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People in
research





Every day people make decisions that affect our lives. At the University of Southern Denmark we want those decisions to be based in fact, knowledge and understanding. With more than a thousand researchers in fields ranging from technology and engineering to history and politics, we aim to improve knowledge of our world and contribute to a better society. And because there is a person behind every discovery, we asked ten researchers at the University to tell their story - and explain what inspires them to know more each day.



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Fighting the bad guys

How do you catch a terrorist? And how do you find the rest of the gang? Denmark's leading researcher in international terrorism, Lars Erslev Andersen, explains

LARS ERSLEV ANDERSEN IS FRUSTRATED. Nervous even. As Denmark's leading international terrorism researcher, he has ample ideas about what does and doesn't work when it comes to tackling the bad guys. And having just returned from the United States, he is fresh with frustration at the latest anti-terrorist tactic: biometric passports.

"It's ridiculous," he says, looking out of his office at the University of Southern Denmark. "It's like every other project just now that's supposed to fight terrorism – a public relations exercise aimed at reminding the public we're at war. What good is it entering my biological details into a database when the details of the ones we want to catch – Osama bin Laden, for example – are not? It's totally half-hearted and almost scarily ineffective."

And his grumblings, while good-natured, don't stop there. The problem with today's war on terror, according to Andersen, lecturer at the University's Centre for Middle East Studies, is that nobody really knows what we are dealing with. The who, why, how and where – the nitty-gritty of terror – remain largely unanswered.

Instead, we are content with an over-simplistic idea of terrorism based on the principle that practical barricades will ensure safety: biometric passports, safeguarding ports, biological warfare training. Of course these mechanisms are important, but the real focus should be elsewhere.

"There are zillions of projects out there to protect us, but most of them do absolutely nothing. Mostly they are just for the sake of doing something. There's no point

spending billions of euros on protecting a nation's ports because terrorists merely find other ways in," says Andersen, who believes the establishment of a transnational European police force – a kind of EU FBI – is urgently required in order to tackle international terrorism efficiently.

"We can't ever fully protect ourselves against terrorism, other than by digging a deep hole underground,

“ We can't ever fully protect ourselves against terrorism. We must go to the root of the problem – the terrorist networks – and tackle it head on. ”

crawling inside and never coming out again. So we must go to the root of the problem – the terrorist networks – and tackle it head on. It's useless trying to protect ourselves against something we can't define, or haven't taken the time to define.”

In demand

But surely the politicians must listen to you as Denmark's most knowledgeable academic on international terrorism? Andersen nods. Yes, government rhetoric shows that his expertise, while it may get somewhat lost in the political bargaining process, weighs heavily with the country's top political circles. And so it should.

The 49 year old is so much in demand in the academic, security and political communities in Denmark and beyond that he has been awarded a national research

grant that will enable him to put teaching on hold and assemble the last five years' work. Finally. It's been a busy few years for experts on international terrorism. First came September 11th, then Madrid, then two wars in the name of the war on terror. World events dictate

that Andersen's home phone rings constantly with calls from journalists wanting accurate descriptions of the bad guys.

"If I knew where the terrorists were, and

what they looked like, I'd tell the police - not journalists!" says Andersen, who regularly despairs at what he describes as the media's fickle attitude towards terrorism. One day all eyes are on new training exercises in preparation for a bio attack, while the next day attention has moved to an exposé of suspected terrorists lurking in the nation's garden sheds. "The focus changes depending on which way the wind blows," he says. "They never look at the big picture."

Thinking globally

From analysing democracy in Yemen's tribal society to studying al-Qaeda's international network, Andersen's work paints a vivid and complex picture of the Middle East and global terrorism. It's no surprise, then, that he takes him all over the world, from Jerusalem and Dubai to Oslo and the United States, where he was a guest researcher at the Monterey Institute for International Studies in Washington, DC.

Now he is part of a select network of researchers across the world investigating international terrorism. And as a leading expert in the field, Andersen was commissioned by Denmark's security police to carry out a strategic analysis of the organisation, rhetoric and recruitment of international terrorism. The year-long assignment, during which Andersen was hounded by the press, which mistakenly regarded him almost as an official secret agent, took him on a fact-finding mission inside one of the most protected buildings in the world: CIA headquarters.

"It was an incredible experience. Not many people make it past those gates," says Andersen, who was aided by no less than five CIA officials. "Suddenly you're standing inside the building you've seen on television and read about in books all your life. It was quite something."

But the question hanging on everyone's lips today is: are we too late to fight terrorism? Two unsuccessful wars in Afghanistan and Iraq mean our track record so far is not good. Osama bin Laden is still at large, terrorist networks are more dispersed and potentially dangerous

than ever before and anti-Western sentiment is increasing every day – with fatal consequences. Andersen shakes his head.

"No, it's not too late. But the US must change its tactics. The administration needs to be more aware that these conflicts require more than just military power before they can be solved," says the academic, taking a deep breath. "There needs to be a whole new balance in our world. It's time we increased international cooperation and tackled the many political and social problems fuelling conflict – that's our hope for truly fighting terror."

LARS ERSLEV ANDERSEN

Age: 49

Title: Security policy historian

Wants: Global terrorism to be analysed politically rather than morally.

WWW.MIDDLE-EAST.SDU.DK



Believing in science

He is one of a handful of scientists around the world with permission to carry out research on embryonic stem cells. Endocrinologist Moustapha Kassem describes his fascination with the tiny creations

YOU NEED TO BELIEVE to work with stem cells. More than just trusting your instincts, you need the wisdom gained from years of scientific research. Because when other people argue that your work on life's most complex matter is immoral – unethical even – you need to know, deep down, that what you are doing is right. Without question. Without hesitation.

Moustapha Kassem believes. As one of just a handful of people around the world with both the permission and knowledge to work on fertilised human eggs in stem cell research, he has to. Denmark is now one of only eight countries in the world to have created a human embryonic stem cell line, cells maintained in vitro for medical or research purposes. Thanks to Kassem's expertise, his lab at the University of Southern Denmark became the first in Denmark to get the go-ahead.

But before transforming this belief into medicine, you need others to believe. Public support is vital for Kassem, who sees his work – which could lead to a cure for diseases such as Parkinson's and diabetes – as an integral part of society.

While Kassem says he would respect a patient's decision to refuse treatment based on research involving human embryonic stem cells, he also believes society should be given the chance to scrutinise his work under the microscope.

"For me it's important as a scientist to be sure that my work is transparent," he says. "Debates on my work can become very emotional. But I think it's vital in a pluralistic society for all ideas to be expressed and discussed in a logical debate. As a physician, I would hate it if my work wasn't celebrated by society."

He leans back to think for a moment, letting the full

meaning of his words sink in. Bright eyes twinkle from behind steel-rimmed glasses, a clear sign that Kassem enjoys the challenge of talking about his work in a broad context. It is a dialogue the 45 year old treasures, and perhaps one good reason for his unquestionable success.

Egypt to Denmark

Kassem came to Denmark as a young man in 1986 to be with his family. Since then his talent has taken him to the University of Aarhus and the University of Southern Denmark, where he now works at Odense University Hospital as a practising consultant and researcher. As if in testimony, a multitude of certificates and awards in Danish, English and Arabic hang on his office wall, giving a speedy chronological insight into his eventful career.

“Scientists across the world are pulling out the stops to make breakthroughs with human embryonic stem cells. We are making big strides forward.”

Today the professor's attention is focused on the cells he has created in the lab since 2003, when a change in Danish law made his work possible. From the 345 fertilised eggs leftover from infertility treatment and delivered to Kassem's lab, the team has created two cell lines. It's not difficult to calculate from a success rate of two in 345 that the work is demanding.

"Our work is labour intensive and therefore very expensive. You don't get many cell lines at the end. And before using these lines we have to be sure that they are



of good quality. We're checking them now. It's too early to say how good they are, but I have to say they look very promising," he says, pointing to a grey, swirling image on his laptop.

Potential to heal

The next step is to manipulate the cells. In theory, they can develop into any cell type: an insulin-producing cell, a new muscle cell for the thigh or a brain nerve cell. Placed inside damaged areas of the body, embryonic stem cells seem to 'know' where they are and transform into the appropriate cell type. Scientists hope that by inserting stem cells in the body during treatment, the transferred cells will act as a kind of 'polyfilla' and repair the damaged area.

"Cells are like human beings. There is nothing unique about them – it's their potential that matters. When used the right way, their potential makes them stand out from the crowd," says Kassem, quickly moving on to another comparison.

