

news

bulletin

Åbo Akademi University

Spring

2015



Energy and transport have often been regarded as an internal concern for the state, instead of a competitive advantage. This is what we aim to change.



Keeping the shipping industry afloat

BLOOMING WATER | FLEXIBLE POWER PLANTS | AN AMBASSADOR FOR THE NORDIC MODEL | ON THE VERY SPOT | MAKING SCHOOL A PLACE FOR ALL PUPILS | SULPHUR – A QUESTION OF LIFE AND DEATH

Tools for opening up the microscopic world

Studying phenomena at the molecular level greatly contributes to our understanding of them. Therefore the development of microscopy is important for research – and by extension for our lives.

“We now have the instruments and the conceptual knowledge that enable us to really start understanding the progress of various diseases and that of ageing, and also to get more insight into cellular processes and why organs develop in certain ways,” says John Eriksson, professor of cell biology at Åbo Akademi University.

Turku Centre for Biotechnology (CBT) is a unit run jointly by Åbo Akademi University and the University of Turku. The CBT has state of the art and innovative equipment such as, for example, one of the STED microscopes developed by Stefan W. Hell. In 2014, Hell was awarded the Nobel Prize for chemistry in recognition of his work in the development of stimulated emission depletion (STED) microscopy.

Hell worked at the Biophysical Laboratory of the University of Turku in 1993–1996, and he conceived of the idea for the STED microscope during his time in Turku. ♦

Iranian Elnaz Fazeli is studying within the master's programme in Bio-imaging at the CBT. For her thesis on the mechanisms behind osteoporosis, she examines high-resolution pictures of a bone-eating cell, which she can see on a computer screen by means of the STED microscope.

“What we see at higher resolutions are small dots on the membrane of the cell – its “skin” – which fasten onto the skeleton. These dots contain an acid which corrodes the bone and weakens it,” Fazeli explains.

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intro

Water is one of the crucial elements for our survival, communication and societal development. People cannot live without clean water and therefore it is of utmost importance that aquatic systems are kept uncontaminated and that effective water cleaning methods are developed.

However, at the same time we have created circumstances which are increasingly threatening to our waters. Today's agricultural and industrial sectors put a strain on our environment; not least the aquatic environments, where a vast majority of wastewater and other pollutants end up. One consequence of this is an increased occurrence of blue-green algae. This issue contains an article on a new method being developed for eliminating these poisonous algae.

A MAJORITY of all transports still take place on the sea, and harbours are both politically and financially significant for cities around the world. Nevertheless, current sea transportation has to handle the modern day logistical challenges and the ever more strict demands imposed on it as a result of environmental concerns. Åbo Akademi University has started a new research project in cooperation with two top universities in the USA, aiming at creating new solutions for the transport industry. The project is presented in more detail in this magazine.

ÅBO AKADEMI UNIVERSITY holds a broad-based competence in various issues pertaining to water, conducting research on sustainable solutions for global and local problems. Our solid knowledge within marine biology is particularly focussed on the sensitive marine environment of the Baltic Sea.

The university is located in a geographically unique setting close to an archipelago consisting of more than 20,000 islands – the Turku Archipelago, which has been established as a UNESCO biosphere reserve, while our campus in Vaasa is set in the Kvarken marine region, Finland's only UNESCO world heritage site. You are warmly welcome to visit us!

Thurid Eriksson
Head of Communications/Editor-in-Chief



news

bulletin

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Fiction and films depict physical environments in a new light. In spite of the fact that this 'new light' is occasionally of a very dark nature, it nevertheless brings about a renewed interest in the places featuring in the work.

MIKKO HUPA ELECTED NEW RECTOR OF ÅAU



Mikko Hupa.

THE BOARD OF Åbo Akademi University has appointed Professor **Mikko Hupa** as the new Rector of Åbo Akademi University for the four-year period 1 January 2015 – 31 December 2018. In the rectorial election the Board agreed on a profile emphasising strategic thinking, leadership and communicative abilities.

“I like working with people; with people in a group. It’s a good feeling when

you have gathered a group for a project and you see the work progressing. When a new scientific question emerges, the first thought is, naturally, how the question could be answered. But after that I immediately start thinking about who could be part of the group working on the question”, says Hupa on being asked to describe himself as a leader.

“It’s not just about competence. You need to know people and consider how they can cooperate with each other.”

Hupa is professor of inorganic chemistry and one of four professors on the board for the Process Chemistry Centre at Åbo Akademi University.

“Our goal is always to create something scientifically interesting, while also being significant and useful for people and the world.” ♦

IDEAL AGE OF SEXUAL PARTNER DIFFERENT FOR MEN AND WOMEN

MEN AND WOMEN have different preferences when it comes to the age of their sexual partners, and the preferences of women are more often realised than those of men. However, the ages of actual sexual partners display a considerably smaller difference between men and women. According to researchers in psychology at the Faculty of Arts, Psychology and Theology at Åbo Akademi University, this pattern demonstrates the fact that as to the formation of couples and sex, it is women who steer the market.

Informed by evolutionary theory, the researchers suggest that since women are more selective than men in their sexual behaviours, it is less likely for men, compared to women, to have sex with their ideal partners.

For their study of this pattern of age preferences, the researchers collected observations from a population-based sample of over 12,000 individuals. Their results showed that women in general are interested in men of the same age or somewhat older than themselves, and that this pattern is discernible across the entire lifespan of

women. Men, on the other hand, tend to be sexually interested in women who are in their mid-twenties. This tendency appears among men who are both younger and older than that. Men under the age of 20 prefer women who are older than themselves, while men older than 30 years prefer women who are younger in age.

The reason as to why men’s sexual interest focuses on 25-year-old women is that women of that age are at their most fertile. This means that in our evolutionary past men who have had sexual intercourse with women of that age have had more children than men who have had sex with women of other ages. The study shows that evolution has favoured differences between the female and male psychology pertaining to sexuality.

This study only explored heterosexual preferences and sexual activities. Next, the researchers plan to investigate corresponding patterns among non-heterosexuals. The study is a part of the research project “Parent-child incest: Experimental tests of evolutionary mechanisms”, which is financed by the Academy of Finland for the period 1 September 2012–31 August 2015. ♦

ELEVEN DOCTORS OF EDUCATION FROM TANZANIA

THE DOCTORAL Education Project in Tanzania – DEPT – officially commenced in 2007. Since then a large number of postgraduate students from Tanzania have received their doctoral degrees from the Faculty of Education and Welfare Studies at Åbo Akademi University. The first doctorate to be awarded in this collaborative project was completed in 2009. In late 2014 the last two of the 11 Tanzanian students who went on to do postgraduate studies after taking their Master’s degree in education defended their theses and are now doctors of education.

Åbo Akademi University started offering Bachelor’s and Master’s programmes for teacher trainers and administrators from the educational sector in Morogoro, Tanzania within the framework of the Teacher Education Project in Tanzania, TEPT, in 1995. Well over 100 students of education have completed a Bachelor’s or Master’s degree within the project. Both DEPT and TEPT have had a wide impact on the development of education and schools in Tanzania.

“The collaboration has been a success story and enormously important for the participants. A doctoral degree has entailed personal career opportunities and most of them have high level posts within higher education and educational administration,” says **Kristina Ström**, Professor of special education at Åbo Akademi University.

A new development programme called “Competence Development in Education” was started in 2013. It is a three-year continuing education project for teachers, headmasters and administrators within the Tanzanian educational administration. The doctors who have received their degree within DEPT will work as educators within the new project, and one of its basic ideas is to disseminate the research conducted within DEPT. ♦



Blooming water

Cyanobacteria, often called blue-green algae, can cause serious health problems. Treating water containing cyanobacteria with hydrogen peroxide is a new method being studied at Åbo Akademi University.

NICKLAS HÄGEN

The best and most sustainable way of handling cyanobacteria is to avert their mass occurrence. This is done by preventing the eutrophication of aquatic systems which is caused by the presence of nutrients, such as phosphates as a result of human activities such as farming.

Despite efficient sewage treatment works however, there will always be an outflow containing a certain amount of nutrients. Therefore it is necessary to be prepared for quickly treating cyanobacteria when they start to bloom. Such a method for the quick treatment of cyanobacteria is now being sought at Åbo Akademi University by repeating an experiment which was earlier conducted at the Dutch University of Amsterdam, ARCADIS Nederland and Waterschap Hunze en Aa’s. The results so far are promising.

The method consists of treating the water with hydrogen peroxide. “We want to find out whether the method works here in our waters. To begin with, we conduct tests in vitro – in a lab environment on land”, says **Jussi Meriluoto**, docent in biochemistry at Åbo Akademi University.

The water used in the experiment comes from Lake Köyliö. In addition experiments are carried out with Serbian water in cooperation with a research group from the University of Novi Sad, led by Professor **Zorica Svirčev**.

“Some analyses still remain to be done, but the results seem positive. We also have new data on which amounts are optimal,” says Svirčev.

The method leaves no traces

Treating water containing cyanobacteria is not a new idea. Previous attempts to suppress the growth of cyanobacteria have been done by mixing copper sulphate into the water. However, this method is not without problems, since while eliminating the cyanobacteria, copper sulphate also harms many other organisms. Moreover, the method results in the accumulation of copper in the environment.

