right this time!”

In order to create new chemicals, materials and biofuels a lot of scientific detective work and research is required to find the right starting materials to arrive at the processes which make it possible to extract the structures and molecules which we need to replace the fossil raw materials.

“The hope is to be able to create so-called bio-refineries where, just like in an oil refinery, several different products can be extracted in several different steps”, says Josefin Ahlqvist.

BACTERIA LEND A HAND

In Lund researchers are working on discovering new methods to convert biomass into usable components. Among other things, they use bacteria which can help break down large molecules as well as being able to produce other valuable molecules and biofuels.

The researchers also use enzymes, which are proteins acting as biological catalysts. Biocatalysis and other methods are used, for example, in a current project where researchers are working on finding new uses of the lignin – one of the main components of forest biomass. Lignin is a by-product from the pulp and paper industries, and is today mainly used as an on-site fuel. However, lignin could potentially be used for production of many valuable products, such as bioplastics, through new routes of depolymerization and conversion using microbes. This would be good not just for the environment but it is also a way to strengthen the forest industry.

“This is an important aspect”, emphasises Josefin Ahlqvist, who explains that if we are going to be able to carry out the necessary and society-wide changes required for a sustainable development, industry needs to be included as a driving force.

MANY EXPERTS REQUIRED

The switch to a circular biobased economy comprises every aspect of society. In other words, experts from many different fields are required to cover all the different angles of approach which the changes and adjustments carry with them. The area is very interdisciplinary. Many experts are required, everyone from chemists, engineers, biologists and ecologists to toxicologists who in the early

stages can see the advantages and possibilities, conduct risk analyses and predict problems with the new materials produced. And the new technologies mean there is also great demand for experts in economical, political and social sciences.

“Lund is unique in that we have great access to so many different researchers with different backgrounds and expertise right from basic research right through to product development”, concludes Josefin Ahlqvist.

Text: Catrin Jakobsson

Photo: Shutterstock



“ Biological materials can come from many different sources: agricultural products are one of the rich sources.

Speaking the unspoken – on the increasingly important role of audio description





Is it possible for people who have never seen to create mental images? With the help of audio description, a certain mood, a particular light or an interesting gesture in a film is conveyed to the visually impaired.

An old cup, an upholstered chair and flowery wallpaper in a classic 1800s kitchen. How do you describe it to a person who cannot see and has no concept of what an old kitchen might look like? Audio description has grown in recent years and is available for a large proportion of Sweden's population; however, more research is needed to fill in the gaps in knowledge that still exist.

Is it possible for people who have never seen the world to nevertheless create mental images? And how can the interpreter, i.e. the audio describer, convey a film sequence containing a particular atmosphere through description of environments, actors, gestures and lighting.

Audio description is a complex mediating activity that should preferably be personal, objective, customised and fast. The audio describer has to decide what is relevant in the particular moment in the film, theatre production or exhibition. All in order for the visually impaired or blind audiences to receive an improved and richer understanding of what is happening.

YOUNG FIELD OF RESEARCH

Audio description is a young field of research in which Sweden has come a long way in the international context.

Jana Holsanova is associate professor in cognitive science and coordinator of the thematic collaboration initiative Audio Description for Accessible Communication. She and her research colleagues have the goal to investigate audio description processes – what the audio describers do and how audio description is received by the end users. The researchers also aim to further develop the audio description training programme that has been available since 2011 and which admits nine people annually.

EXCITING CONNECTIONS

Research in audio description reveals interesting connections between language, communication and thinking and is an exciting subject for cognitive research.

“Our research, which focuses on cognitive aspects and receiver perspective, has a unique position internationally. Among other things, this research will result in guidelines for creating audio description so that people with visual impairment get the most out of it.”

The thematic collaboration initiative includes a broad lineup of researchers from different areas: psychology, medicine, linguistics, speech pathology and cognitive science.

“With our combined expertise we are able to research exciting topics concerning what happens in the brain when we process information and segment events – in both the blind and the sighted”, explains Jana Holsanova, who continues:

“By using advanced methods, we can, for example, study which areas of the brain are activated when the sighted watch a scene from a film and when the blind listen to an audio description of the same scene. What happens in the brain when people try to imagine what is happening?”

This kind of research could help audio describers to gain even better tools for helping the end users to get a better experience of different environments and interaction between people. What is the best way to describe a wry smile, a feeling or how people touch each other?

DIFFERENT KINDS OF AUDIO DESCRIPTION

However, who becomes an audio describer? It is a motley crew of editors, actors, speech pathologists, educators and culturally interested people. Some of them have someone in their proximity who is visually impaired.

Audio description may take place in many different ways. In cinemas, a visually impaired person may be given a receiver with which it is possible to tune in to channels for films and audio description that takes place live from an undisturbed area. In these cases, the audio describer needs to have seen the film several times to be able to analyse how best to describe different sequences. There are also apps available that are synchronised to the film in different ways if a visually impaired person wishes to watch a film in another person's home. There are also museums and theatres that offer audio description.

“I attended a children's theatre performance where audio description was involved as early as in the production stage, and connected with the play's lighting. The producer was lyrical and now had a production for a broader public with which they could tour the country”, explains Jana Holsanova.

INCREASED NEED FOR AUDIO DESCRIPTION

There are 120 000 visually impaired people in Sweden today and the interest in audio description is constantly increasing. However, Jana feels that the awareness that help is available is low.

“It is very different to sign language, which has had very established training programmes for 50 years with many different information channels.”

In the near future, Jana Holsanova sees an increased need for audio description as the Act on Web Accessibility of the Public Sector places increased demands on public authorities to make films and images on their websites and apps accessible.

Even people other than the visually impaired can benefit from a film being audio described, e.g. those with ADHD, dyslexia, or autism, or the elderly. The development of AI will also affect and improve audio description in the future.

“A person is able to describe an event better than a machine; however, there is an EU project currently underway that will train algorithms to describe dynamic film scenes. Future AI, in which humans and machines collaborate, opens up new opportunities.”

Text: Bodil Malmström

Photo: Shutterstock, Kennet Ruona



“What areas of the brain are activated when a sighted person and a blind person perceive a series of images in a movie? That is exciting research!”

Jana Holsanova, associate professor in cognitive science and coordinator of the thematic collaboration initiative Audio Description for Accessible Communication.



Olof Hallonsten, researcher at the Department of Business Administration at Lund University and coordinator of the collaboration initiative BISS – Big Science and Society.

↑ Spår 2-6



← Väntsals



Spår 1



Ersättningstrafik



Creating a
smoother start for
MAX IV and ESS

► **The MAX IV Laboratory and the European Spallation Source, ESS – two world-class research facilities are being set up in Lund. Research at MAX IV has been underway since 2016 and ESS is opening its user programme for researchers in 2023. Is it now just a matter of waiting for a breakthrough and completely new research findings within medicine, biology, geology and nanotechnology? Is it that simple?**

“No. Often there is too much confidence placed in large research facilities being enough in and of themselves. That they attract expertise and create a strong research environment. However, it is not quite as simple as that”, says Olof Hallonsten, researcher at the Department of Business Administration at Lund University and coordinator of the collaboration initiative BISS – Big Science and Society.

SWEDISH CONTEXT

BISS is researching the conditions required by MAX IV and ESS to fit into the Swedish context. What is necessary for these facilities to be used in the best way possible; and how are the best conditions achieved for the operations to run efficiently and provide positive social impact, in the broad sense?

“To position ESS in Lund was essentially a political decision. The whole process has taken approximately 10 years, however, unfortunately during this time little thought has been given to the fact that investments in other areas such as infrastructure, development of expertise, and changes to regulations are also needed.”

INDIVIDUAL NEEDS AND SOLUTIONS

He says what we must do now is make the best of the situation. And, with BISS, pave the way for practical solutions based on the requirements of academia and businesses.