"That's not the only way they're like humans. We rarely work with one cell in isolation because it's more difficult. We don't leave them alone. They're just like humans – they need company."

With two cell lines – one of insulin-producing cells that one day might help cure diabetics and one of cells that develop into bone – Kassem's team have niche areas in which to expand. They have also imported five lines from Harvard University free of charge and one from Sweden at a cost of €9,396. With such fierce competition from every corner of the globe, Kassem needs to be on his toes.

"We're competing with a lot of smart people. Scientists across the world are really pulling out the stops to make breakthroughs with human embryonic stem cells. We're trying to be as competitive as possible. And I think it's fair to say that we're making big strides forward," he says.

Gathering expertise

The resources available at the University are key to competing at an international level, says Kassem. In 2005 his team moves to the new Medical Biotechnology Centre (MBC), where scientists from across the world will investigate disease at a molecular level. It is hoped that by working closely together, researchers can share expertise and create a highly productive working environment.

"This is a very visionary undertaking. It's a great oppor-



ABOUT EMBRYONIC STEM CELLS

- > Embryonic stem cells are harvested from early embryos.
- > They first appear about a week after fertilisation and later lead to the formation of all the cells in the adult body.
- > Embryonic stem cells are easier to manipulate than adult stem cells because they have not yet developed into specific cell types.
- > Scientists are exploring their potential to treat diseases such as diabetes, Parkinson's and spinal paralysis.
- > Eventually it may be possible to grow whole organs from them.

tunity for me to be part of this centre, which is full of young and ambitious people with a strong background in biotechnology. With several groups interacting with each other, we've got excellent support and research conditions at the University," says Kassem.

Also based at the University is the Danish Stem Cell Research Centre (DASC), which opened in April 2002 with government funding of €3.1 million and involving nine research groups from Odense, Aalborg and Copenhagen. In January 2003 the Danish Stem Cell Research Doctoral School (DASCDOC) was established with its headquarters at the University. The creation of a national network and PhD programme for stem cell research and related technologies means that the school's original 16 research groups have now grown to 23, with an increasing number of PhD students enrolled and taking courses.

Having talked for two hours, during which Kassem has drawn avid sketches of cells and discussed the challenges of his work at length, time is now up. Before the interview Kassem had been attending to patients down on the ward, and now they await his return. But before he continues with his daily rounds, one question: how successful do you think your team will be?

Without hesitation he answers: "Now is a very interesting time to work in stem cell research. We are part of a huge network of researchers around the world. In our work we hope to add a piece of information to this growing, global mosaic.

"We are trying to understand the ABC of human embryonic stem cells. At the moment I'd say we are probably around A. Sometimes you never even get to Z. But you have to try."

MOUSTAPHA KASSEM

Age: 46

Title: Consultant endocrinologist

Wants: To discover new treatment for degenerative and age-related diseases using stem cells.

WWW.MBC.SDU.DK

Save our coasts

Her message is simple. Environmental economist Eva Roth says it's time we woke up to reality

WHEN EVA ROTH SPEAKS, you listen. As with your favourite teacher at school, her words spark your imagination. She inspires. She urges. She persuades. Do something to change the world, she insists. Believe change is possible. It's not difficult to grasp the reason for her urgency. Coastal zones – and the lives of millions of people and animals – are under threat across the world. Not just in the future, but also here and now. Right on our doorstep. And unless we act soon, the environmental economist explains, we risk losing them forever.

“Protecting coastal zones isn't just something we ought to do. We have to do it. This threat is real. Look anywhere around you and the signs are there: sea levels are rising, people's homes are disappearing, fishermen's livelihoods are being lost. Coastal zones are in urgent need of sustainable management. If we don't do something soon, it could be too late. And that's no exaggeration,” says the straight-talking Roth, lecturer at the University's Institute of Environmental and Business Economics in Esbjerg.

She looks over her coffee with determined eyes, letting the full reality of her message sink in. The human impact on the coastal zone – home to more than half the world's rapidly growing population – has been dramatic in the last 50 years. Global sea levels have risen by between 10 and 25 cm in the last 100 years and are set to increase by another 50 cm in the next 100 years, if not more. Entire Pacific islands are disappearing under water. European cod stocks are rapidly being depleted. Coastal erosion is widespread. And in today's globalised world, decision-makers can't just look after their own back garden. International

cooperation is vital if we are to save our coasts.

And that's where Roth comes in. She is the first Danish researcher on the steering committee of LOICZ, an international organisation with the job of informing the scientific community, policymakers, managers and stakeholders of the relevance of global environmental change in the coastal zone. With 2500 researchers from 130 countries, it's a huge global network. And as a team leader and member of the scientific steering group, Roth is tasked with coordinating the research agenda for one of the organisation's five areas. No easy task, she admits.

It's a demanding post, but one the 50-year-old lecturer welcomes. Having researched resource economy, fisheries and aquaculture since 1981, Roth is more than well equipped for the job, which she poetically describes as 'inspiring the international scientific community'. It is also a valuable complement to her academic work,

“This threat is real. If we don't rectify it soon, it could be too late.”

which involves research, lecturing and teaching an international study programme on biological oceanography run by the University of Southern Denmark and Kiel University, Germany. As a member of the European Association of Fisheries Economists and a former member of a working group on mariculture and the environment at the International Council for the Exploration of the Sea, Roth has no shortage of inspiration for this international agenda.





Let people act

“Empowering coastal communities is the starting point for global change”, says Roth, who was asked to join LOICZ in spring 2004. While statutory regulation is a vital part of a sustainable management plan, it can only go so far without public support. By informing communities of the long-term benefits of protecting their area, local people can understand the stakes and themselves be the instigators for change. It’s a tall order. But according to Roth, it’s the only way forward.

“Only the coastal communities themselves can change this process. We need to empower these people by giving them information. If they understand what is going on

right on their doorstep, you can hope that they will react themselves.

“Otherwise, the short-term benefits of exploiting the coastal zone are just too appealing – and any change will be too late,” says the expert in fisheries economics and management.

“Building change on knowledge is better than building it on politics. In politics you risk too many mistakes and we simply can’t afford to take that risk.”

Change our ways

Before this can become reality, Roth warns, society must make life-changing sacrifices. Our current lifestyle,

where intensive exploitation of natural resources is the norm, will have to make an about-face. Coastal tourism, industrial fishing and the conversion of nutrients and waste must be downscaled to a sustainable level not seen in decades. Anyone who believes otherwise – that they can have their cake and eat it - has not understood the vulnerability of coastal areas today.

But will people accept that? Will we really give up our holiday cottages and cheap fish for the benefit of future generations? Roth has the scenario mapped out in her head. “They will have to,” she says, without hesitation. “Otherwise they will have nothing left.”

Luckily, LOICZ - Land Ocean Interactions in the Coastal Zone – is a good place to start. It is independent and its grass-roots structure means members are highly active in decision-making, which gives participants like

Roth the freedom to set their own agenda. And because everyone in LOICZ is working towards the same goal, Roth says the atmosphere is more relaxed than in conventional research networks, and certainly less competitive. However, academic expertise and amiable colleagues are not enough to be a part of LOICZ, she adds. Dedication, hard work and a healthy dose of idealism are equally as important.

“You need to be idealistic to do this work, which I definitely am. It’s quite idealistic to think that a group of scientists working around the world can actually influence what goes on in the coastal zone,” says Roth, whose network now stretches across the world, from Singapore and Morocco to Germany and Portugal.

“Protecting the world’s coastal areas is a lengthy and complex process. You might never achieve it. But there is too much at stake here not to try. Otherwise it will be a dreadful waste of nature and human life.”

FACT

> More than 50 per cent of the world’s human population lives in the coastal zone.

EVA ROTH

Age: 50

Title: Environmental economist

Wants: Global action to protect coastlines

WWW.SAM.SDU.DK/IME



Size is everything

It is one of Europe's largest and fastest computers. Computational chemist Frank Jensen explains how he built a supercomputer – without breaking the bank

BRIGHTLY COLOURED LIGHTS FLASH in the darkness, illuminating the underground chamber. Yellow. Red. Blue. Green. Outlandish sounds emanate from huge steel columns rising up to the ceiling. Huffing and puffing, puffing and panting, the metal beast toils tirelessly to cool the hot air. If you think your computer behaves strangely, think again. Because this is no ordinary PC.