The photosynthesis of cyanobacteria seems more vulnerable to hydrogen peroxide than that of other organisms, so treatment using peroxide is relatively safe for the environment.

“A positive feature of hydrogen peroxide is that it consists of hydrogen and oxygen, substances which exist in water as it is. When hydrogen peroxide is degraded, water and oxygen is formed, and no foreign substances remain,” Svirčev explains.

In the Dutch experiment hydrogen peroxide was added to a lake with a so-called ‘water harrow’, which disseminates the peroxide below



Lake Köyliö. Photo: Jussi Meriluoto.

the surface. The amounts needed and the exact timing of the treatment for best results are details that are currently being investigated.

“The crucial thing is to nip the blooming in the bud and add hydrogen peroxide at an early stage. There is a constant competition between species and the aim is to make life unbearable for the cyanobacteria so that other species can beat them,” says Meriluoto.

If the cyanobacteria are removed, what is the risk that one problem is simply replaced with another?

“Something, such as vegetable plankton, will thrive and the rest of the vegetation in the lake will use the nutrition available there, just as the cyanobacteria do. But cyanobacteria produce poison, they are the ‘bad guys’ in water,” Meriluoto explains.

“Another alga might perhaps start utilising the nutrients, but there is hardly anything that can cause the same extent of problems as the cyanobacteria. Since they are bacteria, they grow faster than algae. And things that grow fast are almost always problematic,” says Svirčev.

In places the Baltic Sea suffers from cyanobacteria blooms during the summers. Those who hope that hydrogen peroxide will finally provide a solution to the problem will, nevertheless, be disappointed. Treatment with peroxide is effective only in lakes.

“In the cases of such large bodies of water as the Baltic, we can do nothing but admit that the problem is outside of human control, at least when it comes to quick treatment methods. The damage has taken place over many years in the Baltic and it will require long-term work to repair it,” Meriluoto says.

Health risks

The presence of cyanobacteria can cause various health problems such as skin ailments and other irritations; it can also affect the respiratory organs, cause nausea and even hallucinations – in extreme cases it can lead to liver damage and even liver cancer.

Most bacteria prefer warmth and therefore the problem is more severe in the more southerly regions of Europe than Finland. Here we also usually have a good range of water sources, while drinking water in, for example, parts of Serbia, may have to be sourced from lakes. Thus cyanobacteria blooms are a very sensitive political and financial issue.

When cyanobacteria begin to bloom in the water reserves efficient water purification plants become necessary.

“In Serbia we don’t have as many sourcing alternatives as there are in Finland: neither do we have access to the same technology. There is a certain amount of worry in Serbia concerning cyanobacteria. Therefore it’s important for us to come and learn from Jussi and his colleagues about how problems with cyanobacteria are tackled here,” says Svirčev. The official line in Serbia is that tap water is not injurious to health.

Bacteria or algae?

Cyanobacteria have special features because of which they may be referred to as either blue-green algae or bacteria, depending on which approach one chooses.

The cell organisation of cyanobacteria is prokaryotic, like that of other bacteria; in other words, they are single-celled organisms which lack a nucleus. True algae, on the other hand, are eukaryotic. A eukaryote is an organism comprising one or several complex cells in which the genetic material is contained in a nucleus enclosed by a membrane.

However, cyanobacteria differ from most other bacteria in that, like plants, they use photosynthesis: they create energy by means of sunlight. Therefore they can also be called blue-green algae.



Photo: Jussi Meriluoto.

Lake Vrutci in Serbia suffers from red cyanobacteria covering its surface like a carpet. The lake is used as a drinking water reservoir for the town of Užice with approximately 60,000 inhabitants. Cyanobacteria are a serious health risk, and thus place a great strain on the water purification plants. Photo: Tijana Jevtić.

An Ambassador for the Nordic model

A doctoral conferral ceremony was held at Åbo Akademi University in 2014. The degree of Honorary Doctor in Political Science at the Department of Social Sciences was conferred upon President Martti Ahtisaari.

MARCUS PREST

Martti Ahtisaari was the tenth president of the Republic of Finland in 1994–2000. Recognised as one of the world's foremost peace mediators, Ahtisaari was awarded the Nobel Peace Prize in 2008. In his work he has made an essential contribution to the peace processes in, for example, Namibia, Indonesia and Kosovo. He is the founder of the independent peace organisation Crisis Management Initiative (CMI). President Ahtisaari was awarded the degree of Honorary Doctor at Åbo Akademi in recognition of his efforts as a peace mediator and as an avid advocate for the position of the Swedish language in Finland.

– “Mr President, in his memoirs, Tony Blair describes you as highly competent and humble – his appraisal is connected to your peace work in Northern Ireland. What does humbleness entail in the work of a peace mediator? Do you agree with Mr. Blair’s description of you?”

“First of all, I must say I admire Tony Blair. He has been criticised a lot, but if he hadn’t been so active and determined, the result of the peace negotiations would not have been as positive as it was.”

“And if Tony Blair finds me competent, I will not disagree with him. I also checked the quotation you mention, and he actually uses the word ‘modest’. Perhaps it is right to say that if your motivation for participating in peace negotiations is based on an ego trip, you’re in the wrong place. I tend to ask such people to leave the process.”

“To develop the idea of being ‘modest’, it could be illustrated by the following incident: Recently, we had a problem with the radiators in the office, and the rooms turned cold. We phoned a repairman who came and fixed the radiators for us. And I must say that it’s always nice to watch a real professional at work. A professional has no need for ego trips. The repairman knew what had to be done, and he was efficient, very professional. That’s the way I want work to be carried out. This also pertains to peace work. We assist with practical things. The actual agreement has to be made by the parties themselves.”

“In the case of Northern Ireland I usually say: ‘We took on the political process when it was in the intensive care unit: we sent it back after one year, not out of the hospital, but on to the general ward’. In other words, the process was not complete when we turned it over to the parties, but it was manageable.”

– “Is this a description that can be applied to all peace work?”

“Often the negotiations are relatively easy; it is the actual peace building which is the difficult part. Therefore we must also be present after the end of the negotiations and be prepared to assist with practical solutions. Take, for example, Aceh where CMI worked between the years 2005 and 2012. Fairly soon everybody was eager to sign a peace agreement, but with that achieved, the difficult part of the process began. People were elected into the parliaments to lead the adminis-

tration. These were people who totally lacked experience in administration; they had never done anything remotely like it. The newly-elected parliamentary members recruited friends to good positions, only too soon to discover that these friends were not able to produce anything. At that point they had to start looking for people who may have had slightly different political views, but who were professionals and could perhaps achieve the desired results. So the necessity to run an administration bolsters a more professional viewpoint. Small countries cannot behave like the USA, where the entire administration can be replaced after an election. Small countries have to use those experts which are available in the country, and the number of these is limited. It is also important that the peace process takes place over a period of a sufficient duration, since mistakes are made which are all part of the learning process. For us as peace mediators it also means that we come to a much better understanding of the situation.”

“I often use the Nordic model as an example. In our ministries there are administrators who must be able to work for any government. If they cannot cooperate with the current government, they must simply find work elsewhere. Professionalism is extremely important. I myself am a civil servant.”

– “How do you view your work as peace mediator? Do you find that the world is improving or do you experience your work as continual crisis management; or perhaps you view your work in a completely different way?”

“If we’re counting the total number of conflicts, it has perhaps decreased. But there are still far too many undemocratic countries in the world.”

“What I want to show, and what I describe in my pamphlet *A Recipe for a Better Life – Experiences from the Nordic Countries*, is that we in Finland have developed from a poor country into one of the richest in the world, just as all the other Nordic countries have. Our model entails, among other things, managing our country so that differences in income levels do not widen, as they have done in the USA. I’m sad to see the increasing inequality there. It has increased in many other countries, too, also in our Nordic countries. We must make sure to keep development under control. All comparative studies which have been conducted – and there is an enormous amount of documentation – show that the Nordic system has created all the opportunities now on offer, while it has also enabled economic growth and innovative social developments.”

“In 2012 *The Economist* said that if you want to experience the American dream – in other words, if you want to live in a society where all have equal opportunities to succeed – you should move to the Nordic region. We’re witnessing a sorry story in the USA, where the difference between the enormously rich and the middle class has become extreme. The position of the middle class has become very difficult, not to speak of the opportunities for minorities when it comes to education, for example. Today, the USA is a completely different country compared to what it was when I lived there between 1977 and 1991. I do hope the USA will recover, since in its present state it does not serve as a good example.”

“That is why I have produced this pamphlet. I wish to show the Nordic example as a model for the rest of the world.”

– “What do you think has made it possible to realise the Nordic model?”

“The explanation behind the success of the Nordic model has been, and still is, social consensus. The work of the social democrats has made it possible to realise the model in our countries; it was social democracy that enabled the introduction of the system. In addition,



Martti Ahtisaari. Photo: CMI.

however, the realisation of the model has also been dependent on the establishment of consensus between all the major political parties about the fact that this is the desired model; that we want everybody to be involved and have equal opportunities. Nobody has seriously opposed the system.”