Because, according to Olof Hallonsten, it is neither desirable nor feasible to simply look at how other research facilities, such as those in Grenoble in France and Hamburg in Germany, have proceeded. This is because the solutions have to suit both the Lund and national contexts, and that in the aforementioned cases there were already structures in place that could take on the facilities.

SIGNIFICANT CHALLENGES

“The challenges of establishing such large research facilities are many”, says Olof Hallonsten. “They consist of everything from data management and interfaces to industrial research environments, to tax regulations and labour migration in order to recruit staff.”

IMPROVED INCLUSION

As an academic collaboration initiative run by researchers at Lund University, BISS is completely independent of all stakeholders. The goal is to contribute constructively, starting from a deeper and broader understanding of the relationships between advanced research facilities and wider society, to an improved inclusion of ESS and MAX IV in society.

The main mission of BISS is to contribute long-term sustainable solutions and perspectives on challenges and issues outside topical considerations in politics, the exercise of public authority and industry.

The initiative also benefits from relevant international and historical comparisons, not least the long history of the MAX Laboratory in Lund.

SPECIFIC MEASURES

BISS works with different relevant sub-themes. Within one of these, which focuses on Swedish life science and how it can benefit from ESS and MAX IV, in collaboration with MultiHelix Think Tank, they have carried out round table discussions with different stakeholders to identify the needs and challenges that must be managed. The work shall be detailed in a report including a list of specific measures that are produced in collaboration with stakeholders. In other sub-themes, BISS is planning more conferences, seminars and workshops, and publications in the form of popular science-oriented articles that analyse issues such as taxation rules and skills provision.

A BOOST TO SOCIETY

“Everyone must be included in the work on ESS and MAX IV. Academics, industry, politicians and public authorities. That is how we will create the right combination and the right conditions to ensure a boost to both research and society, concludes Olof Hallonsten.

Text: Noomi Egan

Photo: Kennet Ruona



“ Everyone must be included in the work on ESS and MAX IV. Academics, industry, politicians and public authorities. That is how we will create the right combination and the right conditions to ensure a boost to both research and society.



MAX IV is the world's brightest synchrotron radiation facility. The laboratory is located in northern Lund and is hosted by Lund University. PHOTO: SALAR HAGHIGHATAFCHAR

The city of the future, a sustainable city

How do you best design a residential area, or a square or a school? A sustainable city that is accessible to all – that is the goal of the collaboration initiative, Urban Arena Testbed, which gathers researchers from Lund University and representatives from the City of Malmö, the City of Lund and the Nordic City Network. Together, they want to identify problems and find solutions that contribute to more sustainable urban development.





Catharina Sternudd, researcher at the Department of Architecture and Built Environment at Lund University and coordinator of the Urban Arena Testbed.

“ The living environment is so important. Everyone who works with urban design has an impact on how we live.

“The word ‘testbed’ may sound very abstract. But it is about working more closely together, the University and the municipalities, to identify problems to which we can try to find solutions together and that can then be tested in innovative development projects – testbeds. The projects can be about how we can organise, manage and design urban areas that enable us to live more sustainable lives”, says Catharina Sternudd, researcher at the Department of Architecture and Built Environment, who coordinates the initiative.

The background to the collaboration initiative is that researchers and municipal staff often work in a compartmentalised way when it comes to sustainable urban development rather than finding common points of contact.

“We want to create a common approach to be used as a basis for how to design a new place, say a square or a residential area. We want to make sure that all companies and stakeholders work towards the goal of long-term sustainability, something that is not always obvious.”

In practice, it can mean not separating projects according to sustainability aspects but rather including energy use, water consumption, waste management and social inclusion on the common agenda for many different projects.

MULTIPLE USE

“If there are opportunities for multiple uses of a place or an object, more sustainability goals can be achieved. Then we create an environment where all parts are involved. A residential building can have added insulation through a greenhouse on the roof. Rainwater can be collected and used for irrigation, and young people far from the labour market could manage the cultivation and sell the harvest in a local store? There are many examples of projects that try to ensure several aspects of sustainability in one initiative.”

Research can also monitor ongoing projects and

ask the critical questions: how will this turn out? For whom is the place built? Who benefits? It is important to think broadly as the city is to be accessible to everyone while being sustainable.

CLOSE COOPERATION IS NEEDED

The way cities are planned, organised and built will become increasingly important as urbanisation and the effects of climate change become more noticeable. That is why close collaboration between different disciplines and areas is crucial, argues Catharina Sternudd.

“These are big issues that need to be resolved. For example, how do we build schools and nursing homes that are adapted to a warmer climate? What could urban planning be like if we were to use fewer cars? If we give priority to pedestrians, bicycles and public transport, how does this affect the cityscape and city life? We believe that together we can solve these challenges. But only if we are given the space to identify challenges and opportunities at an early stage and in physical locations.

FULL SIZE TEST BEDS

In addition to organising workshops, seminars and study visits, during the project period the researchers and the municipal staff will also make joint applications to carry out concrete projects in the cities. One area they want to work on is Brunnsög, which is currently emerging in northwestern Lund.

“The goal is to implement several full-scale testbeds, where citizens and companies participate in the process. Working with a whole new area, where you can have a huge impact, would be tremendous”, concludes Catharina Sternudd.

Text: Noomi Egan

Photo: Kennet Ruona,

Orbit / Science Village Scandinavia



The picture represents a competition grant for a new Science Center in Lund and Science Village.



A black and white close-up portrait of Agneta Gulz. She has long, wavy, light-colored hair that is blowing in the wind. She is looking upwards and to the right with a slight smile. She is wearing a dark top, a thin necklace, and a chain necklace. The background is dark and out of focus.

Agneta Gulz, professor of Cognitive Science at Lund University and coordinator for the thematic collaboration initiative Together Stepping into Tomorrow's Classroom.

“ We are destroying young brains. There is all the evidence in the world showing that it is not possible to multitask.

In the world of apps

► How does a school support its pupils in an optimal way to ensure the most number of pupils reach their full potential? Collaboration initiative Together Stepping into Tomorrow's Classroom want to strengthen the message that quality is needed in the use of digital learning resources. Learning apps can both be a help and a hindrance.

The explosion of digital learning resources in schools combined with the unfortunate idea that there is value in learning on your tablet or computer signals a red flag according to Agneta Gulz, Professor of Cognitive Science at Lund University:

“There are huge quality differences in our digital aids and unfortunately many of them are of poor quality. The challenge lies in providing teachers with strengthened knowledge so they can understand why they are using a particular app and what it should lead to for the students.”

Agneta Gulz, together with several other researchers, runs the new thematic collaboration initiative Together stepping into tomorrow’s classroom at Lund University. How does a school support its pupils in an optimal way to ensure the most number of pupils reach their full potential? With the collaboration initiative the researchers would like to disseminate their research results to teachers, principals, parent associations and students in teacher training with the message that the quality of digital learning resources chosen for classroom use needs to be assessed.

“These days we have new research opportunities to study the learning process more closely in classrooms and to follow what happens with students in real time. This means we can also see how future digital aids should work.”

ADVANTAGES WITH DIGITAL LEARNING RESOURCES

Good digital learning resources which are subject-specific and educationally well-developed provide many advantages in comparison with traditional textbooks. To learn the capital cities of Europe or multiplication through a well-designed app can be the best way to learn. Pupils can compete with themselves and the teacher can adapt their teaching and provide support and feedback at various levels. Different components which support learning in a powerful way.

CAN FOOL THE SYSTEM

However, many of these digital aids do not stand the test and are not at all good for learning. There are many more than one thousand apps on the market directed at primary schools, but if a pupil makes a mistake they need to know why and receive constructive feedback. Only a small per cent of these apps do this, according to Agneta Gulz. She is also very critical toward pupils often being able to systematically test their way forward and, in that way, fool the system.