Standing amidst this remarkable display in a far-flung corner of the University of Southern Denmark, it's clear this is a computer of mammoth proportions. A supercomputer. Twenty-four hours a day, 365 days a year, Horseshoe – so called because of its unmistakable U shape – blinks and hums with admirable intensity as it slaves to complete its epic task: calculations impossible for the human mind.

"Scientific research today involves complex calculations with such huge amounts of data that they would take years on a normal computer. We can't wait that long," says Frank Jensen, leader of the Horseshoe project and lecturer at the Department of Chemistry, against the background buzz of computer activity.

"It's not long since we mapped the human genome. Today the scientific community faces a new set of questions. Without supercomputers like Horseshoe, important questions will remain unanswered. We simply can't do without it."

As one of Europe's largest computers, Horseshoe is well equipped for the job. With no less than 4.7 teraflops - that's 4,700 gigaflops for the computer illiterate - and 950 processors, this is Scandinavia's fastest computer, capable of conducting 4700 billion calculations a second.

In fact, Horseshoe is so advanced that, given a chance, it could appear on the world top 500 list of supercomputers. No problem.

"There's no doubt it would make the list quite easily – and come high up," says Jensen, who estimates it would rank at around 115 on the current list. "But to do that, you would have to relieve it of its current calculations,

“Scientific research today involves complex calculations with such huge amounts of data that they would take years on a normal computer. We can't wait that long.”

and we're not prepared to do that. For us the research is far more important.”

Brilliantly cheap

But how expensive is this wonder machine, you might ask. The world's most costly and powerful supercomputer, IBM's Blue Gene, used for protein science, cost around €83 million. Yet, as Jensen explains, Horseshoe cost a fraction of the price, a mere €1.7 million. Compared with other supercomputers, this is as cheap as it gets. So what's the secret?

"Instead of using expensive material found in classic supercomputers, we use standard PCs," says the 43 year old. "Rather than spending the some €13 million required for a traditional computer of the same capacity, we built a cluster computer – in which are networked to share resources – with everyday components. There's nothing fancy about the materials. You

can buy the parts in any high-street computer shop.”

Each year the Danish Centre for Scientific Computing, the governmental body which ensures researchers access to computer capacity, spends €2.1 million on increasing the country’s computer power. Not only is this the lowest budget in Scandinavia, it is also considerably less than most European counterparts. Researchers at the University, however, decided to use this to their advantage.

“It’s fair to say we’ve been successful because we were poor,” says Brian Vinter, the architect behind Horseshoe and associate professor at the University’s Department for Mathematics and Computer Science, now one of the world’s leading research centres in cluster computing.

“It isn’t that difficult to assemble a cluster computer. What is demanding is designing a program that makes optimal use of its capacity. And we are one of the few teams around the world to have mastered this technology.”

As the first supercomputer in Denmark, Horseshoe also increased students’ interest in scientific computing. Now cluster calculation is one of the department’s most popular courses. “A project like Horseshoe creates close links between research and education,” says Vinter. “With cluster computer technology set to expand significantly over the next few years, these students have skills that are highly desirable in the global marketplace.”

Computer simulation is another of Horseshoe’s many applications. As the scientific world delves into areas such as atomic testing or climate change that are too costly, dangerous or lengthy to measure, computer simulation forms a vital research tool. Horseshoe is currently being used for simulation by a University research team exploring the membranes surrounding living cells.

“The supercomputer allows us to simulate how fats and proteins in cell membranes influence one another,” says Professor Ole G. Mouritsen of the University’s MEMPHYS institute, one of the supercomputer’s main users.

“Without the supercomputer, our research would be extremely difficult. Calculations that would take a year on a normal computer take just a week on this supercomputer. It’s an invaluable tool in our everyday research.”

A global revolution

Meanwhile, another computer system is unfolding at the University. The Grid, a global network linking the world’s computers, will form a huge virtual computer capable of revolutionising calculation capacity within just a few years. While it may sound like the stuff of science fiction, the Grid – which will include Horseshoe – is set to become a reality within a decade.

“The idea is to use the capacity of computers in schools, offices and homes when they would otherwise be switched off. A typical computer uses less than five per cent of its capacity. Instead of standing idle, the memory can be used to carry out calculations just waiting to be solved,” says Vinter, director of the Nordic Data Grid Facility, which is tasked with developing Scandinavia’s grid technology.

“The Grid is currently most developed within research communities. Scientists are using it for advanced calculations. Scandinavia is the only place in the world with a grid linking universities. And within a few years this technology will reach private Internet users in homes up and down the country. We’re working hard on it. It’s a very exciting time.”

FRANK JENSEN

Age: 43

Title: Computational chemist

Wants: To develop computational methods to describe chemical reactions

www.DCSC.SDU.DK

1964 – THE WORLD’S FIRST SUCCESSFUL SUPERCOMPUTER IS MANUFACTURED AND DESIGNED BY AMERICAN SEYMOUR CRAY. THE CDC 6600 WITH THREE MEGAFLOPS OUTPERFORMS MACHINES THREEFOLD.

1985 - CRAY-2, DESIGNED BY CRAY RESEARCH FOR NUCLEAR WEAPONS RESEARCH AND OCEANOGRAPHIC DEVELOPMENT, BECOMES THE WORLD’S FASTEST SUPERCOMPUTER.

JUNE 2000 – IBM UNVEILS ASCI WHITE, WHICH COST €91.2 MILLION. WITH 12.3 TRILLION CALCULATIONS PER SECOND, IT IS THREE TIMES FASTER THAN THE PREVIOUS RECORD HOLDER.

1 SEPT 2004 – HORSESHOE AT THE UNIVERSITY OF SOUTHERN DENMARK BECOMES SCANDINAVIA’S FASTEST SUPERCOMPUTER, COSTING A MERE €1.7 MILLION.

TIMELINE

1997 - THE ASCI RED, DESIGNED TO REPLACE LIVE NUCLEAR DETONATION TESTING, IS THE FIRST COMPUTER TO SURPASS ONE TERAFLOP.

29 SEPT 2004 - IBM’S BLUE GENE/L PROTOTYPE, DESIGNED FOR PROTEIN SIMULATION AT A COST OF €83 MILLION, SURPASSES ESC AS THE WORLD’S FASTEST SUPERCOMPUTER.

Playful science

He is one of Denmark's youngest professors and has a reputation for thinking out of the box. No wonder Henrik Hautop Lund's latest work makes artificial intelligence tomorrow's playground

"QUICK! LET'S HURRY SO WE CAN GET THERE FIRST," is the rallying cry in a busy town square in Odense, Denmark. Fresh-faced girls and boys speed towards a square rubber mat on the ground. "You are blue – we are red," one boy shouts. And almost before the teacher says go, the classmates are in full swing. Hopping, jumping and leaping, the children experiment with their new toy: a state-of-the-art game so new you can't even buy it in the shops.

Sweat is soon dripping from their brows. Puffing and panting, the children catch their breath as they impatiently await the result of two minutes of intense game playing. The red team beams as they are declared the winners. Eight-year-old Amalie is one of them. "It's great fun," she says, trying to get her breath back. "I'd love to have one in our school playground."

This is the world premier of Body Games, an innovative IT project masterminded by researchers at the University of Southern Denmark. It's set to revolutionise playgrounds up and down the country, according to Henrik Hautop Lund, professor at the University's Maersk McKinney-Møller Institute for Production Technology. Not just because it's good fun, but because the art of play is in desperate need of a revamp in the 21st century.

"Obesity and obesity-related diseases are on the increase, partly because children are playing less physical games than even just ten years ago. Playgrounds are still there, but computer games have taken the place of many traditional games. Kids simply aren't getting enough exercise," says the 35-year-old professor, who developed the technology with an international team of experts from the worlds of teaching, computer games, engineering and playground production.

"We want to capture children's fascination for computer games and instil that in physical play. Not only can we get children exercising more, we can offer them an amazing experience, which – until now – was only possible via a computer game."

In a playground near you

While the toy is still a prototype, Lund says the gadget could soon be a welcome fixture in playgrounds across Europe, where child obesity is at acute levels. The first opportunity for children and adults to try out the technology was at the opening of a new entertainment park in May at Danfoss, an international Danish engineering company, which, along with Kompan, a world leader in the playground industry, contributed €600,000 to the Body Games project. With €400,000 of funding from the

“ This technology is of great value – not just for children but also for adults, industry and researchers across the world. ”

Ministry of Science, Technology and Innovation, the project received €1 million.

"In principle this technology could be in playgrounds in the next few years," says Lund. "It works, that much is certain. We've seen the results and we know that this technology is of great value – not just for children but also for adults, industry and researchers across the world. And that's a great feeling."