– “Following reports in the media here, it would seem that the internal divergences in Finland are on the increase, industries are being sold and closed down, the income differences appear to be growing uncontrollably...”

“We mustn’t forget that we are in the Nordic Region. Compared to the rest of the world, there are no better countries than the Nordic ones. I’m thinking of the welfare model with free, good healthcare, education and so on. The important thing is that we give everybody a chance to succeed. But, at the same time, individuals must make use of the opportunities available, and this must be stated clearly. Each one has to take advantage of it.”

– “So you emphasize the responsibility of individuals?”

“Yes, I do. This means, for example, that one must understand that education and learning continues throughout one’s entire life. Relying only on what one learnt in school, or just one form of training does not necessarily suffice throughout one’s adult life. Continued training also adds to a healthy self-esteem and a good level of self-confidence.”

– “How important is it to take into account the kind of education, do you think – particularly with reference to the humanities subjects, which currently have to fight to assert their value?”

“Regardless of what one’s main subject is, I recommend that everybody takes the opportunity to improve their knowledge in a few humanities subjects, either during or after one’s studies. Everybody needs humanistic knowledge; to lead a good life, if nothing else.” ♦

Solemn traditions

The doctoral conferral ceremony is one of the most formal academic events. In May 2014 Åbo Akademi University conferred 120 doctoral degrees, 14 honorary doctorates and one jubilee doctorate, that is, a doctoral degree that was originally conferred 50 years ago.

The conferred doctors received their doctoral hats, diplomas and swords in the Turku Concert Hall. The ceremony was followed by a service in Turku Cathedral and the day’s festivities ended with a banquet at Turku Castle.

Åbo Akademi University has retained many of the doctoral conferral traditions of its predecessor, the Royal Academy (founded in 1640), which in turn derived its model from Uppsala University (founded in 1477). As far as is known, the first doctoral conferral ceremonies took place there in the 1480s. In addition to the so-called conferral terminology, these old traditions include the use of certain phrases in Latin, sceptres and the conferral of honorary doctorates.



ÅBO AKADEMI UNIVERSITY



Kim Wikström.
Photo: Robert Seger.

Rethinking needed in trade and industry

Stricter limitations on the sulphur emissions coming from shipping came into force at the beginning of 2015, despite strong protests from the industry. A thorough makeover of the infrastructure of Finnish trade has begun in a project with international relevance.

NICKLAS HÄGEN

Trade is experiencing a fundamental change. The old, heavy transport industry based on, for example, paper, metal or minerals is decreasing. Instead, an industry has emerged which sends smaller amounts of material, but with an increased demand for shorter delivery times.

Traditional industrial systems have involved the transport of large streams of cargo that are highly predictable and thus easy to plan logistically. Smaller and more fragmented cargo streams place new demands along the entire transport chain, from producer to consumer.

All aspects of this industrial logistics process is now to be explored by a research consortium led by Åbo Akademi University and carried out in cooperation with Stanford University and the Kellogg School of Management in the USA. This is one of several projects on energy and the transport industry at the Laboratory for Industrial Management at Åbo Akademi University, and it will result in considerable changes in Finland's infrastructure during the next 10–15 years.

Kim Wikström, Professor of Industrial Management at Åbo Akademi University does not hold his fire.

"We have a record number of ports in Finland; close to forty altogether. At least half of them should actually be closed," says Wikström.

"Having many ports is an old tradition, but in our arctic conditions it's an enormously expensive infrastructure to maintain. We have ports with expensive cranes and staff, and ships that arrive at them once a week."

The project is of international relevance. The Baltic Sea and the English Channel will, from the beginning of 2015, be subject to the world's strictest environmental regulations, with the main focus being on sulphur emissions. In the rest of the world the restrictions will come into force in 2020.

In order to comply with these limitations, the industry needs to rethink its processes. For example, the Finnish Transport Safety Agency, Trafi, has calculated that for the ships sailing to and from Finland, a conversion into low-sulphur fuel would entail an investment of 460–490 million euros. The corresponding sum would be 120–140 millions if all vessels were to install exhaust gas cleaning systems. These are very high costs and require extensive work.

"Our country has to work with extremely demanding logistical circumstances as well as the world's strictest environmental regulations. Should we throw in the towel or see this as an opportunity? When my colleagues at Stanford heard about this they were galvanised. The same restrictions will be introduced elsewhere in 2020, so we have an advantage of five years. It's a fantastic opportunity."

"While solving our own country's problems we expect this to also give us an extraordinary platform for innovations which will become part of a global industry. The Mediterranean, the west coasts of North and South America – there are numerous places with similar problems where we can export individual products, systems and organisational solutions."

The objective is something similar to what the late **Steve Jobs**, the owner of Apple, did to the music industry: a total overhaul of old industrial segments.

"Energy and transport have often been regarded as an internal concern for the state, instead of a competitive advantage. This is what we aim to change. It could be said that we will explore an entire ecosystem, which from a theoretical perspective means that we'll study information streams and material streams, and try to identify an ideal set of roles, asking the question of which actors are needed and who has the overall responsibility," Wikström explains.

"We will look at technology, organisational solutions and the information flow from the production unit, the export industry and all the way to the final client. This includes land transport, ports, customs, shipping and handling at the end of the transport chain. We will investigate the entire system."

A new boost

Finnish industry annually uses approximately 34 billion euros for transport, which corresponds to 10–12 per cent of the total cost structure of all enterprises. Shipping represents close to 90 per cent of all foreign trade and will therefore be the first aspect to be brought into focus.

Until a few years ago, Finland had a high position in the World Bank's Logistics Performance Index, but now the country has fallen in the statistics from third to 24th place. The explanation behind this drastic drop is that the usage level of the infrastructure as a whole is as low as about 70 per cent. The average usage of the ships' cargo capacity amounts to only 70 per cent, and the ships might be anchored in port for up to 40 per cent of their time of use. This is not reasonable, either from a financial or an environmental point of view.

According to Wikström, the problem is a lack of collaboration between the various parties involved. In order to bring about an improvement to the situation openness, transparency and new ICT solutions are needed.

Traditional ICT companies, such as Google or Facebook, have an administrator; a central actor that steers or controls the streams of information. Now the trend is to move from a centralised to a decentralised, friction-free information flow directly between users, and not through an administrator.

“A key to identifying solutions in logistics is to receive more exact information at an earlier stage and make correct analyses of it. This is an issue concerning big data.”

If the production industry at an early stage informs the relevant actors, such as ports, of what they intend to produce and when, it is easier to plan for that need. However, current logistical solutions are organised in a completely different fashion.

“Today, enterprises pass on their production information to their acquisitions department, which starts by finding land transport and perhaps opts for paying such a low price that the transport reaches the port more slowly than planned. The ship has sailed quickly in order to be able to load the cargo on Friday, but cannot do so and lies inactively waiting over the weekend while the crew accrue overtime,” says Wikström.

“These are simple and therefore perhaps difficult things to change, since all they actually require is a different attitude and an acceptance of the fact that certain actors are no longer a necessary part of the chain. This is where we must start.”

The project takes the form of a five-year collaborative undertaking between the research unit, the public sector and the industry, which will form the basis for an investment period of 10–15 years. It will involve all elements, including investments in new ships, issues pertaining to ports and establishing start-up companies within ICT.

“Our laboratory in industrial management is located in the field, within the companies. Our role is not only to give advice; we will also contribute to promoting change. We have already participated in negotiations on how the orders for new ships should be made,” says Wikström.

“Over the five years of the project, we will conduct pilot studies and create and implement solutions. We will collect observations, which make up the empirical material for our research. By analysing these we will create concepts, on the basis of tested results, which can be returned to the industry and also used in other contexts.

What kinds of new ships are needed?

“The macro trend is container traffic. Russia, for example, is constructing its infrastructure in order to receive goods from the West to St. Petersburg in containers. This is perfect when volumes are big. But when volumes are smaller, things are more complicated. The optimal delivery of smaller amounts of cargo requires bulk vessels, ro-ro ships with containers. There are various concepts involving feeder ships that sail in and berth halfway, while smaller vessels come and unload them. In addition, there are short sea ships for coastal traffic.”

“Ship owners are a breed who find it unbelievably difficult to cooperate. Their success has traditionally been based on each one developing their own strategies and competing with each other, but in crisis situations we need to join forces. Ship owners seem to enormously enjoy planning new vessels, and all of them think they are best in the world at it, which makes it impossible to create standard platforms. What is needed is a few ship owners who dare to apply the same concept to their vessels. That would mean lower unit costs, getting rid

“All that is required is a different attitude and an acceptance of the fact that certain actors are no longer a necessary part of the chain.

of prototypes and moving on to serial production. The ingredients can, of course, vary. In future, we can't compete with technology, we must compete with intelligence and information flows.”

What characteristics are required of the ships?

“Smaller volumes and the various types of cargo place great demands on the holds. Two important issues are the emptying and cleaning of the holds – a common problem is that goods are contaminated by something that has previously been transported in the same cargo space. Speed is also a key aspect.”