DEVELOPMENT BASED ON INDIVIDUAL ABILITIES

But Agneta Gulz is simultaneously optimistic and pessimistic when it comes to the use of digital learning resources to encourage pupils to develop their skills based on their own abilities and needs.

“There are many good digital learning resources which focus on well-defined bottleneck areas acknowledged to be difficult within mathematics, for example, where pupils are known to get stuck”, says Agneta Gulz who continues, “However, unfortunately there are many apps which look attractive on the surface and, as they are sold on the app store, teachers and parents are fooled into thinking the educational design has been well-thought-out. The graphics look nice, the music is good and you can choose your own typeface, but it is just the packaging and not at all adaptable.”

POWERFUL MARKET FORCES

But how does tried and tested science compete with the powerful market forces at play?

By preparing future teachers early on during their training replies Agneta Gulz, whose research group Educational Technology Group is at the forefront. The group is itself developing a digital play-and-learn game which she hopes will reach users right across Sweden. The content will also be available in Arabic in order to study the importance of pupils receiving information in their first language.

Together with pupils, teachers and researchers, they are also building virtual teaching environments in so-called Virtual Reality which is combined with more traditional tested teaching methods.

“Meeting with the children is an incredible source of energy for my work, they make sure that I will never give up”, says Agneta Gulz.

Her drive for young people to receive the best support possible in their learning is steadfast. And above all, she emphasises, for those who may not otherwise have a good start to life. Children who come from environments where adults do not talk or play with them very much and who therefore do not receive the necessary foundations.

IT IS NOT POSSIBLE TO MULTITASK

Agneta Gulz is also very critical of children doing many things at once.

“We are destroying young brains. There is all the evidence in the world showing that it is not possible to multitask. What the brain does is jump very quickly between different things which is disastrous and weakens the ability to focus.”

This is where a school with a well-developed plan with a combination of technical support for teachers and more classical education can make a difference to a child’s opportunities to learn.

“I think the future is bright and believe that many more teachers will be better prepared and able to use digital learning resources in a smart way. That is what has to happen.”

Text: Bodil Malmström

Photo: Kennet Ruona, Shutterstock



“ Meeting with the children is an incredible source of energy for my work, they make sure that I will never give up.

Land use for a sustainable future

► How should we use land and for what? The issue is more topical than ever. Society's demands on land are many: increasing need for land for food production, growing cities and the transition to bioenergy may result in further intensification of forestry and agriculture. At the same time land is also important for climate adaptation, biodiversity conservation and recreation. A new collaboration initiative at Lund University aims to highlight land use conflicts and to find synergies between different interests.

Henrik Smith, director of the Centre for Environmental and Climate Research and one of the coordinators of the initiative LU Land.



“ It is important to highlight the intractable issues.

“If we are to secure food and energy production, create a bio-based economy, manage climate change, preserve biodiversity and live up to global sustainability goals, we must achieve long-term sustainable land use”, says Henrik Smith, director of the Centre for Environmental and Climate Research and one of the coordinators of the initiative.

“However, today there are many interests that conflict with each other, and everyone wants to use the land for different things. We want to work together across sectors and disciplines, with researchers, business, public authorities and NGOs, to find solutions where we can use land for several things simultaneously.”

Since land is not an endless resource, the tensions and conflicts can be difficult to solve. Moreover, the challenges can look very different in different parts of the country. In Skåne, the competition is hard for the productive agricultural land which is used both for agricultural production and growing cities. In other parts of Sweden, the challenge is instead abandoned farms and croplands that are becoming overgrown. In both cases, the result are more uniform landscapes, with negative consequences for biological diversity.

HIGHLIGHT THE INTRACTABLE QUESTIONS

According to Henrik Smith, it is important to include different interests and needs in the discussion. It is also important to highlight the intractable issues. He considers the fact that the collaboration initiative brings together a large number of stakeholders and researchers from different disciplines to be a major advantage in this work.

The initiative particularly wants to highlight the consequences of an increased production of bioenergy: can bioenergy be grown in a way that is conducive to biodiversity instead of resulting in a more intensive forestry or agricultural production? If so, where in the landscape should this be done, and how would it affect other types of land use? Other questions concern urban planning: should cities be

densified at the expense of green areas and their functions for people, or should one instead exploit agricultural land around the cities? Even climate adaptation measures might have to be balanced against other interests: can adapted agricultural management reduce greenhouse gas emissions and increase carbon sequestration? Or will measures taken to reduce climate change effects instead result in conflicts with other environmental goals, such as the protection of biodiversity?

“Is land a problem or an asset? By discussing how, for what and why land should be used in a certain way, we may be able to establish consensus and new ways of working together, says Henrik Smith.

FIND SYNERGIES – HANDLE CONFLICTS

Synergies maybe about collaboratively finding measures or management practices with multiple benefits, for example managing land in a way that both increases carbon sequestration and soil fertility. Another way to find synergies is to work more on a landscape level, for example by growing biocrops in areas where they can be beneficial for biodiversity.

The ambition is that the initiative will lead to both new collaborations and research projects, but also to pathways to communicate knowledge in a better and more applied way. Henrik Smith also wants the results to be communicated to decision-makers at different levels – locally, regionally and nationally – as it is ultimately a democratic question how land is to be used and for what.

“How to govern land use is a political issue, but we can help increase knowledge about existing conflicts and possible win-win solutions. It is high time for a political discussion about the instruments and policies required to create sustainable land use”, concludes Henrik Smith.

Text: Noomi Egan

Photo: Kennet Ruona, Shutterstock





Information on sustainability performance must be enhanced

► All parts of society must become more sustainable if we are to achieve the global sustainability goals. However, what does it mean to be a sustainable organisation? How are companies to measure, compare and understand their own performance and that of others in the area of sustainability? These questions are the focus of a new collaboration initiative at Lund University.

“We are currently witnessing a rapid transition towards more sustainable organisations. This transition is urgent and needs to be efficient if we are to achieve the global sustainability goals and at the same time limit the temperature rise to under 1.5 degrees”, says Susanne Arvidsson, researcher at the School of Management and Economics at Lund University and coordinator of the collaboration initiative Enhanced Value Relevance and Credibility of Sustainable Information (EVRACI).

COMPANIES MUST BECOME MORE SUSTAINABLE

The collaboration initiative is coordinated by Lund University and brings together organisations such as the European Environmental Agency (EEA), the Swedish Tax Agency, the AP funds, the Swedish Inspectorate of Auditors, several international MCCs, interest groups and researchers. It aims to help companies become more sustainable as the demand for transition presents companies and organisations with major challenges. What does a sustainable organisation actually look like? How are they to measure, compare and understand their own performance and that of others in the area of sustainability? There is currently a great need for more standardised processes and instruments when it comes to evaluate sustainability performance.

“We have come a long way when it comes to the

ecological parts of sustainability, such as emissions, water and energy use, and even though these parts need to be enhanced we are lagging behind in the social dimensions. We do not have credible or comparable ways to measure, understand and evaluate how companies are performing with regard to, for example, anti-corruption, equality and human rights. Here we need to be creative to be able to show performance and impact.

DIFFICULT TO EVALUATE

The lack of comparable performance measures or indicators makes it difficult to quality assure and integrate the work within sustainability. It is also a challenge for companies to self-evaluate and link their performance to results and long-term sustainable development.

“A company must be able not just to measure but also to understand its performance in order to develop its operations and practices: why and how have the company reached its results? If it has reliable and comparable performance indicators used by many, the company can better understand its own work and that of others. It is also the basis for how internal funds are allocated and both internal and external investment decisions are made”, says Susanne Arvidsson.

As a first step, the collaboration initiative wants to start a discussion on what such performance indicators

“ We want to help companies change to become more sustainable and transparent.