Switching off the webcam images, Lund explains exactly



how it works. Using artificial intelligence, the mats sense their surroundings. Once given an input, such as the pressure from a child's foot, the mat processes that information. It then produces an output, light or noise, for example, which allows the child to continue the game.

Child's play, you say? While the game sounds simple, the technology is far from straightforward. It's taken years of research by Lund into robotics and artificial intelligence, but the results have been sweet. With cover stories in *New Scientist* and *Business News*, plus coverage on Sky Television, on the BBC and in the *Sunday Times*, among other places, Lund's research has made him an internationally recognised world leader in robotics. Some of the latest robots were even showcased for the Queen of Denmark and presented to the Emperor of Japan and his family during a Danish state visit to Tokyo in November 2004. Such achievement perhaps explains how he came to be one of Denmark's youngest professors at the age of 30.

"I always try to break traditional ways of thinking. I

“ I always try to break traditional ways of thinking. ”

want to combine the team's knowledge with expertise from other areas. This can mean working with biologists, chemists and even psychologists," says the 35 year old. "I've got a lot of energy. I can set things in motion, follow them through and get lots of people to work together effectively. And make sure that what we do is amongst the best in the world."

Just looking around the office, it's clear Lund is a man of action. Six computers are visible at first glance, with possibly more hidden under all the tall stacks of paper. A Japanese robotics magazine, a souvenir from one of his many working trips abroad, is on top of one bundle. Wires, cables and odd computer components lie scattered around the floor, ready for use in the next experiment. And beside Lund there is a small LEGO figure, on hand for endless inspiration.

But having just returned the night before from Japan, where he presented his research at two international

conferences, the young professor looks remarkably bright. He has a characteristic long, blonde ponytail and bronzed face, the result of a trip just a few weeks ago to a small community in Tanzania, where he explored how people unfamiliar with technology become creative with his new gadgetry. Despite the jetlag, Lund has no problems mustering up energy to talk about his research.

Ahead of the game

And energy he needs. Lund's research into playground technology was declared a potential leading industry in 2004 by the Innovation Council, an international network of innovators tasked with helping Denmark achieve its declared goal of becoming one of the world's most innovative societies within the next decade. Already big business is watching developments keenly. Microsoft Research is sponsoring *Body Games* in the hope that one day they can spearhead production of software for Lund's virtual playground.

In the knowledge that *Body Games* could put Denmark at the forefront of playground technology, Lund and his team are working hard on its next stage – a three-dimensional version in which the playground reacts to the child's position and movements via an electronic sensor similar to a game console fitted to the child. The aim, says Lund, is to let the playground go wherever you go.

"We want it to be as mobile as possible. With a gadget small enough to fit in your pocket, the size of a match box or an mp3 player, you can create your own playground anywhere you want. In the town square, the high street - even McDonalds," he says, grinning. "Traditional playgrounds are disappearing, so we want to create new play space. Where that space is, is up to you."

Not only children will benefit from the robot technology. The sick, the elderly and teachers are amongst the many sectors of society that could use the innovation, which, according to Lund, has almost limitless applications. Already the professor is collaborating with the University of Siena to explore how the robot technology emerging from *Body Games* can help people with dementia in hospital in Italy. The technology could contribute significantly to treatment by allowing elderly people to find their way through corridors, for example, or to play memory games with the light- and sound-emitting tiles.

"Our technology has amazing possibilities. It can help people in many situations across the world, young and old, ill and healthy. Our strength is our ability to create new concepts and work across disciplines," he says. "Seen separately, the different elements in our research aren't that impressive, but together they become state-of-the-art technology of great value."

HENRIK HAUTOP LUND

Age: 36

Title: Robotics and modern artificial intelligence expert

Wants: To create adaptive robot technology that benefits people across society

WWW.MIP.SDU.DK



Always on holiday

Forget hidden tribes or ancient civilizations. Anthropologist Janne J. Liburd studies international tourism, the fastest-growing industry in the world today. And don't think she can't get technical

JANNE J. LIBURD IS NOT WHAT YOU EXPECT from an anthropologist. She doesn't spend months in a tribal village trying to speak like a native. Nor does she attempt to rediscover ancient civilizations using broken pottery as inspiration. Instead, the 35 year old – slim, classically dressed and oozing moderation - is a young professional firmly rooted in contemporary global tourism, the fastest-growing industry in the world today.

But what has anthropology to do with beaches, bathing and budget flights? And what does a tourism researcher do all day? It's all about observing people's habits and values, says Liburd, lecturer in international tourism at the Institute for Business Communication and Information Science at the University of Southern Denmark in Esbjerg. Tourism is a contemporary phenomenon that can be studied and documented just like ancient civilisations. And if that means jetting off to the Caribbean, lounging on the beach and observing the habits of package-deal tourists, so be it. It's all in a day's work.

"As a tourism researcher, you do more or less the same as tourists. You hang out, take pictures, collect memorabilia," says the international tourism researcher. For two and a half years she swapped rainforest and ancient civilisation for sandy beaches and palm trees to complete her PhD on sustainable tourism development while based on St Croix, a Caribbean island sold by Denmark to the US in 1917.

"But many people consider tourism research frivolous. It's too much fun, sun and relaxation, they think. Yet to gain a holistic understanding of an industry or culture, the time-honoured method of participant observation is the only way to do serious anthropological research. And the

industry urgently needs forward-thinking research. Without knowledge or expertise, we risk permanently damaging communities and ecosystems across the world."

Serious business

She pauses. Just a few minutes into the conversation and tourism – a subject many of today's globetrotters feel expert in - is no longer straightforward. Already Liburd is using technical language far removed from family discussions about the annual beach holiday or camping trip.

'Typologies', 'nominal group technique' and 'conceptual

“ Many people consider tourism research frivolous. Yet without knowledge and expertise, we risk damaging communities and ecosystems across the world. ”

development' are just some of the academic terms that rattle off Liburd's tongue in perfect English as she gives a whistle-stop tour of the global tourism industry.

Liburd takes tourism seriously, which explains her appointment in 2005 as chair of the international tourism research network B.E.S.T. E.N, Business Enterprises for Sustainable Travel Education Network. It is the first time an anthropologist has held the position. For the next three years Liburd will steer and coordinate 75 multidisciplinary researchers across the world from the organisation's headquarters at the University in Esbjerg.

Until now, the organisation has been developing teaching materials on sustainable tourism for undergraduate level. However, at the network's fifth annual meeting in Jamaica



in 2005 the focus changed to crisis management. The catastrophic tsunami in Asia, the deadly SARS virus and intermittent terrorist attacks have put security, planning and warning systems at the heart of the tourism debate today.

“We don’t know where the next catastrophe will be. We need to recognise the risks involved in millions of people travelling abroad each year. Developing standards for crisis management is vital if we want to ensure sustainable tourism development,” says Liburd.

“Most travel operators and accommodation providers have a protocol for how employees should dress or how toilet paper should be folded. But the same employees are not trained in handling a crisis or cultural differences during and after a catastrophe. We want that to change.”

Techno tourists

Not all of Liburd’s work revolves around disaster, however. The anthropologist is currently leading 19 public and private partners in developing digital technology for tourists visiting Denmark. After completing a user profile, tourists receive personalised information via their mobile phone before, during and after their stay. This helps plan a journey and ensures tourists don’t miss out on attractions while on the road.

The device, already launched for pilot testing in four towns in Denmark, will be available in a few years. Similar devices are under development in Europe, but none has the same volume and quality of information as the University’s model, says Liburd. Finally, tourists will be

able to replace cumbersome guidebooks with technology that revolutionises the way they plan, experience and relive a holiday.

“The guide gives tourists opportunities they didn’t know they had. Tourists receive information related to their location and interests so they get the most out of their holiday. They can then communicate this information to friends back home and other tourists,” says Liburd.

“It’s not just well-established attractions that are in the guide. It also includes gems off the beaten track and a link to tourist operations adhering to good and sustainable management.

“This device has great potential and can help Denmark become a frontrunner in global tourism. Demand for such technology is high. More and more people want to individualise their holiday. Rather than planning a holiday according to destination, an increasing number of people plan according to interests and activities. This guide makes that possible.”

Sense of adventure

Liburd’s first major travel experience was, like many school-leavers, backpacking around the world. Having worked as a gardener to buy the plane ticket, the 19 year old left her native Denmark to explore Canada, Hawaii, New Zealand, Indonesia and other foreign climes. Money ran out but Liburd worked her way to Australia, finally coming home after 14 months on the road.