“The part of a ship that makes money is the cargo space. The logistics company Cargotec is a key actor in delivering loading functions. They have already sold their first solutions to Korea, consisting of partition walls, washers and other solutions, as well as a certain level of automation. They don't only deliver a product, but will also participate in the actual use of it. If Cargotec cooperates with 100–150 ship owners, it's obvious that the amount of intelligence and statistics that they can gather will enable them to apply their knowledge to gaining a competitive advantage. By delivering a function instead of just a product, we can compete armed with knowledge. We try to convince the suppliers that they must be function-driven.”

“You should deliver a function in order to make money, and in order for the ship to be fully loaded so as not to make unnecessary demands on the environment, as well as to ensure the crew enjoys their work. When all these three aspects are included, shipping is sustainable.”

“We will develop a new model for shipbuilding; a network yard which doesn't only involve one company, as is the case in traditional models. Here, a small group coordinates the construction. The rest is provided by suppliers. For example, the Finnish shipyard in Rauma has about 500 employees. According to our model, there would be 30–40 persons employed at the shipyard, while the rest come from companies such as Wärtsilä and Cargotec. This model is based on an organisational solution and shared responsibility. It's impossible to provide a single ‘Great Innovation.’

How has the form of trade changed transport systems in recent decades?

“Trade is not at a healthy level because of the way logistics are administered today. It's not globally healthy to order tennis shoes from China or send salmon from Norway to China to be filleted and then back again to be eaten. This is untenable in the long run.”

What is the role of the internet in the changes? Don't we tend to exaggerate its significance?

“No, many large chains have been surprised by the power of e-commerce. It has a massive impact on logistics. When you have a large department store where people come to shop, your material flows are much easier to handle than when all goods are delivered to the consumers' homes.”

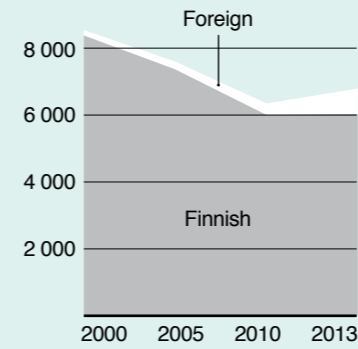
“Finding a solution to this is a very big question. The trend is that people want to be increasingly local. They understand that it's impossible to send things back and forth across the world. Many countries have emphasized the environmental consequences of this, and many consumers protest by not wanting to buy food that is transported over distances that are too long. This is a key issue for us.” ♦

Finnish shipping

Infographics: Erik Nylund

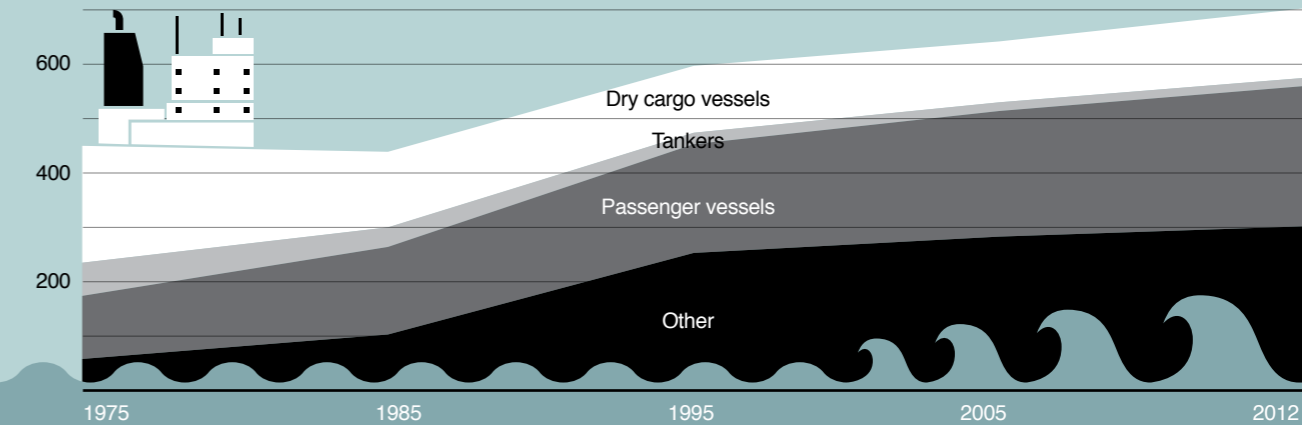
Seamen on Finnish vessels

Finnish and foreign seamen who have been employed on Finnish vessels and Finnish seamen who have been employed by foreign companies.



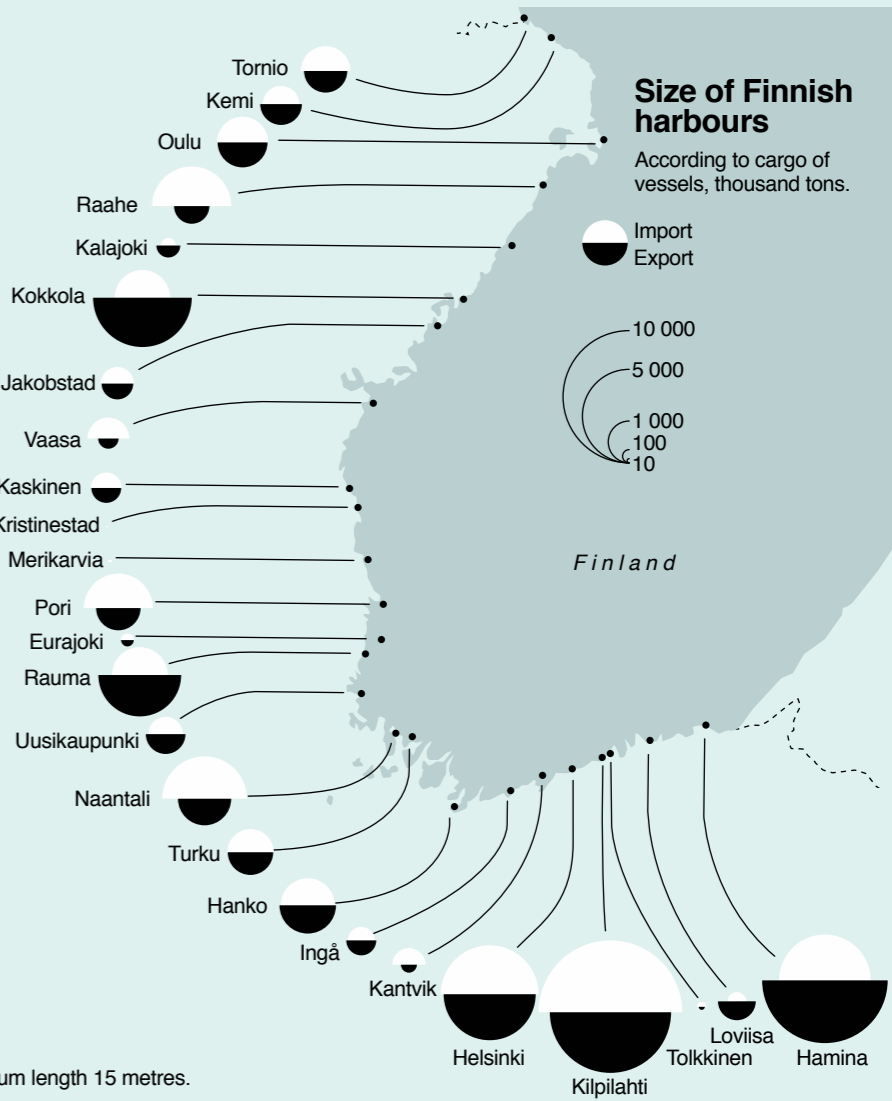
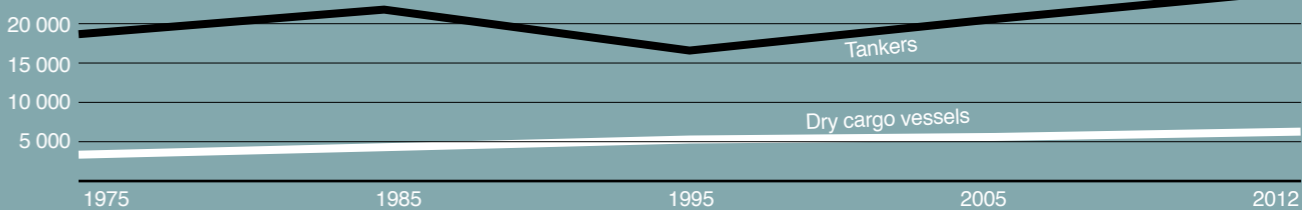
Number of vessels

Registered in the Finnish merchant fleet. Minimum length 15 metres.



Average gross tonnage

Overall internal volume, cubic metres.





“Adapting ships first to the sulphur restrictions, then to future nitrogen restrictions and thereafter to greenhouse gas restrictions is not financially sensible or sustainable.”

Jussi Mälkiä. Photo: Marcus Prest.