Susanne Arvidsson, researcher at the School of Management and Economics at Lund University and coordinator of the collaboration EVRACI.

or standardised measurement processes could look like. What are the challenges and possibilities to integrate different sustainability goals and to measure performance? How could performance be more clearly linked to results? What knowledge needs are there within research, policy, industry and financial market?

“One thing we want to do is contribute to the development of relevant, credible and comparable ways to describe performance in relation to the different areas of sustainability. It is also important to realise that not all performance is quantifiable and that progress and impact can be ‘measured’ in different ways. We have to remain humble in that this is a challenge in our common endeavour to achieve a transition towards more sustainable organisations.”

“In this endeavour it is a key prerequisite to be able to compare and understand how different organisations perform in order to be able to make the most effective transition possible.”

FINANCIAL RISK FOR THOSE WHO DO NOT BECOME MORE SUSTAINABLE

To reach Agenda 2030 and promote a global sustainable development, our companies are undergoing a powerful transformation towards becoming more sustainable. For upholding an efficient capital market, Susanne Arvidsson emphasizes that it is vital for the various actors to be able to assess sustainability performance. This remains a key challenge puzzling the world’s policy makers, financial-market actors, industry and academia.

“We, in the EVRACSI initiative, want to assist in solving this challenging puzzle by contributing to develop disclosure opt for providing value-relevant, credible and comparable information on how our companies perform on the different sustainability arenas.”

According to Susanne Arvidsson, succeeding with this is crucial for accelerating and reorienting capital flows towards sustainable investments and thereby, reaching a sustainable growth.

Text: Noomi Egan

Photo: Kennet Ruona, Shutterstock





ENVIRONMENT

SUSTAINABILITY

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Stories with inherent power

► A well-thumbed science fiction novel. Computer models of Sweden's vegetation in the year 2100. How to best plan for an educational exhibition. These are three examples of climate stories which the thematic collaboration initiative Narrating Climate Futures is investigating in a project which brings together visions of the future and climate policy.



Johannes Stripple, coordinator for the thematic collaboration initiative Narrating Climate Futures and political scientist at Lund University.

“ Narrating Climate Futures is sowing seeds which need time to grow.”

The project wants to explore whether stories, and different ways of imagining the future, can have an impact on climate measures and policy instruments. A broad approach provides the researchers with the opportunity to look at examples of climate narratives which are maybe not considered stories in the general sense. Future energy systems, scientific models of rising temperatures and urban living labs are studied as well as climate representations in art, literature and film.

VISUALISING THE FUTURE

“Stories have significant inherent power. They help us visualise the future and highlight what it means to be human. If we can identify and expose different kinds of narratives, from various areas and sectors, together we can investigate how these may impact on policies and provide us with a new way to manage and respond to climate change”, says Johannes Stripple, project manager and political scientist at Lund University.

Like the research methods, the project’s work methods are also broad and interdisciplinary. In many ways they can be described as innovative given that they consider creativity and participation. It includes guided tours of art exhibitions, workshops which allow participants to try out and reflect on different narrative techniques, input on a forthcoming exhibition on the global goals, a book club, and climate walks with researchers and artists in Kristianstad’s Vattenrike Biosphere Reserve and the Gropahålet Nature Reserve.

“To be in a museum or out in nature with others to investigate something gives rise to other insights and discussions. It creates greater scope for research than more traditional models do”, says Johannes Stripple.

A COLLABORATIVE PROJECT

According to him, the choice of work methods has a lot to do with the project being a collaborative one where researchers and external stakeholders are involved. Nearly all of the faculties at the University are taking part with researchers

from different levels, from Master’s students to post retirement professors. External parties include artists and curators, production companies, several municipalities across Skåne, consultants, businesses and authorities in the climate and energy sectors, as well as museums and visitor centres such as Malmö Museums, Skissernas Museum (Museum of Artistic Process and Public Art) and the Naturum Vattenriket visitor centre.

“We are not a closed network, rather researchers and other interested parties can jump onboard whenever they like. We are constantly developing new ideas and we would like to continue taking advantage of existing ideas both within and outside the University. It is that sort of input which drives the work forward. Our website will be a live and natural meeting place for our ideas, information and collaborations”, says Johannes Stripple.

“Narrating Climate Futures is sowing seeds which need time to grow.”

LEAVE A MARK ON SOCIETY

Enduring collaboration is an intended outcome of the project. Collaborations which can go on for many years – and leave a mark on society as a whole in regards to solutions and ideas on how to manage the effects of climate change and how they in turn can play a role in climate policy measures and agreements.

And Narrating Climate Futures has already made some progress: they have received funding for two new projects, one on stories about a fossil-free society, together with an interdisciplinary group of researchers in Utrecht, Warwick and Durham, and another about forests. They are also working on two significant applications together with external stakeholders.

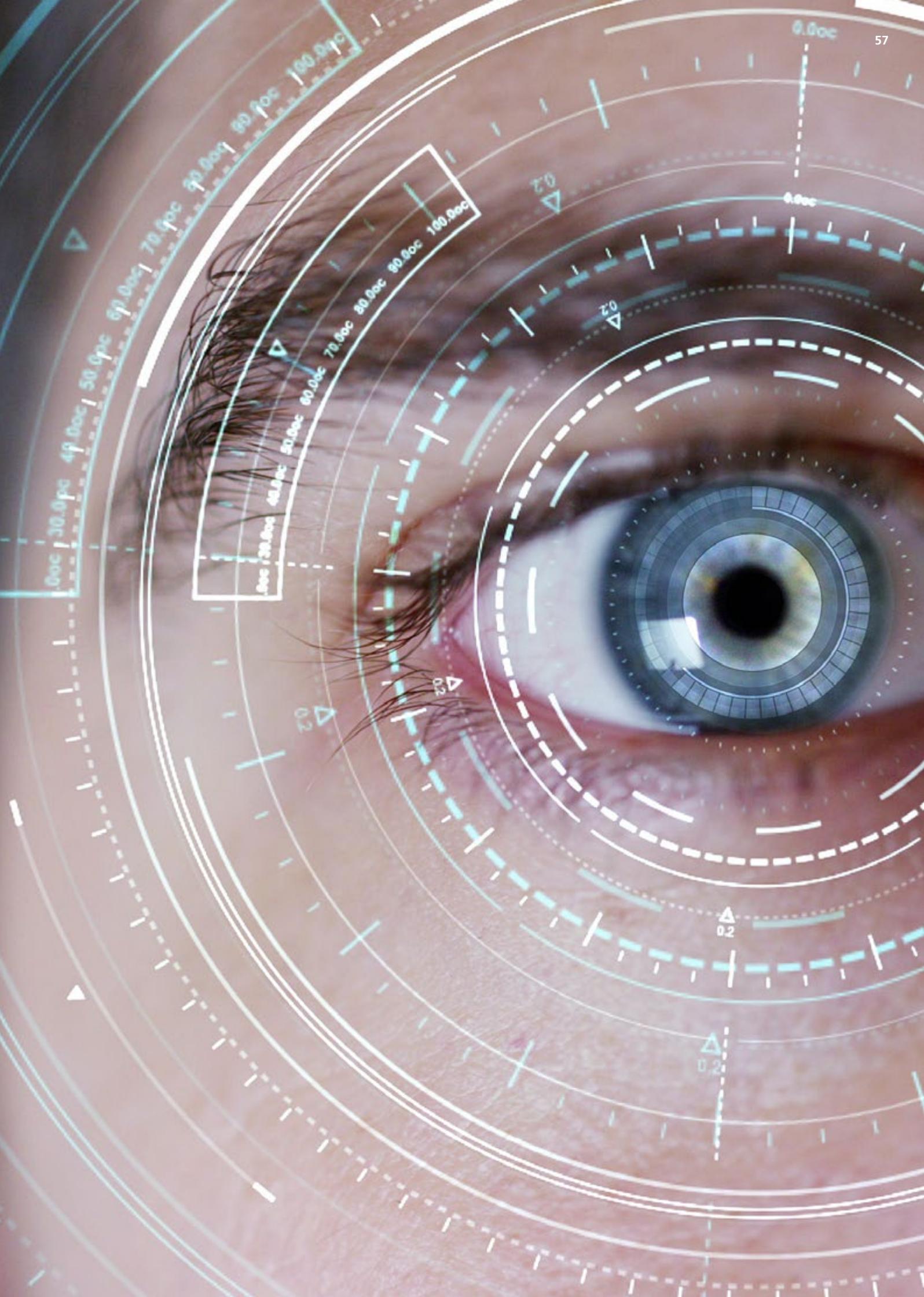
“We want to continue with what we are doing! Because we cannot afford to wait if we are serious about wanting to save the climate and create a better future”, concludes Johannes Stripple.

