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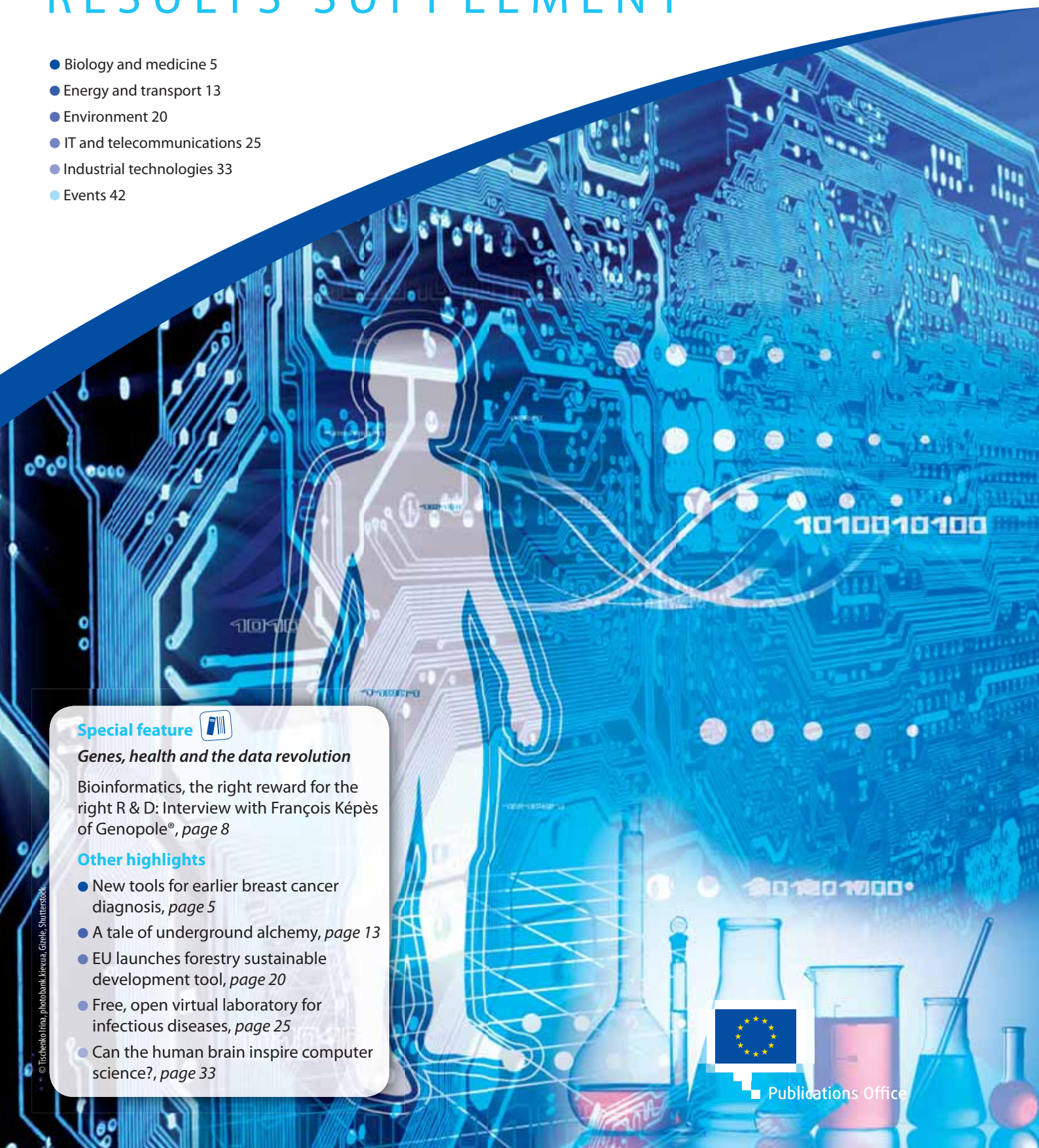

Special feature

Genes, health and the data revolution

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Where the life sciences and IT meet… it's not all in the genes

Any story about genetics and information technology (IT) has to start with Watson and Crick's double helix and probably has as its middle part the human genome project… but how does the story end?

To answer this question you probably have to look at what the world's life scientists are doing now to unravel the mysteries of proteins, genes and the core functions of the human body. This is a huge investigation which has been made possible by developments in IT and more powerful microchips. In its wake, a whole new branch of science has evolved, 'bio-informatics', merging biology and IT, which has far-reaching applications from better healthcare to homeland security to bio-inspired robotics.

For example, bio-informatics is at the core of a new paradigm called personalised medicine, variously described as 'the right treatment for the right person at the right time'.