Meriaura shipping company calls for holistic thinking

Jussi Mälkiä is Managing Director of the family-owned shipping company Meriaura, based in Turku, Finland. From the beginning, Meriaura has aimed at taking environmental issues into consideration in all its activities. According to Mälkiä, there is a risk that the implementation of the Sulphur Directive will have an effect exactly opposite to its general intention within the EU with respect to transportation; that is to say, the directive might result in increased lorry traffic instead of road transportation being transferred to shipping routes.

“What is needed is a holistic solution, with the allowance of enough time to take into consideration the total emissions from traffic, as well as a commitment to rebuilding existing ships and constructing entirely new ships so that they will also comply with future environmental requirements,” says Mälkiä.

“Adapting ships first to the sulphur restrictions, then to future nitrogen restrictions and thereafter to greenhouse gas restrictions is not financially sensible or sustainable.”

Mälkiä says that a lot of time was wasted in arguing about whether the sulphur restrictions were going to be introduced or not, since it was obvious that the directive was going to be accepted. According to

him, shipping companies have had far too short an allowance of time to make the necessary changes. The existing exhaust cleaning technology does not work sufficiently well. Nor is there an infrastructure for using gas as fuel; it's impossible to invest in new ships quickly enough, and there is an insufficient supply of bio-oils or alternative oils.

“This means that the shipping companies must run their fleets on more expensive diesel oil, which is the main reason for increased transport costs.”

Environmental thinking

Meriaura's largest investment project is the *Ecocoaster* – the construction of an entirely new type of ship, which will come very close to halving fuel consumption at sea. The *Ecocoaster* will be run on bio-oil produced by the Meriaura Group.

“Currently it seems that the *Ecocoaster* will be by far the most energy-efficient vessel with an ice class. This we will achieve partly by a better hull construction, and partly by using hybrid technology in the fuel system. We'll use a small main engine run on biofuel during normal sailing. In order for the ship to pass through ice, generators are connected to the driving shaft. But the main idea is to use lower power at sea, which in practice means slower speeds.”

A longer time at sea, in turn, requires improved port logistics. Currently Meriaura's ships spend 45 per cent of their time in ports, and 55 per cent at sea. What is needed is a change resulting in the port time being reduced to 20 per cent and the time at sea increased to 80 per cent. This could partly be achieved by recognising that it is not necessary to sail at full speed; only to queue up at the port. ‘First in, first served’ is currently the rule in ports.

“The queuing system should be improved. And the loading and unloading work in harbours should run around the clock for seven days a week in order to shorten the queues. Or alternatively the ports should have a larger capacity in order to be able to service several ships simultaneously.”

Meriaura's fleet of fifteen ships sail on the Baltic Sea and in northern Europe. They move between the major ports which function as central points for the global freight shipping, and annually also visit more or less all of the smaller ports of the Bothnian Sea, which provide the national markets with products and through which local products are exported. In total the Meriaura ships transport about two million tons of goods per year. ♦

MARCUS PREST

Sulphur – a question of life and death

Sulphur emissions, erosion, oil accidents, chemical leaks and invasions of foreign species into new ecosystems – there are numerous examples of the environmental problems caused by shipping.

NICKLAS HÄGEN

In the 1980s acidification was a big problem and it was caused by, among other things, industrial emissions, road and sea traffic, and heating systems. Considerable developments have taken place since then; we use unleaded fuel and factories filter sulphur and oxides out of their waste emissions.

However, developments in the shipping industry have stagnated in this respect and it has, for a long time, been the key agent responsible for the highest levels of sulphur emissions into the Baltic Sea area. According to **Johanna Mattila**, head of the Åbo Akademi University Biological Station in Husö on the Åland Islands, sulphate emissions into the air result in acid rain, which contributes to corrosion and has serious health consequences.

“A Danish study has calculated that the emissions from ships have annually caused as many as 50,000 premature deaths in Europe.”

Sulphur causes acidification when it bonds with water and oxygen molecules, both on land and in the sea, and most damage occurs in the archipelago areas.

The new Sulphur Directive has sparked protests, but according to Mattila, the application of stricter environmental restrictions tends, in the long run, to be a step forward for the industry. For example, the wood industry realised that they could utilise materials that had

“A Danish study has calculated that the emissions from ships have annually caused as many as 50,000 premature deaths in Europe.”

previously been flushed into the sea for making more by-products, and the car industry has developed in only a positive direction since it predicted its own death in response to the introduction of the requirement for unleaded petrol.

“Stricter environmental requirements have often ended in making savings, once the technology has caught up. The problem is that so many of the ships currently in use are still in good sailing condition. Complying with the directive is not expensive when new ships are built and designed in compliance with the required technology, but rebuilding an old vessel entails a large one-off cost and the result is not as efficient,” says Mattila.

The alternative is to convert to fuels which contain less sulphur, but these consist of higher grade oil and are thus more expensive. Another



Sulphur in acid rain

Oil contains 0.1–3 per cent sulphur. When products containing sulphur burn, the sulphur reacts with oxygen in the air and forms sulphur dioxide.

Combustion: $S + O_2 \rightarrow SO_2$

Oxidation: $2SO_2 + O_2 \rightarrow 2SO_3$

When sulphur dioxides react with water, the result is sulphuric acids, which fall to the ground as so-called acid rain. The acids accelerate corrosion and dissolve harmful metals that are poisonous for animals and hinder conifers from absorbing nutrition and water.

Acid sulphate soils are discussed on the following pages. In such soils sulphur is kept bound mainly as iron sulphides (FeS and FeS_2) as long as the ground is covered by water. When the soil is drained and the iron sulphides come into contact with oxygen in the air, they are oxidised into iron hydroxides and sulphuric acid (H_2SO_4), which lowers the pH in the soil and dissolves metals.

future possibility could be to stop using oil entirely and change to liquid natural gas, LNG, instead. However, at the moment we lack an infrastructure which would enable a large-scale transition to gas-driven ships.

Slow improvement

Many European ports are located at river mouths which frequently need to be dredged as new land mass gathers on the seabed. This spreads concentrations of nutrients (such as phosphorus and nitrogen) and other harmful substances; to some extent this is because the area dredged is in water and cannot be closed off, and partly because the sediment removed has to be disposed of somewhere else.

For instance, when the Vuosaari Harbour in Helsinki, Finland, was built, large quantities of TBT (organotin compounds) and other poisons were found; they had gathered at the bottom of the sea when hulls which had been treated with bottom paint had been sandblasted.

Bottom paint residue is very harmful to fish and bottom feeders; the paint is actually used to prevent various organisms from fastening onto the hull of a ship. It is not unusual that new species enter an area by travelling on the hulls of ships and in the ballast water.

“They alter the ecology, but it’s not always all that easy to determine whether a new species has a negative or positive impact on an area, or whether it is simply modifying it. There are, for example, mussels that can enter the cooling water pipes of nuclear plants and thus create a risk, and predator fleas that cause problems by fastening onto fishing nets. However, we haven’t in general had any very extensive problems in the Baltic Sea caused by new species,” Mattila says.

“Usually a new species initially grows quickly in numbers until the rest of the ecosystem catches up. A new balance is thus created, which might, however, also entail financial losses.”

Big ships also cause surges and currents which have the effect of washing the shores close to major fairways clean of fine particles and salts. This results in erosion and creates problems in, above all, archipelago areas which comprise many small islands.

“The surge tears particles from the sediment and the nutrients flow further out, collecting behind islands and forming bilge water. We get thread algae and generally bad conditions in these areas. Eventually



Once they have started implementing the new rules, they might even go further than the original requirements.

this results in a lack of oxygen and the proliferation of rotting algae. The fish disappear and the area is washed clean of bottom feeders.”

Are we sacrificing certain aquatic areas for the benefit of traffic?

“Most fairways are old and even though the size of ships traversing them has grown, we simply continue to use them. Nobody has thought of the implications of this.”

“In some cases it’s good to keep to the established routes, since it means that new areas aren’t exploited. On the other hand, the old fairways can be too narrow for today’s ships, which leads to continued or increased erosion.”

How big an interest in environmental issues do the shipping companies display?

“There are strict rules and recommendations, and when the International Maritime Organization (IMO) decides something, it’s binding. But things progress slowly; a large majority of the member states must ratify a decision for it to enter into force. Various NGOs conduct important work in this respect.”

“Some form of obligation is always needed in order for a change to happen, either through new rules or in that the general opinion grows so strong that the shipping companies must yield. But once they have started implementing the new rules, they might even go further than the original requirements.” ♦

Johanna Mattila. Photo: Nicklas Hägen.



Problems hidden in the soil

Acid sulphate soils contain high quantities of sulphate compounds and are very fertile. However, when these soils are turned by dredging or ditching, processes are started that might have considerable negative environmental impacts, including massive fish die-offs.

There is a large proportion of sulphate in seawater, and sulphates are a natural part of the environment. However, when acidic sulphate soil comes into contact with oxygen, the sulphates and minerals in the soil combine to provide all the ingredients needed for creating sulphuric acid and solutions high in heavy metals. These, in turn, constitute a severe problem.

Peter Österholm, a lecturer in geology at Åbo Akademi University, is chair of an international working group focussing on acid sulphate soils.