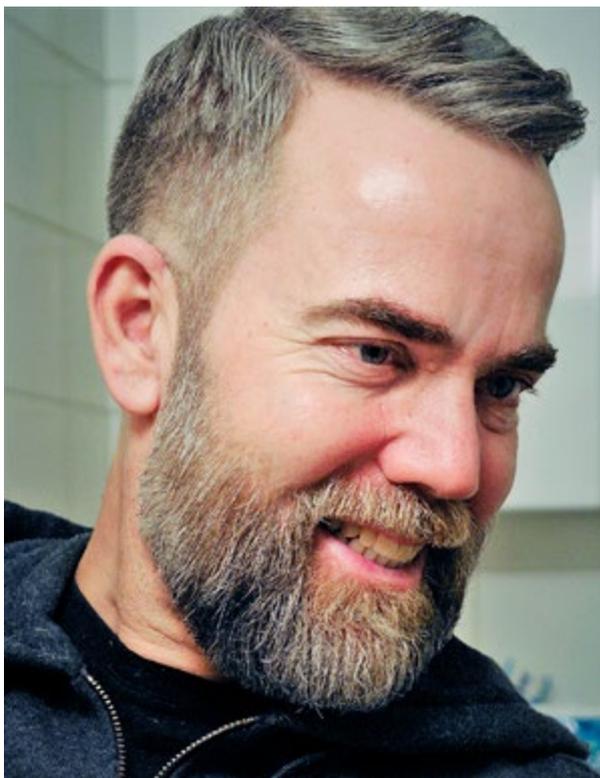
Text: Noomi Egan

Photo: Catrin Jakobsson, Shutterstock

Intelligent intelligence

► We are facing significant societal challenges. Our security policy situation in Sweden has changed and the fight against organised crime is so extensive, and has such momentum, that it needs to be tackled with coordinated participation from society as a whole.





Tobbe Petterson, researcher in intelligence analysis at Lund University who leads the initiative Intelligent Intelligence.

Research at Lund University is required to contribute to improved and more efficient intelligence activities, something that both the prevention and fight against crime require to make any progress.

Specifically, the intelligence activities are about equipping decision makers with relevant data. For example, the task of the intelligence services at a strategic national level is to map the situations and opportunities for negotiation of foreign powers and to judge the development of events. Intelligence activities in all its forms have even started to play a more prominent role in international relations, crisis management, business activities and the fight against crime.

NEW IMPORTANT KNOWLEDGE

In order to improve and make intelligence activities more efficient mainly in defence and fight against crime, researchers at Lund University are now collaborating with practical intelligence activities within several authorities such as the Swedish Armed Forces, the Swedish Migration Agency and the Swedish Police. Such a collaboration, according to Tobbe Petterson, researcher in intelligence analysis at Lund University, will lead to the operative organisation receiving new important knowledge.

FRUITFUL COLLABORATION

“The intelligence process and the methods used show an extraordinary similarity to the processes and methods used within research, and collaboration between practical

intelligence work and academia is therefore obviously fruitful”, says Tobbe Petterson who is also the coordinator of the thematic collaboration initiative “Intelligent Intelligence”.

TEXT AND WRITING ANALYSIS

Useful new knowledge for intelligence activities can be found in many research areas such as sociology, psychology, communications, and technology. A specific example is language research where the methods in text and writing analysis can be developed to suit the operative intelligence activities.

PROFESSIONAL DEVELOPMENT

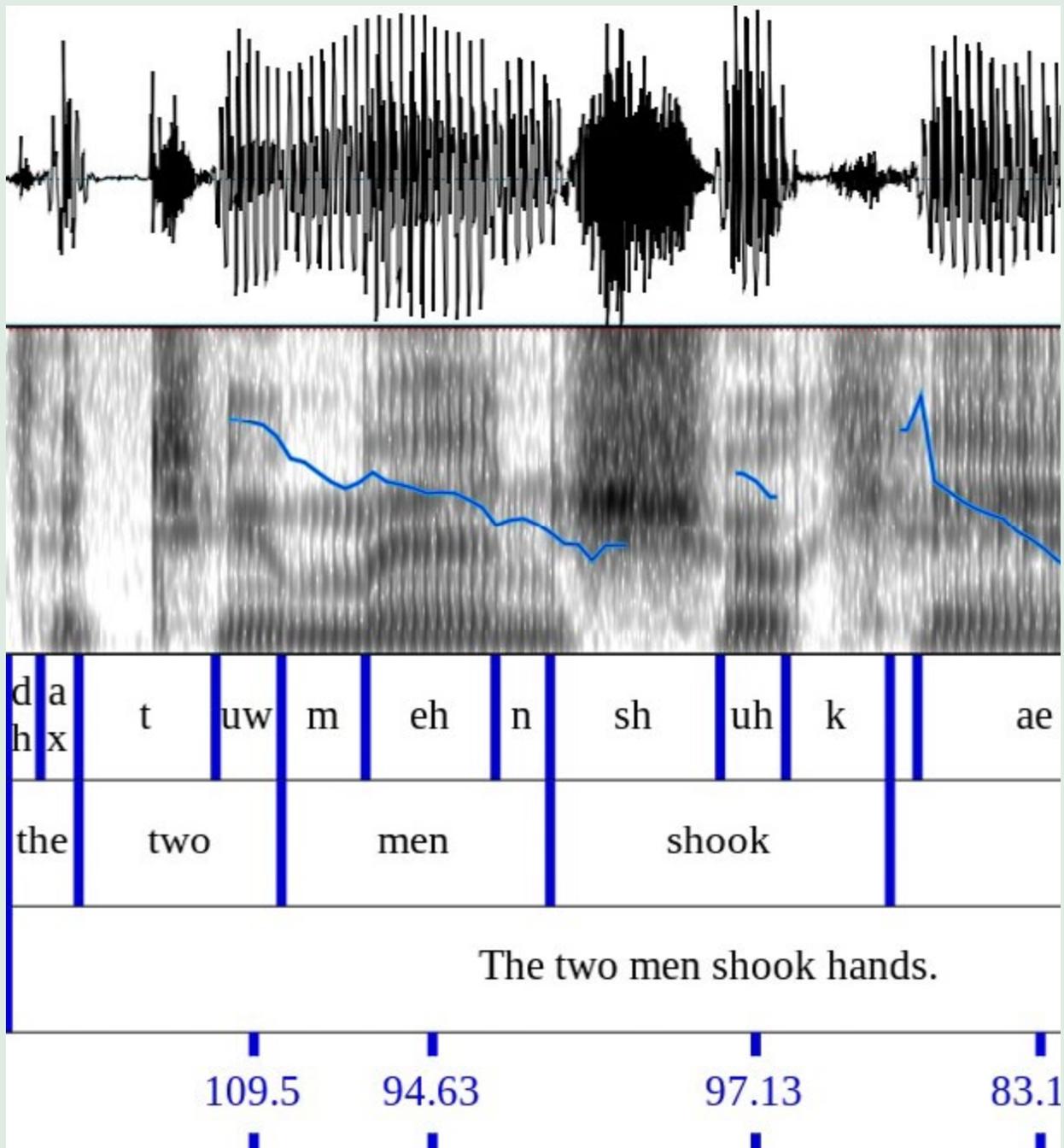
Professional development is also something which is in demand from authorities both to strengthen the operative sections of the activities, and as a staff welfare measure with the aim of stimulating and retaining qualified staff.