But her travels didn’t stop there. Anthropology took her to the Caribbean, where she met her husband, an Englishman of Caribbean descent. The next stop was Houston in the United States, where a “physical and psychological distance” from field work enabled her to write her PhD. After completing her doctorate, she worked at the University of Houston, developing curricula and teaching contemporary anthropology and environmental studies at undergraduate and graduate level.

Houston to Fanø

With Liburd at the helm, the University of Southern Denmark launched the country’s first MA in International Tourism and Leisure Management in 2003. The course, which is taught in English and German, is attracting an increasing number of postgraduate students from across the country each year.

Today Liburd lives on Fanø, a small and idyllic island off

the west coast of Jutland, and commutes to work by ferry every day. Ironically, her parents used to have a holiday cottage there. Having spent many summers exploring the island’s countryside, she was well prepared for the many tourists who descend each year.

Where will she be holidaying this summer? Sunny England, she replies with a smile. Liburd has visited England many times, mostly to visit her husband’s family. This year the family is going camping to see more of England’s green countryside - a change from last year’s city break in Italy. But according to Liburd, that’s quite normal.

“In the 80s, when tourism was less developed, tourists were easy to categorise. Today there are so many choices out there that tourists are less homogeneous. The segmentation categories are becoming obsolete,” she says.

“In that respect I’m a typical contemporary tourist. Married with two children, I don’t go to the same holiday destination twice – unless it was an exceptionally successful holiday. One year I might take a city break, while the next I might go camping. No, the variation doesn’t make my job easier - but it certainly makes it interesting.”

DID YOU KNOW?

Tourism generates 11 per cent of global gross domestic product (GDP), employs 200 million people and transports nearly 700 million international travellers a year – a figure that is expected to double by 2020.

JANNE J. LIBURD

Age: 35

Title: International tourism researcher

Wants: Tourism practitioners to prioritise sustainability for the benefit of future generations.

WWW.BCIS.SDU.DK





The travelling scientist

How did life on our planet begin? Ecologist Donald Canfield goes to the ends of the earth to find out

ASK PROFESSOR DONALD CANFIELD WHERE HE WORKS, and you will get a lengthy answer: Canada, Australia, Israel, Mexico, Chile. Scaling rocky mountain ridges and traversing expansive salt plains, the adventurous scientist travels the world exploring some of the planet's most remote and desolate corners. Because, while his lab at the University holds some answers, the real journey, he says, starts abroad.

"We travel to some amazing places – some of the most extreme environments on Earth," says Canfield, director of the Danish Centre for Earth System Science (DSESS) and professor at the Institute of Biology. "People often ask me if I do my work for the travel. But frankly, we go because they are the only places in the world where we can find answers to our questions. It's that simple."

Canfield and his team at the University of Southern Denmark are on a quest to reveal the history of life on

over 60 degrees centigrade house bacteria in conditions similar to those in which Earth's first bacteria lived. Or on the Australian west coast, where layer upon layer of mineral deposits from bacteria have created huge fossils at the water's edge.

One such clue lies inconspicuously on a piece of kitchen roll in Canfield's office. At first glance it looks like any other rock, hardly noticeable amid the collection of curios, both biological and non-biological, that fills the professor's shelves. But this dark object is in fact the world's oldest rock at around 3.8 billion years old. Together with several other relics harvested on tour, this stone from the 30-kilometre-long Isua complex in south-western Greenland is a vital clue in this journey back in time.

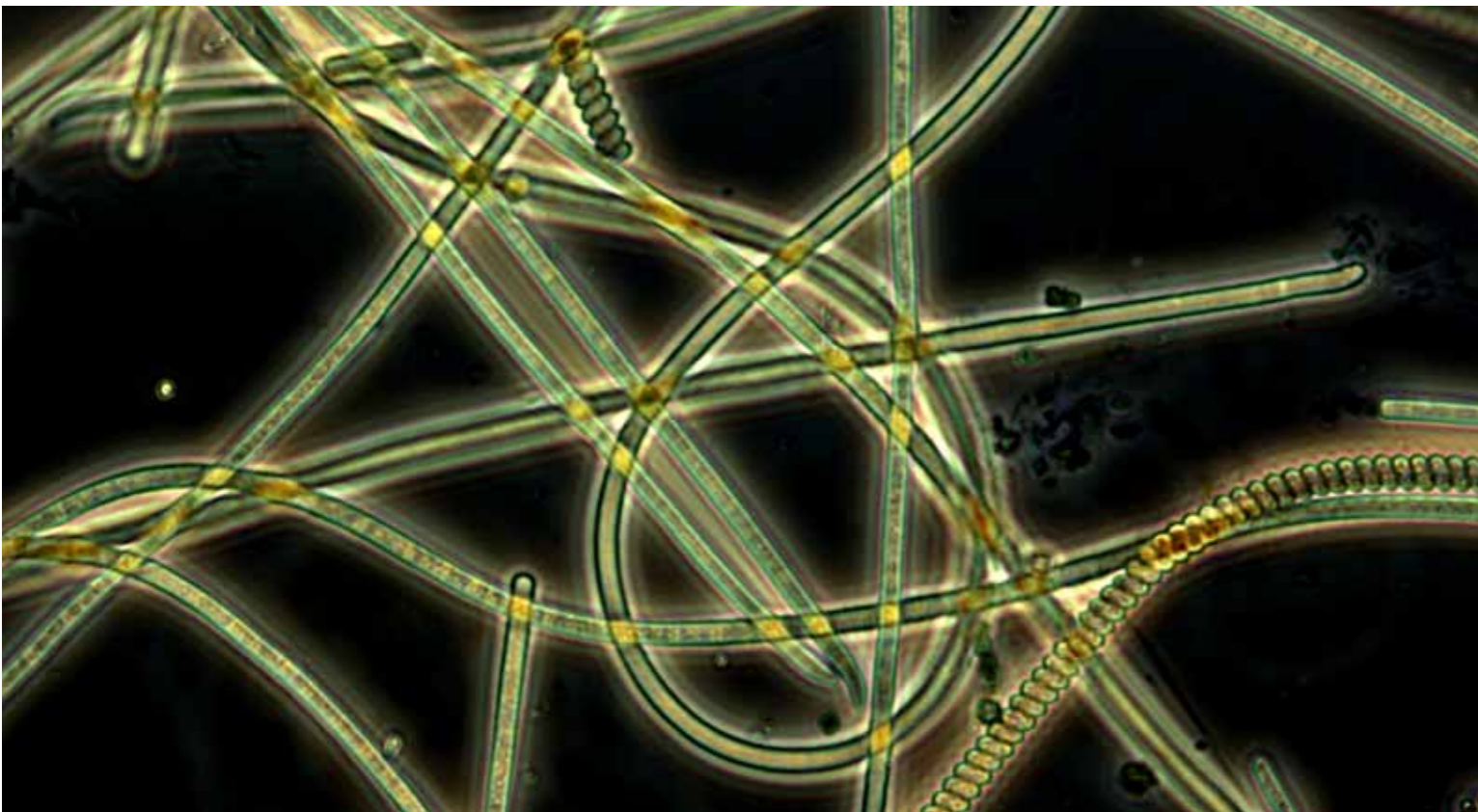
An epic journey

The world looked very different when it formed 4.6 billion years ago, Canfield explains. There were small continents, huge volcanic activity, frequent meteoric activity and lots of water, which was a founding factor for life. But at that time there was still no life on Earth. In fact, the oldest evidence of life on Earth can be found 3.8 billion years ago in chemical fossils such as the one collected from Isua.

By looking at ancient rocks, his team identifies the chemical changes in the oceans and atmosphere that were triggered, in part, by early life on Earth. Under close inspection the Isua rocks reveal possible chemical traces from oxygen-producing bacteria, cyanobacteria. If this is correct, these rocks suggest that oxygen production may have begun very early in the history of the Earth.

“You want to hear what the definition of an animal is? Listen to this. It will shock you. These are your ancient predecessors.”

Earth. The scientists - whose groundbreaking research has featured in *Science* and *Nature* – build a picture of the past by examining clues hidden in our world today. On the world's largest salt plain in the northern Mexican desert, for example, where the lakes are so salty only bacteria can survive. In Yellowstone Park in the United States, where geysers and springs at a temperature of



Despite the possible early evolution of cyanobacteria, Canfield's team showed that oxygen did not accumulate in the atmosphere until long after cyanobacteria first started to produce it. In other words, the atmosphere contained hardly any oxygen for a long period of time.