“In Finland, acid sulphate soil is an environmental problem, but there are many places in the world where it could be described as an issue of life and death – there are particularly sensitive environments in which cultivating the land in the wrong way might cause conditions that totally destroy opportunities for farming or fishing,” says Österholm.

Research into acid sulphate soils has been carried out at Åbo Akademi University since the 1990s. One area has been to develop methods for identifying so-called potentially acid sulphate soils, that is, soils that will turn acid if oxidation processes start.

In collaboration with farmers, Österholm and his colleagues have also worked on methods for minimising the damage caused by cultivation. One method that has provided positive results and is being developed further is so-called regulated drainage, where the outflow from a field’s covered drains can be regulated. If water is available, it is also relatively easy to pump extra water into the system in order to reduce the level of oxidation.

It is harmful to drain too much – each drained decimetre corresponds to the impact of one year’s acid rain, and in the summer the plants often suffer from drought. This can be avoided by regulated drainage.

“When the desired depth is achieved, it’s possible to store water for the summer. This gives the landowners a better water balance, and it’s a good means of protection against drought if climate change leads to drier summers here,” says Österholm.

A project called Chemical Precision Treatment of Acid Sulphate Soils, PRECIKEM, has



Peter Österholm. Photo: Nicklas Hägen.

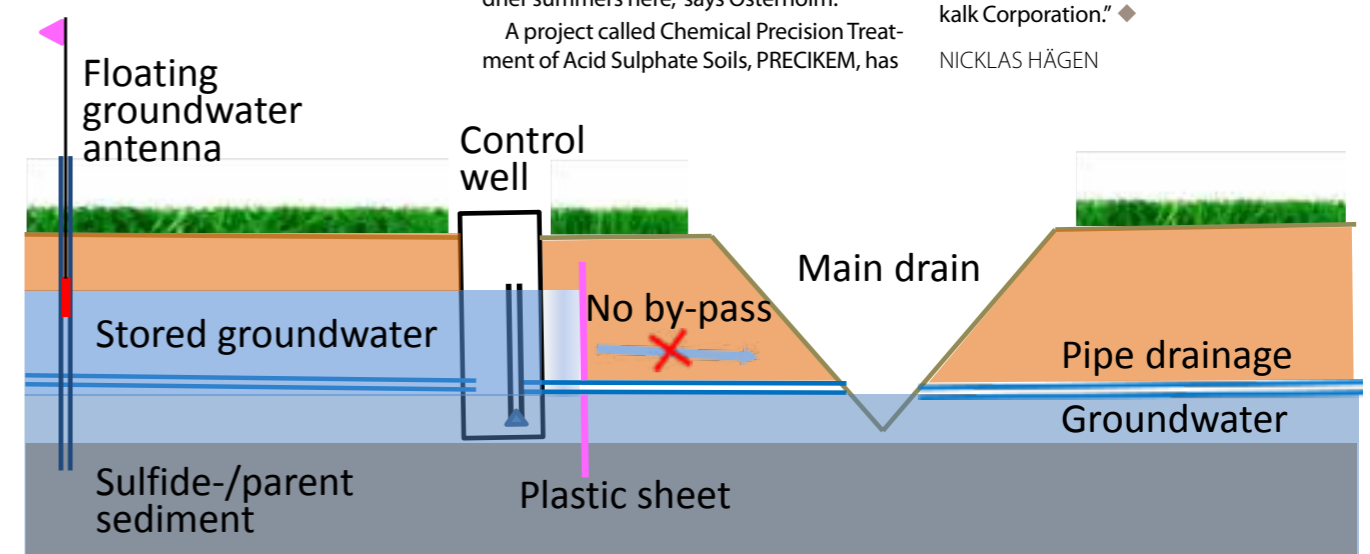
also developed a new method where irrigation pumps are used for pumping neutralising lime into acid sulphate soils. The application of just a moderate dose has been proved to considerably reduce the concentration of aluminium.

Currently the long-term effects are being investigated.

“When spreading lime from above, everything remains on the surface and does not reach down to the critical acid soil layers deeper in the ground. If the lime is pumped through the system in which water normally runs, the treatment reaches the hydrologically active pores, which are of key importance. The problem has been to find lime that does not clog the pores, but we have achieved good results with the finest grade of lime obtained from the Nordkalk Corporation.” ♦

NICKLAS HÄGEN

Regulated drainage



To the left of the ditch: Regulation of the outflow from covered drains using a regulating well and a ‘floating groundwater antenna’ for easy monitoring of the groundwater level. If regulation is started early enough in the spring, the sinking of the groundwater level can be slowed down. **To the right:** A conventional covered drain without regulation. Recreated from Österholm & Rosendahl 2012.

Sustainable industrial ecosystems

The smooth running of a system in one location does not guarantee that it will work in another, despite the conditions being seemingly similar. The establishment of a sustainable industrial ecosystem requires a thorough understanding of all aspects of its life cycle in terms of production and consumption.

MARCUS PREST

The successful establishment of a sustainable industrial ecosystem involves taking into consideration the financial, environmental and social aspects of each of its stages; not just those involved in production processes, but also in the consumption of the products. In addition, potential by-products are recycled at all stages of both production and consumption. In her doctoral thesis in industrial management at Åbo Akademi University, **Anastasia Tsvetkova** has concretised the model of an ecological ecosystem by using the production of biogas as a test example.

“Presently, the production of biofuels is organised according to the same model as the production of fossil fuels. This isn’t sustainable. Transporting biomass over long distances, as is done with oil, is not reasonable at any level at all,” Tsvetkova says.

The key difference between a traditional value chain and a sustainable industrial ecosystem is in the properties of their respective life cycles: in a sustainable industrial ecosystem the individual elements interact in both directions, while the direction in a traditional system is usually one-way only.

“In industrial ecosystems the activities should be organised in a way which is as sustainable as possible for the system as a whole. The flow of raw materials and products should be coordinated so that each participant involved in the system benefits from the others and the greatest quantity possible of the various products of the processes is efficiently utilised. This means that the main product finds its way to consumers and by-products can be re-introduced into the production life cycle.”

“Taking biogas as an example, this requires an understanding of the conditions for production and the conditions for consumption, such as the quantities that must be produced and sold in order for the process to be profitable. And one must also know the cost-structure so that, for example, a local public transport company is able to consider converting the fuel of their buses from diesel to biogas. The bus company needs to have certain information on the long-term price of gas and also have guarantees that gas will actually be available in the future.”

“A conversion to the use of biogas also requires the building of a new infrastructure comprising one or several filling stations for the buses, as well as a consideration of the logistics of delivering biogas from its producers to the filling stations. We should bear in mind that in order for an activity to be truly sustainable, it must also be profitable, not just environmentally and socially sustainable.”

“In a sustainable industrial ecosystem the various elements of the system are in optimal relation to each other internally. That is, they can depend on each other and carry a joint responsibility for the entire system. Sweden has successfully introduced this kind of ecosystem in local public transport.”

Why does a similar system not work in Finland?

“One aspect of the argument in my thesis is that a complex system which works in one place does not necessarily do so somewhere else.”

“The reason why biogas buses have not gained a foothold in Finland is due to cultural differences at a practical level. The environmental conditions are more or less the same; it’s cold for half of the year, and so on. Also the organisation of society is similar. But it seems that people in Sweden generally are less cautious and more willing to test and introduce new systems.” ♦

Anastasia Tsvetkova. Photo: Marcus Prest.



The numbers of pupils from Muslim or other minority religious backgrounds are increasing in Finnish schools. This brings teachers face to face with new questions concerning everything from fasting to the structure of teaching.

Jenny Berglund. Photo: Klas Backholm.

Making school a place for all pupils

Jenny Berglund is a docent in comparative religion at the University of Helsinki in Finland, and a researcher at Södertörn University in Sweden. **Mårten Björkgren** is a lecturer in the didactics of religious education at Åbo Akademi University. Both argue for the viewpoint that it isn’t enough that it is only the teacher of religious or philosophical education that introduces various types of religions to pupils.

“It’s often the case that the responsibility for multi-religious issues is left to the teacher of religious education to handle. But it should actually be dealt with by all teachers and in the school environment as a whole,” says Mårten Björkgren. During the past year he has arranged, together with his colleagues within teacher training at Åbo Akademi, several seminars on how future teachers should approach the subject of Islam in schools. The task of school education is not only to provide pupils with knowledge and information on what religious diversity is; it should also give the pupils a sensitive and curious attitude towards this diversity. Teachers should be prepared to guide pupils in their encounters with people who, for example, wear different clothes or observe other traditions than their own.

“In a school environment religion takes the practical form of various arrangements,

such as signs in the dining hall clearly indicating what Muslim pupils can eat,” Björkgren explains.

Jenny Berglund has studied how religious minorities can be included in teaching at various levels. In her doctoral theses (2009) she explored how Islam is taught in religious charter schools (‘friskolor’) with a Muslim focus in Sweden, and her recent research has focussed on the teaching of religious education in four countries in the Baltic Sea area.