“Researchers today have a great opportunity to support professional development in intelligence authorities, for example through further education in methods and critical thinking – areas where universities are traditionally strong and which are of key importance for successful intelligence activities”, says Tobbe Petterson.

Text: Pia Romare

Photo: Shutterstock, privat

Spektogram: Johan Frid



Authentic or not?

in this diagram of the spoken English phrase 'The two men shook hands', there is an acoustic analysis of frequency, time and sound intensity. The upper section shows the waveform, the middle section the spectrogram, and the lower section different aspects such as phonemes, words, text as well as characteristics in speech melody. Speech melody itself is seen on the blue curve.

The analysis can be used by intelligence services to assess statements from individuals who may be witnesses

or suspects in criminal investigation contexts. The analysis can also be used when interviewing prisoners of war.

Which dialect does the person speak, which words are used frequently? And how does the person organise their speech, is it authentic or not?

Psycholinguistic methods to determine how people talk, write, read and listen can assist operative intelligence services to better understand human language capabilities.

What is the value of the water?

► It was a dry summer and in many places we had to save water. Now, if not before, we realise how much we need water – that all life around us is dependent on clean water. Water issues play a part in several of society’s biggest challenges. The initiative LUWater and Lund University brings together hundreds of researchers tackling these challenges.

We are used to thinking we have a limitless supply of clean water in Sweden and that we can waste water at home and use it for complementary irrigation of crops. However, if it doesn’t rain for a long time, like the summer of 2018, the groundwater supply is reduced and we have problems both in the city and in agriculture. It is not good if it rains too much in a short period of time either – it can cause flooding and overflow, that is to say, discharge from wastewater and rainwater pipes.

“The dry and warm spring and summer we have just seen in 2018 gives us an indication of our future climate”, says Kenneth M Persson, director for the initiative LUWater. And even if we can count on increased precipitation in the long-term it will be distributed much more unevenly than before. A much more unpredictable climate is something we already have to learn to manage and plan for.

WATER IS USED A LOT

Having to plan so we have sufficient water supply to keep ourselves and our crops and animals alive, is one perspective on our dependence on water. Yet we humans use water for so much more. We wash, shower, clean and flush our toilets with water. Water makes the production of paper and the pulp industry and several other important industries possible. We even use water to transport all waste and pollutants through our wastewater systems. So, aside from the right to clean water, we need to plan

for sustainable cities, fight the spread of diseases and achieve good health.

POLLUTANTS END UP IN THE OCEAN

“Sooner or later all substances we use end up in water – it is not possible to avoid that”, says Kenneth M Persson.

“Water is the best solvent we know of.”

“Some pollutants are caught up in treatment plants, but a lot continues out to lakes and waterways, for example, drug residues and microplastics. Rainwater also carries with it substances from the ground and air and transports them via surface water drains to the groundwater or to lakes and rivers. Water is everywhere and moves around our earth in a perpetual cycle”, explains Kenneth M Persson.

“For example, we can find pollutants from Europe in the meat and blood of polar bears up in the Arctic, pollutants which have been carried there via water and food chains. It is currently permitted to release substances which do not disappear, that is, that do not break down – since there are no natural ways to break them down. However, people should know that, for example, perfluorinated compounds such as PFOS or PFOA are present in fire fighting foam which basically never breaks down. And that microplastics remain in nature for 500–700 years!”

“If you have that knowledge then you understand we need to use materials which do not remain and accumulate in the food chain, rather we need materials which break down or are transformed when they end up out in nature.” ►

“ Sooner or later all substances we use end up in water – it is not possible to avoid that.



Kenneth M Persson, professor of Water Resources Engineering and director for the initiative LUWater.



Some pollutants are caught up in treatment plants, but a lot continues out to lakes and waterways, for example, drug residues and microplastic.

USE WASTEWATER SYSTEMS IN THE BEST POSSIBLE WAY

How then do we best prevent the spread of undesirable substances and contagious bacteria in wastewater? To phase out the use of undesirable substances and treat the discharge directly at the source would obviously be the best way but this is only possible in some cases. Therefore, we need to ensure that the wastewater systems we have function in the best possible way, says Kenneth M Persson. Through different improved measurement systems it is possible to achieve a comprehensive idea of how the system is coping, if it is old or is about to break. Later on we could perhaps complement the systems with specific sensors to receive even more information.

“Subsequently, when we have information on the state of the system we can widen our focus and study the water use – how much waste-water is formed, and where – in a city such as Lund. If we then also look at how much water is available I think we could get quite a comprehensive idea of what society’s water balance looks like.”

SUSTAINABLE WATER USE

How much water an area has access to can be ascertained by calcu-

lating, among other things, precipitation and evaporation. These factors vary year to year and therefore calculations are made from an average number taken from several years’ worth of measurements. To achieve sustainable water use we need to plan our society so that there are good margins for coming dry years.

“In Cape Town in South Africa water use has been dimensioned to use significantly more water than the average calculated supply”, says Kenneth M Persson. “When it gets as dry as it did this year they therefore have serious problems. They now have to work on both supply and demand; can they increase supply and find more water, can they reduce demand or build more recirculating systems?”

CREATE GOOD MARGINS

In Sweden, on the other hand, we normally have plenty of fresh water; we have rain and snow which tops up streams, rivers, lakes and form groundwater. Consequently, we often only need to use a small part of the resource.

“If we can build a society where we only need to use around 20 per cent of the average water supply we would have good margins even during dry years”, says Kenneth M Persson.

He thinks we should all be able to help out to use water in smarter ways, in the same way we have been trying to reduce our energy use both at home, in municipalities and in industry. Because, do we really need to use so much water?

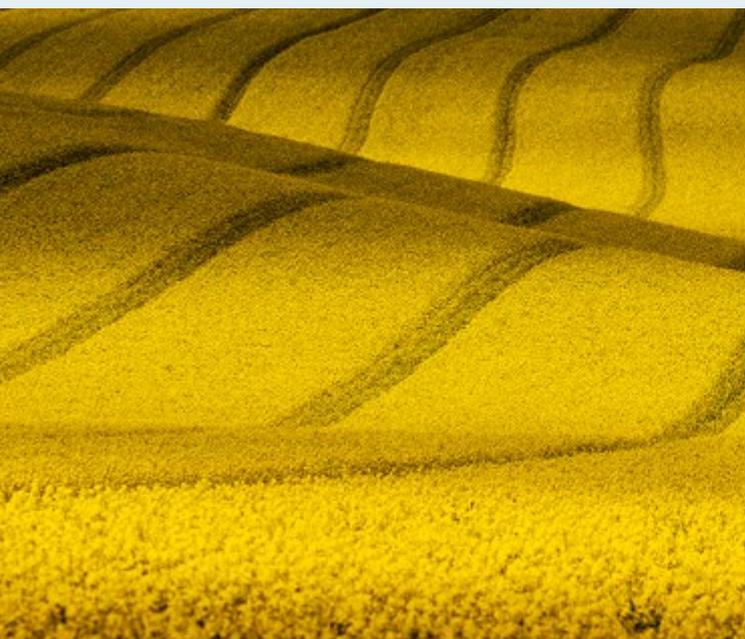
Text: Pia Romare

Photo: Kennet Ruona, Shutterstock



New diet – it may be right, but it isn't easy

We should reduce our meat intake and eat a mainly vegetarian or completely vegan diet. That is the advice. However, do we all want that, and do we understand the consequences for our health, Swedish food production or for the climate and a sustainable environment? The so-called protein shift, from animal to plant-based protein, and its effects is one of the complex questions on food which researchers at LU Food Faculty, Lund University, are tackling.