"The reaction from the international science community was very positive," says the 47-year-old ecology professor, who did research at Yale University, NASA and the Max Planck Institute for Marine Biology before coming to Odense.

"Our work helped establish a consensus on when oxygen levels rose. We've also helped identify a further oxygenation somewhere between 500 million and one

billion years ago. And we've helped establish how high oxygen might have risen during the middle history of the Earth, between about one and two and a half billion years ago. This was a time period of great biological innovation, when algae first arose and, later on, when the first tiny, maybe even microscopic, animals probably evolved."

Your ancestor

Now Canfield's team is digging deeper into the equation to find out whether environmental changes may have influenced the history of animal evolution. Building on previous research, the team is examining the chemistry

of rocks between 800 and 500 million years old to establish whether animal evolution was stimulated by changes in atmospheric oxygen levels. The professor hopes to find an increase in oxygen levels between 600 and 700 million years ago that, in turn, could have triggered the evolution of large animals.

"If we can establish that animal evolution responded to changes in atmospheric oxygen at this time, this will be a very significant finding," says the professor, who will use rocks from British Columbia, Australia, Svalbard, Greenland and China to complete the jigsaw. On a nearby table, carefully tagged and sealed in plastic bags, lie the ancient Australian rocks. The specimens arrived by post a few weeks ago, having been harvested by a specialist team Down Under. Canfield is itching to start the lab work.

"These rocks are going to be critical. They are between 600 and 700 million years old and we don't have much information about that period, so it's going to be really exciting to do the analysis. Several research groups across the world are working on the same questions. So it's a race against time," he says.

"But we're not talking about the evolution of spiders and snakes, rather microscopic creatures. You want to hear what the definition of an animal is? Listen to this. It will shock you. These are your ancient predecessors."

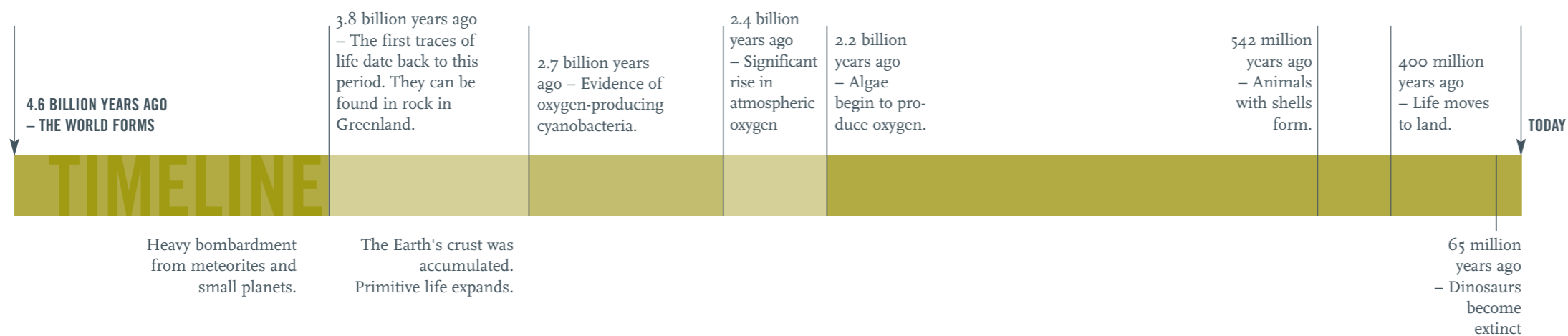
With obvious enjoyment, the American reaches for a dictionary and, in his Ohio accent, reads aloud: an animal is a multi-cellular eukaryotic organism with wall-less non-

photosynthetic cells. Not exactly what you expect from your ancestral lineage. However, the first large animals in the geologic record date back some 570 million years, he says, pointing to an image on his computer. Only 4 cm long, the jellyfish-like creature could not even move in order to absorb as much oxygen as possible. It was not until some 530 million years ago that scientists find evidence of animals similar to those living today. Round and cylindrical, the animals were able to move. They therefore needed more oxygen, about 10 per cent of today's levels, the professor explains.

Open doors

Soon Canfield's research into the history of the world's chemistry is set to assume even greater proportions. Thanks to funding from Denmark's National Research Foundation, the Nordic Centre for Earth Evolution (NordCEE) opens at the University in August 2005. One of only 12 new basic research centres in the country, it will allow Canfield and his team to expand, collaborate with scientists across Scandinavia and make even bigger strides in their research. The prospects, Canfield says, look better than ever.

"This funding will really open doors," says the professor. "In the future we will be able to identify research problems and work on them immediately. The breadth and scope of our research is going to increase enormously. It's incredible, the possibilities available to us now."



DONALD CANFIELD

Age: 47
 Title: Professor of ecology
 Wants: To understand the history of life on Earth and its relationship to environmental change.

WWW.NORDCEE.DK



Fairytale central

How tall was Hans Christian Andersen? Did he wear a wig? Johan de Mylius, a scholar on Denmark's national storyteller, has the answers

ONCE UPON A TIME, there was a man who worked hard. Reading from morning to night all his life, the scholar added to his knowledge until his excellence gained the highest reputation amongst enthusiasts across the world. Soon everyone - young and old, rich and poor - wanted to visit the great man, seeking inspiration from his wisdom. And, much to the man's surprise, they did.

From as far afield as Japan, China, the United States and Germany, people gripped by the man's knowledge visited him at his office. Here he sat, toiling to answer the sea of questions that flooded in day in, day out. In the end, his knowledge was so great that no query was too difficult for this industrious man. Well, almost.

"There will always be some questions I simply don't know how to answer. But that's what keeps it magical. As soon as you have all the answers, the mystery disappears. And we can't have that. No, no, no," says Johan de Mylius, head of the Hans Christian Andersen Centre at the University of Southern Denmark, the only centre in the world dedicated to the 19th-century author.

"We're asked all sorts of questions by all kinds of people around the world: journalists, academics, businesspeople, government officials, theatre producers in Denmark and abroad, as far away as Asia and the United States. Some ask very precise questions, about copyright law, for example, while others ask crazy questions that no one could answer. We get the whole spectrum, that's for sure."

Virtual visitors

He smiles. Luckily for de Mylius, however, these enthusiasts are only virtual visitors. Through the centre's webpage he communicates with Hans Christian Andersen aficionados in all corners of the world. The Internet portal is so popular

that it recently reached a record high of 2.3 million hits in one month, making it the most visited Hans Christian Andersen website in the world by far.

"I like to think of the centre as a kind of open university," says researcher and lecturer de Mylius, who along with his team expanded the portal to create a comprehensive database of information on Hans Christian Andersen. With content ranging from Greenlandic poetry translations and illustrations by Polish schoolchildren to probing analysis of the author's dreams, the website opens up Hans Christian Andersen's fairytale universe to the world.

Looking around the academic's office at the University, you soon appreciate the volume of information involved. Research papers are stacked high on every table, chair and shelf. Books, old and new, cover entire walls. Newspaper clippings ranging from the satirical to the analytical fill any

“Andersen's stories don't really take place in a fairytale world but here, in reality.”

remaining space. Manning the world's main information centre on the Danish writer is, clearly, no easy task.

But this chaos is understandable, with 2005 possibly being the centre's busiest year since its foundation in 1988. Not only is it the 200th anniversary of Hans Christian Andersen's birth, marked by a massive worldwide celebration, for which de Mylius is on call to offer expert advice. It also marks the centre's fourth international conference, part of a long-term plan to build links with researchers abroad. After the last conference took place the United

States, it is fitting that in 2005 academics will gather in Odense, Hans Christian Andersen's birthplace.

Keep the fairytale alive

When de Mylius is not arranging conferences or hosting seminars, he is dashing about the country attending an array of cultural commitments. Tomorrow, for example, he will feature on national radio in a quiz about the great writer. While some researchers may argue that the media have little to do with literary research, de Mylius insists that cultural involvement is necessary – unavoidable even – when it comes to Hans Christian Andersen.

"You could ask: what has this radio programme got to do with research or the University?" says the 60-year-old associate professor, whose office door and walls are covered with newspaper cuttings. "Not a huge deal, perhaps, but it is connected with Hans Christian Andersen. And you can't be involved with him unless you're involved with culture. Andersen is a very broad cultural phenomenon. Sitting at a university doing research isn't enough – you have to go out there and make Andersen part of life today."