In Finland, pupils are introduced to other faiths within the teaching of their own religion, or in philosophical education. Teachers are aware of variations within their ‘own’ religions, as it is obvious for those living within communities characterised by that religion. According to Berglund it is, however, easy to resort to generalisations when talking about other religions, as one does not have equally extensive knowledge of that subject. The variation that teachers need to demonstrate exists at many different levels – not just between groups with different interpretations of the religion, as for example Shia and Sunni Muslims, but also on an individual basis.

“Just like everybody else, Muslims behave in various ways. Islam is not one single entity; there are enormous variations and numerous different interpretations of it. One of the most important aspects of the teaching of Islam is

the highlighting on this variation,” emphasises Björkgren.

“There is a tendency in textbooks and teaching to speak of people from other faiths as if they were robots. The teacher might say something like: ‘All Muslims pray five times a day’. But they actually don’t – there is an aspiration to do so, but far from all Muslims follow this ideal.”

Mårten Björkgren is responsible for the training of future teachers of religious education in the Swedish-speaking schools in Finland, and he thinks that his students need to challenge their own views of society, religions and cultures.

“The undertaking of future teachers is to be a good teacher to all pupils as well as a person who doesn’t shun or problematise things that are somewhat different from what they are used to.”

Björkgren is convinced that the teaching of, for example, religious traditions, can be turned into something which is fun and which in addition to the actual religious education curriculum might involve projects across various subjects focussing on the interesting features from all of the religions represented in the school. This will automatically illustrate the diversity of cultures and lifestyles. ♦

KLAS BACKHOLM

Flexible power plants

Seth Ndayishimye is part of a core group that administers power plant construction projects covering everything from design, delivery, construction and start up. Since the circumstances in which Wärtsilä builds power stations vary greatly, the logistics of each project are challenging.

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Wärtsilä Power Plants in Vaasa, Finland, builds power stations all over the world. Products which are particularly interesting for countries in Africa and Asia include Wärtsilä power plant engines which can be run on heavy oil, light oil and gas with a short switch-over time. The energy source can be varied according to what is available.

The engines may also be switched off and on at short notice; thus they can be kept in stand-by mode and only run during peaks in electricity consumption. This flexibility enables larger infrastructure entities to optimise its energy production according to both season and time of day.

“Wärtsilä’s power plant customers can be divided into three categories: governments; independent power producers – that is, enterprises that order the power plants from Wärtsilä and sell the electricity produced to governments; and companies that build power plants for their own consumption – for example, within the mining industry. Cities and large-scale industries install Wärtsilä power plants when they cannot rely on the energy supply from the national grids,” says **Seth Ndayishimye**, Project Controller at Wärtsilä Power Plants. He has two degrees: a Master of Technology in Engineering and a Master of Economics, both from Åbo Akademi University.

“Mining companies in areas with an unstable energy supply buy our 10–20 megawatt power plants. They might use them solely for their own needs, but they can also sell energy to the national grid if they don’t need all the power they produce.”

In connection to the flexible power plants Wärtsilä has also launched a concept called Smart Power Generation. It is based on mapping the client’s – a city’s or even a country’s – infrastructure, energy supply and energy needs across all the hours of the day and all the days of the year, in order to create a dynamic network of energy sources and power plants that can be started up when necessary and when it is most profitable to use the specific energy source.

Energy networks which have an extensive system of environmentally-friendly energy generation, such as wind and solar power parks, are sensitive to changes in the climate. Stand-by power plants that can be switched on more or less without delay enable a more efficient utilisation of available green energy, as it is possible to quickly respond to sudden changes in the weather conditions. Similarly, these



power plants can be used to compensate for sudden changes in energy demand in cases of cold spells or heatwaves.

Supplementary power plants that can be quickly switched on also make it easier to adapt to the process cycles of energy-intensive industries.

“We’re currently running pilot projects in Denmark and Holland, both countries which produce a large part of their energy by solar, wind and water power. We take all producers and consumers into consideration to make an overall plan.”

In his work as a project controller, Seth Ndayishimye is part of a core group in Vaasa that administers power plant projects. The first phase of a project – finding a client and negotiating a contract – is handled by the marketing department. After that, Ndayishimye and the rest of the core group take over.

“All work pertaining to the construction of a power plant is coordinated in Vaasa, according to the model ‘Initiate, Plan, Execute, Monitor and Evaluate, and Close.’ The plans and component orders are done according to the design. After that, components and modules are put together to be transported to the final destination, either by sea, land or plane, or a combination of these depending on what is most reasonable.”

The design always aims at a structure where the individual components can be combined into modules which are as large as possible. The building site must be surveyed and prepared.

“We must, for example, know how the foundations are constructed and what reinforcements need to be added before the modules can be installed.”

The modules are then transported to the building site where a team of engineers and construction workers wait to start the construction. Engineers, builders and experts might all come from different countries and represent different cultures. When the power plant is completed, test runs are conducted and the station is connected to an electricity grid. Once the power plant is producing electricity, Wärtsilä evaluates its performance together with the client – as both want to ensure that the power plant conforms to the contract and that all details work as they should.

“We have supervisors for each technical area at the building site, who continually report to their contact within the core group at the office in Vaasa. If problems appear or if some phases are behind schedule, we immediately allocate extra resources to catch up.” ♦

Seth Ndayishimye

Seth Ndayishimye came to Finland from Rwanda in 1995. He completed his secondary school in Närpes, Finland, in 1995–98, graduated with a Master’s degree in Industrial Information Technology from Åbo Akademi University in 2006 and completed an additional Master’s degree in Industrial Management at Åbo Akademi University in 2014. He is fluent in Swedish, Finnish, English, French, Rwandan and Swahili.

“When I came to Finland I saw only opportunities. I took far more courses in secondary school than required, and did so also within my first Master’s degree. I used the extra studies as courses for my second Master’s degree. You just go to the library and read. Everything is available.”

Seth Ndayishimye is 37 years old and lives in Vaasa.

Energy technology in close cooperation with industry

The Energy Technology Programme at Åbo Akademi University in Vaasa commenced in the autumn of 2011. Students graduate from the course as Masters of Technology in Chemical Engineering with energy and environmental technology as their main subject.

“We have a separate admission procedure for engineers with a Bachelor’s degree, so new engineering students cannot start the course directly; they have to apply and be admitted,” says **Margareta Wihersaari**, Professor in Energy Technology at Åbo Akademi University.

There is an interest among both recently graduated engineers and more experienced engineers active in working life in joining the energy technology programme. According to Wihersaari, the difference between this and many other engineering programmes at universities in Finland is its successful combination of science and applied studies, which is possible because most of the students already have a basic degree in engineering. Issues such as the energy balance in real systems are explored and the subjects studied include process control as well as process design and systems engineering.

“We focus on knowledge with a direct practical application. This is possible as our students are often directly associated with the industry,” explains Wihersaari.

“One of the advantages of contacts to the industry is that we don’t need to put much effort into finding suitable subjects for the students’ theses. They have a very clear idea of what they need to study and what they want to achieve by their studies.” ♦



“We focus on knowledge with a direct practical application. This is possible as our students are often directly associated with the industry.”

Margareta Wihersaari.
Photo: Susanna Kääntä.

Fiction and films depict physical environments in a new light. In spite of the fact that this 'new light' is occasionally of a very dark nature, it nevertheless brings about a renewed interest in the places featuring in the work. For example, tourists who have no prior connection to the place or country in question are prompted to visit the location in order to follow in the footsteps of one of its fictional heroes.

MARCUS PREST

Amongst recent works of fiction set in the country, it is **Stieg Larsson's** *Millennium* series, which gives an imagined description of contemporary Sweden, that has had the greatest impact on the way the country is perceived.

Joakim Lind at the School of Business and Economics at Åbo Akademi University, studies the connection between fictional stories and the places in which they are set. Before starting his doctoral research in this field, he did a study for the Swedish Institute on the impact of the *Millennium* novels on perceptions of Sweden.

His general conclusion was that Larsson's series has created a more culturally diverse and accessible image of Sweden, attracting more foreigners and foreign journalists than had previously been the case. For example, French journalists have welcomed these novels, which challenge the traditional, stereotypical image of Sweden as a self-righteous welfare state, putting forward a narrative which more effectively facilitates discussions concerning Sweden and the current challenges facing the country. Although fictional, the *Millennium* story reflects sensitive issues pertaining to the country's post-war period. The novels have been claimed to have a therapeutic effect.

"One of the reasons that Nordic crime literature is so popular is probably the stark contrast between the content of the narratives and the stereotypical view that Nordic societies are well-ordered and high-functioning with no major social problems. Setting narratives about criminality and murders in such environments creates a dramatic impact", says Lind.

Stieg Larsson was an investigative journalist very much involved in anti-racism and dealing with social problems. For Lind it is interesting that it was only when Larsson used a fictional form to present the image of Sweden and issues he regarded as important that his work began to attract attention.

In his thesis, Joakim Lind doesn't focus only on the *Millennium* series; the phenomenon he studies concerns popular fiction in general and the connection to the places described in the stories. This also covers many narratives associated with real places in the world, which, however, do not necessarily have a real connection to that place. The TV series *Game of Thrones*, for example, has attracted attention to certain places in Croatia, although the world depicted in the series only exists in fictional form.