Which food we produce, and how we do it, has recently become the focus of debate about our future.

FOOD IN FOCUS FOR THE GLOBAL GOALS

“Of the 17 global goals for sustainable development which the UN adopted in 2015 there are eight which concern food, placing our research on the agenda”, says Yvonne Granfeldt, researcher at the Department of Food Technology, Engineering and Nutrition.

The global goals state that there should be enough food for all and that the food we eat should contribute to health and wellbeing. At the same time, the food should be produced and distributed in a sustainable way with regard to climate and environment as well as socially and economically.

REDUCED MEAT CONSUMPTION

With regard to the effects of a protein shift, Yvonne Granfeldt, food chemist, and Charlotta Turner, analytical chemist, explain that from a climate and environmental perspective there is a lot of research supporting a reduction in red meat consumption, at least if it is based on sustainable production taking account of biodiversity, among other things.

“However, when it comes to the nutritional aspect of a protein shift, the evidence is not as clear”, says Yvonne Granfeldt. “In Sweden as we increasingly switch to a diet with less animal protein – where seaweed, planktonic algae, insects, and cultivation waste products may play a part – we will be eating a considerable number of innovative products and processed raw materials. This includes different fats and different carbohydrates, dietary

fibres, vitamins and minerals. We do not have sufficient evidence on how nutritional uptake and health may be impacted by this.

NEW RAW MATERIALS

Charlotta Turner raises the example of seaweed to demonstrate the complexities –health aspects aside – of introducing new raw materials in the food chain.

“I am very interested in seaweed at the moment, both micro and macro algae. Our chemical analyses show that seaweed contains substances which could prove potentially interesting for foods. However, as Yvonne says, there are also other substances which do not taste good. So how can we process the seaweed to maybe hide or remove those tastes?”

Then how can we imagine food containing seaweed? Should it be something we have in a sports drink or can we put seaweed in patties, convenience food, or is it something we could use as a spice? Should we cultivate the seaweed, choosing the species which do not absorb poisonous metals as much, or should we harvest seaweed from the ocean? What do consumer groups think about this, wonders Charlotta Turner.

“So it is important to also study consumer behaviour”, says Charlotta Turner. “We as chemists think it is exciting to look at what seaweed contains from a purely chemical point of view, but the consumer is not going to eat more seaweed just because we are studying seaweed molecules!”

USE AGRICULTURAL WASTE

To produce new food from raw plant materials is a challenge if we are to reduce our meat consumption. The raw material can, as Charlotta Turner highlights, be seaweed for example, but it can also be the agricultural waste products of today. Currently, growers often only extract one thing from each cultivated raw material, oil from rapeseed, starch from potatoes or juice from fruit or berries. The rest is discarded or sold cheaply as animal feed or for soil improvement. There is potential here which growers and the industry should exploit, say Charlotta Turner and Yvonne Granfeldt.

One example where researchers and growers are collaborating to transform agricultural waste into new foods is rapeseed. A research group at the Department of Food Technology, Engineering and Nutrition, together with colleagues, has developed a process to refine proteins from oil cakes and they are now testing to see if it is possible to use the protein to make a mince product.



Yvonne Granfeldt, food chemist, and Charlotta Turner, analytical chemist, thinks it's important to study consumer behaviour.



One example where researchers and growers work together to convert agricultural waste into new food is rapeseed. They have developed a process to purify proteins from rapeseed cookies and are now testing whether the protein can be used to make a mince product.

PROCESSING IS EXPENSIVE

However, Charlotta Turner points out that even if it is possible to create a product which the consumer wants from different kinds of waste products, sometimes it proves to be very expensive when you consider the entire process around it. It is also important to include researchers who can provide both an economical cost analysis and a life cycle analysis to see what the total costs are in the end – not just for consumers but also for the environment and climate.

The global challenges contain many complex questions

affecting our own future and that of the planet. In the work to adopt the goals concerning food, Charlotta Turner, together with Yvonne Granfeldt, recently started the collaboration initiative LU Food Faculty where traditional food research on raw materials, production, processes, food properties and preservation, as well as on consumption, innovation and economy, is linked to sustainability, environment, nutrition and health.

Text: Pia Romare

Photo: Shutterstock, Bodil Malmström

Register of the initiatives

Big Science and Society

The establishment of the ESS and MAX IV research facilities in Lund brings about a number of societal challenges. To collectively tackle these challenges, the Joint Faculties of Humanities and Theology, the Faculty of Social Sciences, the Faculty of Law and the School of Economics and Management come together in this initiative.

Collaboration partners:	KPMG	MAX IV
Chamber of Commerce and Industry of Southern Sweden	Lund Citizen Hub	MultiHelix Think Tank
Ernst & Young Law	Massive Entertainment AB	Skatteverket
European Spallation Source (ESS)	Migrationsverket	Sony

Heritages of Migration and Mobility in a Democratic and Inclusive Society

The initiative is focused on issues of cultural heritage and migration faced by the Öresund Region's many cultural heritage institutions. The research node consists of researchers from the following departments and specialised centres: the Centre for European Studies, the Centre for Öresund Region Studies, the Department of Law, the Department of Gender Studies, the Department of Arts and Cultural Sciences, the Department of Service Management and Service Studies and the Malmö Theatre Academy.

Collaboration partners:	Kulturen i Lund (via ABM Skåne)	Smithsonian Institution
Borderland Foundation	Malmö city	The Swedish National Archives/ Landsarkivet i Lund & rep.för ABM
Center for the Study of Upper Midwestern Cultures,	Michigan State University Museum	University of Wisconsin at Madison
Church of Sweden/Lund Diocese	Regionmuseet Kristianstad (via ABM Skåne)	Western Kentucky University Western Kentucky University Museum
German, Nordic, and Slavic (GNS) Department, University of Wisconsin	SAXO Inst. Kph, & Centre Advanced Migration Studies, AMIS	

A Social Rights and Social Policy Perspective on Housing for the Ageing Population

The goal is to generate knowledge, through concrete collaboration, that has an impact on future housing policy and housing that involves researchers from the Faculty of Medicine, the Faculty of Law, the Faculty of Social Sciences and the Faculty of Engineering.

Collaboration partners:	Karlshamnsbostäder AB	Pensionärernas Riksorganisation (PRO)
Hälsostaden Ängelholm (Region Skåne)	Kristianstad University	SPF Seniorerna
Helsingborgs Municipality	miThings	Tech4Care
	Österlenhem AB	Vetenskap & Allmänhet

Circular Biobased Economy

The goal is to convert sustainably produced biomass into products that are used and recycled, involving researchers from the Faculty of Science, the Faculty of Social Sciences and the Faculty of Engineering.

Collaboration partners:	Lund City
IKEM – Innovation and Chemical Industries in Sweden	Region Skåne

Together Stepping into Tomorrow's Classroom

What advantages and disadvantages are related to technology-supported learning methods – and how can they be combined with non-technology-supported methods? Next generation learning technology is the focus for researchers in cognitive science, design sciences, linguistics, neuroscience, subject didactics, technology, psychology and educational sciences.

Collaboration partners:	Fäladsskolan, Vårfruskolan och Svaneskolan, Lund	Massive Entertainment i Malmö Science Center, Malmö Museums
AAA-lab, Graduate School of Education, Stanford University	Macleanskolan och Rutgerskolan, Skurup	School departments in Lund and Helsingborg
Doktorander i Lärande (DIL)		

LU Water

Today's challenges, of both increased scarcity and increased abundance of water, are the subject of research by researchers at the Faculty of Medicine, the Faculty of Law, the Faculty of Social Sciences, the Faculty of Science, the Joint Faculties of Humanities and Theology, the Faculty of Engineering, the School of Economics and Management and the International Institute for Industrial Environmental Economics.