And you can see the phenomenon in everyday situations across the world. In China, for example, every schoolchild must read at least one Hans Christian Andersen story over the course of their education. In Vietnam a new edition of Hans Christian Andersen works has just been published, creating a storm in the bookshops. And in Japan a life-size copy of the writer's birthplace stands replicated in a children's theme park, attracting hoards of aficionados each year to the northern island.

But the most remarkable evidence that de Mylius has yet found of the writer's influence abroad was on a Japanese hotel menu, he says, smiling at the memory. Thanks to Japan's own Andersen Bakeries, de Mylius was able to eat a Danish pastry thousands of miles from home. "Okay, so it didn't taste as good as the ones back home," he says. "But it was a good attempt all the same."

Universal

The writer's global success has not been without its drawbacks, however. As countries embraced the literature, they also changed it. In the United States, for example, society could not accept that 'The Little Matchstick Girl' dies. Instead they reworked the story so the girl is adopted by a rich family. In China, Communist authorities found references to God problematic, so they deleted them. Even in

Denmark, de Mylius says, Hans Christian Andersen can be too much to swallow.

"A new cartoon series has changed the story so the bewitched princess doesn't bleed when she flies over to the troll. Nor do you see the troll's head being cut off. It shows that even here changes are being made to the original story so that it can be accepted by today's society," says de Mylius, who has been listed in the prestigious Marquis Who's Who in the World for his contribution to literary criticism.

Regardless of changes along the way, however, Hans Christian Andersen's spirit appears magically immortal. The writer is set to live on in our imaginations and language, with phrases such as 'The Emperor's New Clothes' now being everyday vocabulary. The key to his immortality is frequently discussed, but de Mylius identifies the magic ingredient without hesitation. More than just a storyteller, Hans Christian Andersen had a gift for capturing something that concerns us all: the essence of mankind.

"Andersen's stories don't really take place in a fairytale world but here, in reality. His stories are about psychology, society, life and death, and people, even if they are disguised as objects or animals. He peels away our outer layer and captures our core perfectly. And that message is universal," says de Mylius, admitting that his favourite fairytale is the 'The Tin Soldier' precisely because of its appeal for both adults and children.

"We have many great writers, but Andersen achieved something others couldn't. He allows us to look deep into ourselves, regardless of culture or nationality. It's one thing to create great art. Many Danish writers have done that. But to do it with such universal meaning, like Hans Christian Andersen did, and with such broad appeal, is not just difficult. That requires a genius. Andersen is certainly that."

JOHAN DE MYLIUS

Age: 60

Title: Hans Christian Andersen scholar

Wants: A Hans Christian Andersen dictionary to be published, so readers and translators can better understand his work

WWW.ANDERSEN.SDU.DK

ABOUT THE STORYTELLER

Q: How tall was Hans Christian Andersen?
A: 185 cm

Q: Did he wear a wig?
A: No, but he permed his hair.

Q: Did he travel?
A: Lots, to Italy, Germany, France, Switzerland and Sweden.

Q: Which languages could he speak?
A: Aside from Danish he could speak German, Italian, French and English, to varying degrees.

Q: Could he cook?
A: Not at all. He always ate at friends' or in lodgings.



Following doctor's orders

Spot another wrinkle in the mirror this morning? Ageing expert Kaare Christensen gives a few tips on growing old gracefully

YOU MIGHT HAVE NOTICED THE SIGNS ALREADY. Your earlobes may be drooping, a sign you're reaching 30 years of age. If you're lucky enough to have bags under your eyes and an unsightly saggy double chin you're probably in your fifties, the time when fat deposits accumulate in unwanted places. Or if you're wondering why food has lost its taste you might be in your seventies, having lost a third of the taste buds you had at 20. Ageing, with its aches, pains and Zimmer frames, is no joy ride. And while the signs may vary between individuals, this much is certain: no matter how many wonder creams, herbal remedies or fashionable diets you try, age you will.

But getting old isn't all doom and gloom, according to Kaare Christensen, world ageing expert and professor of epidemiology - the study of health and disease patterns in the population - at the University of Southern Denmark's Ageing Research Centre. While the key to longevity does not lie in a quick-fix, Christensen, who worked as a family doctor before moving into research, says we have more control over our future than we might think.

“Interest in ageing is increasing enormously. The way society is developing, we simply can't avoid the issue.”

His team has provided evidence that we can significantly influence the way we age – far more than previously thought - and radically increase our chances of a long and healthy life. Environmental factors such as diet and exercise account for a staggering 50 per cent of the difference in our physical and mental state in old age, according to the

team's studies. And while the remaining 50 per cent is determined by genetic factors, even their effect can be influenced by your environment. The message? Old age may be inevitable, but your experience is by no means set in stone.

“How you age is, to a large extent, up to you,” says 45-year-old Christensen, fresh-faced and looking deceptively younger than his age. Except for a few sneaky burgers and soft drinks, the non-smoker heeds his own advice, following a reasonably balanced diet and an active lifestyle. As a result, the slim professor is optimistic about old age, despite his relatively poor genetic make-up. “I'm not doomed just because my genetic background isn't the best. Everyone can improve their chances of a long and healthy life. You just need to make a few wise choices.”

Top of the agenda

And the news could not be more welcome. Ageing is one of the biggest social and economic challenges facing Europe today. Of the world regions, Europe has the highest proportion of population aged 65 or over, a figure that is expected to rise. While the ratio of people aged over 65 as a percentage of the working-age population was 24 per cent in 2000, this is set to increase to 49 per cent in 2050. And that's according to conservative estimates.

Not surprisingly, this demographic time bomb has made ageing a top priority for governments, businesses and communities across the world.

From corporate meetings and scientific conferences to coffee mornings and retirement homes, Christensen is in high demand to talk about the implications of his research. Finally, people are sitting up and listening.

“Interest in ageing is increasing enormously. The topic is of such general interest, everybody above the age of





around 30 is interested. Even politicians are paying attention now, acknowledging that ageing research should be top of the agenda. The way society is developing, we simply can't avoid the issue," says Christensen, who has published widely in medical literature, including the British Medical Journal, Science, The Lancet and The New England Journal of Medicine.

"Ageing research is now highly respected in the science world and a hot topic in the public world. The only drawback is that it's difficult to get young people interested. It's

pure theory to them. But like the rest of us, they'll soon realise what all the fuss is about."

Twins reveal

But the professor's achievements would not be possible if it were not for one essential tool: the Danish Twin Registry. Based at the University, the registry is the oldest and most comprehensive of its kind in the world. With information from over 73,000 sets of twins born over the last 125 years, the database is key in determining how genes and

environment influence ageing and conditions such as diabetes, cancer and depression.

"Thanks to the Danish Twin Registry we can conduct research that is only possible in a few places around the world. It's the envy of many science communities abroad," says Christensen, scientific co-head of the registry, which is in such international demand that 90 per cent of its funding comes from abroad. "Geneticists and medical researchers across the world visit the University to access the registry in collaboration with our team. It's a great learning process for everyone involved."

Given that ageing is a global issue, it follows that the professor's network is global. For more than ten years Christensen has participated in an international ageing research program that has its main centres in the United States and Denmark. Christensen's expertise has also taken him to Duke University in the United States, where he holds an adjunct position as a senior research scientist. He is also involved in advisory and working groups for two American research institutions, the National Research Council and the National Institute on Ageing.

And as if that's not enough, Christensen's group is currently also participating in three European initiatives attempting to shed light on the ageing process. Increasing international collaboration is a clear sign, Christensen says, that ageing is moving higher and higher up the agenda.

Pioneering research

But before his next trip abroad, the professor and his team will embark on the final stage of one of their most ambitious projects yet: the world's first longitudinal study of centenarians - people who are at least 100 years old - in which both environmental and genetic information is available. The pioneering project is studying 3000 people born in 1905, having followed them since 1998, when they were 93 years old.

The team hopes to determine whether the 400 or so people in the group expected to make it to 100 years of age have common social, physical, mental or genetic characteristics. Until now, research approaches for studying processes in centenarians have had inherent weaknesses, says Christensen. It is hoped, however, that this study will help overcome those weaknesses and pave the way for more comprehensive research in the future.

"For the first time scientists across the world exploring the ageing process in centenarians will be able to test their

results thoroughly and efficiently. It will be a very valuable resource. Not only will it save time and energy, it will allow the scientific community - us included - to make larger and faster strides into this still largely uncharted area," says the professor, clearly excited at the prospect.