"Whether or not a story is totally fictional and set in an entirely fictive world doesn't seem to be significant in terms of the extent to which it generates interest in a place. The underlying plot in the *Millennium*

novels describes real problems and real places. *The Lord of the Rings*, however, depicts a fantasy world, but because of the location for the shooting of the films, the world of the novels has come to be associated with New Zealand, which has attracted a lot of attention to the country and brought in many new tourists."

The connection between the world of *The Lord of the Rings* and New Zealand has, in fact, become so strong that plans to shoot the *Hobbit* films – which are set in the same fictional world as the *Lord of the Rings* trilogy – somewhere else provoked massive protests. It was claimed that naturally the *Hobbit* by **J.R.R. Tolkien** must be set in New Zealand and nowhere else.

"It's difficult to predict what kinds of narratives and films will have an effect on visitors to the places in which they are located. One prerequisite for a significant impact is, of course, that the story reaches a wide audience – and that the place is identifiable. But a film may not necessarily be shot at the place designated in the manuscript. One example of this is *Star Wars*, which was filmed in Tunisia, Norway and other locations. There are also examples of films that are shot at one location, but actually depict another non-fictional place. This can generate tourism both at the filming location and the actual place where the story is set."

All exposure is generally positive

One instance of the above, as well as of the unpredictable effects of a film, is the case of *Borat*, which purported to be set in Kazakhstan (but was actually filmed in the village of Glod in Romania). Initially, the Kazakh authorities disowned the film since it could be seen to be ridiculing Kazakhstani culture. However, as the film actually attracted widespread interest in the country, with a tenfold increase in tourist visa applications, the authorities changed their minds in order to make use of the interest in their country that had been sparked.

Another case is that of the town of Forks in Washington in northwest USA, which is reported to have been unprepared for the tourist invasion following the *Twilight* novels and films. A few years ago, the annual number of tourists to the location increased from 10,000 to over 70,000.

"There is an increasing interest in film and literary tourism among municipalities, regions and the industry, but the effects discussed are often anecdotal. They usually refer to a very limited area and therefore seemingly great impacts may be reported. The aim of my project is to contribute to an increased understanding of the relation between a story – a fiction – and its setting. My empirical material consists of phenomena within popular culture where the story in a book or film can be assumed to have ascribed certain values to a place and region, by, for example having influenced the image of the place or contributed to its economy."

"I actually don't want to use the concept of 'place branding', since it suggests an active and conscious attempt at connecting certain places to fictional stories."

Lind says that cases where the aim is too obviously to market a location – where a story about the place is written 'to order' – almost always fail.

"But there are exceptions; or at least cases where an early involvement in the project has proved valuable for the promoters of the location. Such cases include for example *The Bridge*, *Gangnam Style*, *Finding Nemo* and *The Lord of the Rings*. Other good examples are **Woody Allen's** films, which are set in various European cities. I also think that the branding work on Rovaniemi as The Official Hometown of Santa Claus is a good example of a fictional story being successfully included in the promotion of a place, resulting in impacts both on tourism and finances."

Lisbeth Salander. Photo © Universal Sony Pictures Home Entertainment Nordic AB.

On the very spot

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It's difficult to think of any examples where exposure has resulted in negative impacts. Hotel Rwanda is perhaps such a case, but then again, Rwanda isn't – or wasn't ten years ago – a place tourists would have wanted to visit anyway.

“Generally, all kinds of exposure seem to be positive. It’s difficult to think of any examples where exposure has resulted in negative impacts. *Hotel Rwanda* is perhaps such a case, but then again, Rwanda isn’t – or wasn’t ten years ago – a place tourists would have wanted to visit anyway.”

What works?

There are also differences in the ways local bodies attempt to make use of the publicity they have received through fictional stories. For Joakim Lind Ystad and Skåne in Sweden have done so rather elegantly, in respect of **Henning Mankell’s** *Wallander* crime novels.

“Something must be done, but it’s crucial not to overdo it. There shouldn’t be any extreme exploitation, and Mankell himself has carefully seen to that. The Bridge, also, is perfectly aligned with the stories that the promoters of the Swedish Öresund Region wish to tell – and it’s told in the popular ‘Scandi-crime’ style. If there is a dialogue between the authors of the crime series and regional stakeholders, this might be posited as one of the best examples of good cooperation.”

“We all react in individual ways to films and books. I myself for example am a great fan of **Lars von Trier’s** films and have visited locations in western Sweden where they have been shot. One of these places is the Tjolöholm Castle, south of Gothenburg, where Trier’s *Melancholia* was filmed. I highly recommend a visit there.”

According to Lind, it is also difficult to explain why some stories work and others don’t, and why fiction works considerably better than documentaries. One film with more or less the same tone of voice as the Millennium trilogy is *Lilja Forever*, which, however, has resulted in hardly any kind of surge of attention or tourism for southern Sweden or Estonia.

“The reasons for the success of the fictional character Lisbeth Salander are difficult to pin down. It is, nevertheless, obvious that both the story about her and the character as such function as a kind of personification of the period following the turn of the millennium. They represent both Sweden and universal issues relating to everything from gender equality and violence against women to questions on the kinds of societies we create.”

Lind says that the character of Lisbeth Salander is loaded with symbolism; she is a kind of phoenix figure, perfectly suited to the setting of a post-industrial and post-modern Sweden. The character is also connected to the political tension of the narrative. Stieg Lar-

The restaurant Apteekki (The Pharmacy) in Turku, Finland, features in the Finnish author Reijo Mäki’s books and films about the private detective Jussi Vares. Picture: Marcus Prest.



Joakim Lind

Joakim Lind is CEO of Cloudberry Communications, based in Stockholm, Sweden. He has studied place branding and how film and literature influences the places referred to in fictional narratives for the Swedish Institute, among others.

Lind has a degree in social sciences and has previously worked within environmental analysis and education. For the last ten years he has been a branding and PR consultant focussing on place branding and destination marketing. He has also conducted several analyses within projects related to film tourism based on, for example, *Wallander*, *Millennium* and *Inga Lindström*, which is very successful in Germany. Joakim Lind is working on his research project at Åbo Akademi University in parallel with his ordinary day job.



son was a social democrat and represented social democratic values. He shows how the authorities have gone to the bad and are exploiting Lisbeth Salander, and he also points to Sweden’s Nazi past, among other things.

“The point he makes is that we need a kind of social democracy where individuals have to reassume their responsibilities rather than blindly trusting the powers that be. Why all this works as it does; why the story has enjoyed such international success; and why it generates widespread interest in Sweden and Stockholm are of course questions which are difficult to answer. But Stieg Larsson’s legacy, which is reflected in and interpreted through the Millennium novels, and vice versa, certainly enhances our interest in both. The author and his story are like a dance, in which the location – Stockholm, Sweden and Scandinavia – is key.” ♦

The Tjolöholm Castle, south of Gothenburg, Sweden, is a key location in Lars von Trier’s film *Melancholia*. Picture: Thomas Carlén, www.tjoloholm.se.



in brief...

A NEW TREATMENT FOR CHRONIC WOUNDS

A NEW METHOD for healing chronic wounds has been developed by researchers headed by **Mikael Bergelin**, research doctor in inorganic chemistry at Åbo Akademi University. The development team has also comprised researchers from Tampere Technical University and Aalto University.

The method is based on electrically stimulating the wound in combination with comprehensively measuring the effect of the treatment. The invention consists of a wound-healing patch with printed electrodes, an electrical stimulation unit and a measurement unit for detailed monitoring of the condition of the wound.

A series of clinical tests, conducted at Tampere University Hospital, has shown that the system improves existing technology. This is achieved by using multiple electrodes for stimulating the wound and, above all, by the system enabling an objective monitoring of the healing process of the wound and tailoring of the treatment according to the needs of the individual wounds. The system can also be used in combination with compression therapy. Elderly people and diabetes patients often suffer from chronic wounds, which are an increasing problem within nursing.

The MC-Patch treatment system has been invented by Mikael Bergelin and Jan-

Erik Eriksson from Åbo Akademi University, **Atte Kekonen** from Tampere Technical University and **Sami Kielosto** from Aalto University.

The patent the MC-Patch invention has been applied for and the researchers will establish an enterprise for commercialising, marketing and selling the treatment system.

The MC-Patch was one of winners in the Turku Science Park competition “Best Business Path” 2014 for enterprise ideas and innovations with commercial potential by researchers, research groups and teachers from the universities in Turku. ♦

Åbo Akademi University



Åbo Akademi University (ÅAU) is a multidisciplinary and an internationally acknowledged research university in Finland. Åbo Akademi University, with two main campuses in Turku/Åbo and Vaasa/Vasa, offers high quality education in Swedish and English for approximately 7 000 students and has a very low student teacher ratio – class size is often small and teachers have time to assist students individually. Around 1 000 international students study and conduct research at ÅAU.

Internationalization is an important part of all activities at the university and ÅAU offers International master’s programmes taught in English. In a national comparison graduates of ÅAU generally have excellent employment prospects. ÅAU provides a unique, inspiring and international environment for research and education.

For more information, please visit www.abo.fi/en and www.abo.fi/master. ♦

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