Collaboration partners:	Lund city	Swedish Agency for Marine and Water Management
Eureau	Länsförsäkringar Skåne	The Swedish Water & Wastewater Association
Havs- och vattenmyndigheten	Malmö city	WIN Water
Helsingborgs city	Region Skåne	Water Europe
Isle Utilities	Simrishamns municipality	
LRF – The federation of Swedish farmers	Sweden Water Research AB	

Narrating Climate Futures

Narratives and ideas on climate and how we can shape the future with our actions for necessary climate changes, bring together researchers from the Faculty of Social Sciences, the Faculty of Science, the Faculty of Fine and Performing Arts, the Faculty of Engineering, Lund University Centre for Sustainability Studies and the International Institute for Industrial Environmental Economics.

Collaboration partners:	Inter Arts Center	Museum of World Cultures in Stockholm
Church of Sweden	K2	Råången project
City of Lund	Kristallen civic centre	Stockholm World Water Week
City of Malmö	Libraries in Lund, Landskrona, Kristianstad	Swedish Society for Nature Conservation
Film i Skåne	Lund Cathedral Parish	Trivector
Folkuniversitetet	Malmö Museums	Umami Productions
Hemslöjden i Skåne		

Intelligent Intelligence

Improved and more effective intelligence activities, something that both the national defence and the fight against crime is dependent on, involves researchers from the Faculty of Social Sciences, the Joint Faculties of Humanities and Theology, the Faculty of Engineering and the School of Economics and Management.

Collaboration partners:	Stockholm University	The Swedish Enforcement Authority
FRA	Swedish Coast Guard	The Swedish Police
Malmö University	Swedish Customs	The Swedish Prison and Probation Service
Norwegian Defence Intelligence School	Swedish Migration Agency	The Swedish Tax Agency
Norwegian Institute for Defence Studies	SÄPO	Umeå University
	The Swedish Armed Forces	

LU Food Faculty

The food system is facing enormous societal challenges where terms such as sustainability, security and health are key. Researchers from the Faculty of Social Sciences, the Faculty of Science, the Faculty of Law, the Faculty of Fine and Performing Arts, the Joint Faculties of Humanities and Theology, the School of Economics and Management and the Faculty of Engineering form part of the initiative.

Collaboration partners:	Food Nexus	Skåne Food Innovation Network
Arla Foods AMBA	National Food Agency, Sweden	Swedish University of Agricultural Sciences
Asthma and Allergy Association	Probi AB	Tetra Pak Packaging Solutions AB
Aventure AB	Region Skåne	

e-Health@LU: Joining forces for Sustainable e-Health Development

This collaboration initiative wants to contribute to sustainable development of digital services and products in health and healthcare. Researchers from the Faculty of Engineering, the School of Economics and Management, the Joint Faculties of Humanities and Theology, the Faculty of Law, the Faculty of Medicine and the Faculty of Social Sciences are taking part.

Collaboration partners:	itACiH AB	OpenLogger System AB
Axis	Jayway	Primärvården Skåne
Baxter	Kara Connect	Region Skåne
Cross Technology Solutions AB	Karolinska institutet	Relevans Strategi & kommunikation AB
Doctrin AB	Kliniska studier Sverige – Forum Söder	RISE ACREO
Jonas Enebrand AB/eFrid Engaging	Kommunförbundet Skåne	RISE SICS AB
Care Sweden AB	Landskrona Municipality	Sensative AB
Ericsson	Legiteam	Sigma Connectivity
FEAT Consulting	Linköpings University	Skåne University Hospital
FindMyScientist	Linné University	Sony Mobile Communications AB
Helsingborg city	Lunds Municipality	Topp
CPF Malmö	Malmö city	Utrecht University
Halmstad University	Malmö University	Vårdförbundet avdelning Skåne
Hörby Municipality	Medicon Village	VIVE – The Danish Institute of Applied Social Science Research
IBM Sverige	Min Doktor	Zenit Design
Innovation Skåne	Mobile Heights	

The Future of Drones: technologies, applications, risks and ethics

Drone technology is used to tackle a multitude of societal challenges. Researchers are taking part from the Faculty of Science, the Faculty of Social Sciences, the Joint Faculties of Humanities and Theology and the Faculty of Engineering.

Collaboration partners:	Lantmäteriet	Università di Siena
Aviation Capacity Resources AB	Ljungbyhed Air	Vultus
Cybaero	Luftfartsverket	Wrams Gunnarstorp Gods AB
University of Copenhagen	Lund city	

Urban arena testbed

What problems does sustainable urban development face? Researchers from the Faculty of Science, the Faculty of Social Sciences as well as EHL, LTH and The University's specialised centres participate.

Collaboration partners:	Malmö City
Lund Municipality	Nordic City Network

AI Lund

The rapid development of AI technologies brings both opportunities and risks. Interdisciplinary research brings together researchers from the Faculty of Law, Faculty of Medicine, The Faculty of Social Sciences, Faculties of Humanities and Theology as well as LTH and the School of Economics.

Collaboration partners:

AI Sustainability Center	Malmö City
AI Competence for Sweden	Sony Mobile Communications
Ericsson	

Audio Description for Accessible Communication

As digitalization and technological possibilities increase, the number of images and their complexity also increases. How to best use audio description is gathering researchers from the Faculty of Social Sciences, The Faculty of Medicine and the Joint Faculties of Humanities and Theology

Collaboration partners:

The National Agency for Special Needs Education and Schools	The Swedish Association of the Visually Impaired
Audio Description training programme – Fellingsbro Folk High School, Region Örebro	Visual Impaired Youth Sweden
The Swedish Agency for Accessible Media	

LU Land

How do we get long-term sustainable land use? Researchers from the Faculty of Science, the Joint Faculties of Humanities and Theology as well as the School of Economics and LTH gather around this challenge.

Collaboration partners:

Region Skåne	Kristianstad Municipality
Biogas Syd	Swedish Energy Agency
The Good Soil	Swedish Agency for Marine and Water Management
E.ON	Swedish Environmental Protection Agency
Skåne Energy Agency	Swedish Forest Agency
City of Lund	Swedish Society for Nature Conservation
City of Malmö	Trelleborg Municipality
Federation of Swedish Farmers	
Helsingborg Municipality	
Lund Diocese	
Hässleholm Municipality	
RISE	
Simrishamn Municipality	
Rural Economy and Agricultural Society	
Sjöbo Municipality	
Skåne County Administrative Board	
Södra Forest-Owner Association	
Sustainable Business Hub	
Swedish Board of Agriculture	
K2	

EVRACSI

How can we understand and evaluate how organizations perform in the various sustainability arenas? Here, researchers from the Faculty of Social Sciences, the Joint Faculties of Humanities and Theology, as well as the School of Economics, LTH and the University's special activities are brought together.

Collaboration partners:

FAR	Swedish Inspectorate of Auditors
Alfa Laval	Swedish National Pension Funds
KPMG	Swedish Tax Agency
Confederation of Danish Industry	SWESIF, The Swedish Forum for Sustainable Investments
Dfind Finance/Randstad Sweden group	Trelleborg
European Environment Agency	
NovoNordisk	
SEK, Swedish Export Credit Corporation	
Siemens	





Lund University was founded in 1666 and is repeatedly ranked among the world's top 100 universities. The University has 40 000 students and more than 8 000 staff based in Lund, Helsingborg and Malmö. We are united in our efforts to understand, explain and improve our world and the human condition.

LUND UNIVERSITY'S VISION

**A world-class university that
works to understand, explain
and improve our world
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