"But it's important that research on ageing doesn't turn into a race to make people live as long as possible. There's no doubt that life expectancy is increasing, with no indication of it levelling off in the near future. Yet breaking records is not nearly as interesting as finding out exactly why people age differently. Hopefully, with that knowledge, we can help people live longer and live life to the full. That's what it's all about, after all."

DID YOU KNOW?

- > The world's oldest person on record is Mme Calment (1875 - 1997). When she died at 122 years of age, the Frenchwoman still had all her mental faculties. She could remember, among other things, how van Gogh bought artwork from her father's gallery.
- > The world's oldest man on record is Christian Mortensen (1882 - 1998). As a young boy, the Dane emigrated to the United States, where he was a businessman until he retired in 1950. He too was sound of mind until his death.

KAARE CHRISTENSEN

Age: 46

Title: Ageing expert

Wants: To increase understanding of how we can live long and healthy lives.

WWW.CAF.SDU.DK



Life on the border

He is Danish, lives in Germany and works in Aabenraa, a Danish town exemplifying border relations at their best. Historian Jørgen Kühl examines the oddities of national borders

AT FIRST GLANCE THE SMALL TOWN in southern Denmark looks like any other in the country. It's ten o'clock in the morning and the locals, undeterred by the frosty chill in the air, are steadily going about their daily business. Rye bread, salami and pickled herring are gradually crossed off shopping lists. But enter a shop, read the local rag or eavesdrop on conversations in the street, and the picture quickly takes an unexpected turn. Goods, for example, are no longer just called by their Danish names: rugbrød, spegepølse or sild. Instead, they are often ordered in German: "Ein Schwarzbrot, bitte," says one customer, ordering a loaf of bread. "Danke schön. Tschüß!"

We're in Aabenraa in Sønderjylland, southern Jutland. A mere half-hour drive from the German border, the town is the administrative hub of Denmark's German minority – Danish citizens who define themselves as having German identity – which numbers 12,000 to 20,000, equal to an estimated five to eight per cent of the region's population. It's here you will find the headquarters of the minority's main cultural organisation, the BDN or Association of German North Schleswigians, which currently boasts some 4,000 members. You will also find the editorial offices of Der Nordschleswiger, the German minority's own daily newspaper, which also runs regular news in German on a private radio station. And if that's not enough, you can't fail to notice the array of schools, youth clubs and cultural organisations for the German minority.

Fittingly located amidst this cultural hubbub, just a few hundred metres from BDN headquarters, is the Department of Border Region Studies at the University of Southern Denmark. It was established in 1976 to study, among other

societal issues in the region, national minorities in the Danish-German cross-border region – unique in Western Europe because of a symmetrical constellation with minorities on both sides of the border. Today, however, the department examines border issues across Europe from every angle you can imagine. From minority research, language and economy to sociology, history and youth culture, its cross-disciplinary expertise has grown to such an extent that it now enjoys the reputation of being a leader in the field.

"With the Danish-German situation on our doorstep, we

“No matter how integrated you are, borders will always make a difference.”

really are at the centre of border issues,” says head of department Jørgen Kühl, who just has to walk out onto the street to experience the subject first hand. “No other border research department in Europe has the same volume, experience or breadth of expertise as us. Our national and international network is extensive. And our work is in high demand from organisations in border regions across Europe, demand we expect to increase in the future. Interest in border issues has increased dramatically in recent years.”

And it couldn't come at a better time. Border issues are more relevant now than ever before, explains Kühl. There are 150 official cross-border cooperation agreements in Europe alone. The EU is expanding eastwards, creating

fresh challenges each year. And although EU politics has focused strongly on integration and harmonisation, problems still exist along many borders – old and new.

“The issue has really come to the fore now,” says the 39-year-old historian. “No matter how integrated you are, borders will always make a difference mentally, culturally or linguistically. And even when the physical border disappears, as we’ve seen in Europe following the Schengen Agreement, the psychological differences might become greater. So cross-border cooperation – a large part of our work – is no easy task.”

Born for the job

But nobody could be more suited to the task than Kühl, who has lived and breathed border issues his entire life. Kühl was born in Germany, in South Schleswig, where today some 50,000 people are affiliated with the Danish national minority, but his father was part of the country’s Danish minority, while his mother was a pastor sent from

higher education institutes in Ireland and Northern Ireland. Kühl, who regularly assesses the programme along with other experts, says it has brought a glimmer of hope to the younger generation growing up in the conflict region. “The teachers say it’s been a real eye opener for both them and the students – it’s incredibly satisfying for them to know their work really achieved something,” he says. “It’s a privilege to take part.”

Or in Hungary and Croatia, where in 2005 they completed a blueprint for cross-border cooperation in culture and education. Although the two nations have a stable relationship, the legacy of Croatia’s civil war with Serbia is still visible today – adding a whole new dimension to the project. When Kühl suggested opening up the Danube for cross-border tourism, for example, the Croats shook their heads: impossible, they said, landmines are strewn all over the nearby forests. Yet despite such practical problems, Kühl’s team developed strategies to help the two nations cooperate and make a tangible difference to the lives of thousands of people living in the border region.

“It’s great to work on a project with a win-win situation. We had really positive feedback. Now it’s up to them how they want to use our advice,” says Kühl, who spent five weeks in the Eastern European countries talking to people from all sectors of society about future

cross-border cooperation. “But we don’t have all the answers. We’re very aware of that. Although we come with experience in border issues, we’re no experts on Hungary or Croatia. It was an incredible learning experience.”

The secret

What, then, is the key to successful cross-border cooperation? As border regions across Europe and beyond continue to be embroiled in conflict, the Danish-German situation is hailed internationally as a winning example of outstanding cross-border relations. Despite its success, however, it’s naïve to think that the same rules can simply be applied to other regions, says Kühl. Each border region is unique, as is each minority. You can isolate certain elements to see if they work in other regions. But as Kühl has learnt during his 15 years of research in the field, when it comes to national borders, there are no guarantees.

“This is no exact science. One technique might have



tremendous success in one area but disastrous results in another. It’s difficult to define the most important element in border issues. We simply don’t know. And it’s too dangerous to experiment with. Because this is no laboratory. These are people’s lives we’re talking about.”

Global network

With each new project the department’s national and international network expands. The department’s books, published regularly in Danish, English and German, are ordered across the world. The latest, an international collaboration marking 50 years since the Copenhagen-Bonn Declarations were signed, includes forewords by the Danish prime minister and the German chancellor.

And the department’s researchers, many of whom are trilingual, travel regularly to lecture, do research or contribute to new publications. As we speak, three researchers are abroad on separate assignments in Estonia, Latvia and Finland. And Kühl, who regularly travels across Europe and to the United States to talk on border issues, has just returned from a lecture tour in Scandinavia where, he adds, there are no less than 18 national minorities.

Now, having visited and studied almost every country in Europe bar Belarus, Kühl is hungry for his next project. It may only be a pipedream at the moment, but the historian wants to write a comprehensive book about national minorities in Europe. It’s a difficult task that will take

several years, he says, but not an impossible one. Until then, however, there’s no shortage of projects for Kühl to get his teeth into.

“You’re never finished when it comes to border region studies. There are so many angles to every issue. And with regions and communities changing all the time, we have to be on our toes,” says Kühl, who admits he thrives on the constant change. “One golden rule helps, though: never stop asking questions. In my line of work, you must never lose your sense of curiosity.”

“It’s too dangerous to experiment with border issues. These are people’s lives we’re talking about.”

Denmark to preach to the Danish minority. In keeping with tradition Kühl went to Danish minority schools before moving to Denmark to study at university. Today he still lives in Germany, though just two kilometres from the Danish border.

Yet despite having lived most of his life in the central European country, Kühl, who has dual nationality, considers himself 100 per cent Danish. Without question. While this perspective might seem confusing, it could not be more natural for Kühl, whose two sons now also attend a Danish minority school in Germany, where his American wife teaches.

Changing lives

While achieving border cooperation may not always be straightforward, it seems Kühl and his colleagues have had undoubted success. In Ireland, for example, where young people from each side of the border learn about border issues in a pioneering education programme developed by

JØRGEN KÜHL

Age: 39

Title: Historian, minority expert and borderlands scholar

Wants: Increased border cooperation across the world

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Innovation and creativity lie at the heart of the University of Southern Denmark, an academic institution at the forefront of global research and education.

Founded in 1966, this modern university has four faculties and enjoys close links with business, industry and institutions across the world. Every day more than a thousand researchers and seventeen thousand students build on the University's reputation as a centre of academic excellence.



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