Yes, you guessed it, this issue of research*eu results supplement *focuses on '**Genes, health and the data revolution**'. To help us examine where biology, the life sciences and information technology intersect, we spoke with François Képès, director of Genopole's® epigenomic programme at the National Centre for Scientific Research (CNRS), France. Epigenomics is the study of changes in the regulation of gene activity and expression.*

In our interview with Mr Képès, we discover where Europe has a distinct advantage in bio-informatics and how European projects are providing deeper understanding at the cellular level of the potential functions of individual genes and chromosomes in various diseases. It's fascinating stuff.

Also in this issue, our biology and medicine section leads with news on how European scientists are developing methods to help doctors diagnose breast cancer more accurately and earlier.

The stop story in our energy and transport section follows researchers in Poland who are investigating new energy sources from old coal mines. The idea: introduce steam and oxygen to coal produces hydrogen.

The environment theme kicks off with news of a new computerised decision-support tool able to provide objective information on how changes in the forestry industry affect employment, the economy, biodiversity, and greenhouse gas emissions.

In our IT and telecommunications section, readers get a taste of the power of personalised medicine thanks to a virtual laboratory which can match drugs to patients, make treatments more effective and reduce suffering.

Our lead story in the industrial technologies theme showcases how research by European scientists into a part of the brain called the neocortex could lead to revolutionary computer hardware discoveries and silicon chip designs driving future industrial technology for decades to come.

As usual, the events section in this issue offers a selection of upcoming conferences and gatherings in the field of research and technology.

We look forward to receiving your feedback on this issue and on the research*eu *publications in general. Send questions or suggestions to: research-eu-supplements@publications.europa.eu*

The editorial team

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Thank you to François Képès for his contribution to the 'special' dossier in this issue

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New tools for earlier breast cancer diagnosis

Modern techniques for investigating suspected breast cancer are now complementing conventional mammography. A team of European and US researchers is developing ways to combine all this data to help doctors make earlier and more accurate diagnoses.

Every year about 350 000 new cases of breast cancer are diagnosed in Europe, accounting for one in four of all cases of cancer in women. As the causes of breast cancer are not well understood the priority is to detect it early so that effective treatment can be given. The earlier the cancer is detected the more likely the treatment is to be successful.

Many countries now employ x-ray mammography screening for women over 40 or 50 but cases still go undetected because of the difficulty of making an accurate diagnosis. Even with a mammogram, some cancers will be unnoticed and there will be many cases of false positives that require further investigation. Confirmation is usually by ultrasound and biopsy but many biopsies will show that a suspected lump is not cancerous.

'From mammography you can't always really see if there is something serious or if it's just something that is not cancer,' says Sonja Guttenbrunner of the European Institute for Biomedical Imaging in Vienna. 'Sometimes it's very difficult to detect breast cancer and often unnecessary biopsies are taken.'

Even if cancer is confirmed, some types will never pose a risk to health but they cannot easily be distinguished from tumours that are likely to spread. The result is that many women undergo surgery, radiotherapy and chemotherapy that would not have been necessary if a more precise diagnosis were possible.

Other diagnostic tools, such as ultrasound, are commonly used as a follow-up to mammography. Newer techniques include x-ray tomosynthesis, magnetic resonance imaging, positron emission mammography and automated 3D ultrasound. All these techniques reveal different information about any suspicious lump and together they can help the clinician make a more informed and accurate diagnosis.

But what is the best way to use all these sources of information? That's where the EU-funded HAMAM(1) project comes in. HAMAM is developing a tool that will be more accurate in the diagnosis of breast cancer and be able to integrate all these different modalities in one clinical workstation, suggests Ms Guttenbrunner who is coordinating the project.

The doctor will be able to compare different images side by side while viewing the patient's history and other information. HAMAM also aims to help clinicians with an element of computer-assisted diagnosis. The workstation will be connected to an extensive database of images and other clinical data. It will be able to suggest further investigations to guide the doctor in coming to a diagnosis.

The project has a prototype workstation which is being evaluated in preparation for a public demonstration. A prototype database is available and the clinical partners have supplied anonymised patient information.

Clinical partners in the project include hospitals in Berlin, Dundee, Nijmegen and a partner in the USA. Boca Raton Community Hospital, in Florida, was chosen for their experience in using multimodal imaging in the diagnosis of breast cancer. They are supplying much of the information that is being used to construct the database.

'Breast cancer is a worldwide issue, both epidemiologically and economically, but handled differently in Europe than in the USA,' Ms Guttenbrunner adds. 'Therefore, joint research is a good way to combine the different perspectives.'

They are supported by technological partners in London, Bremen, Nijmegen and Zurich. 'At the end of the project, we want to have a workstation that can be brought to the market,' she says. 'We have an industrial partner, Mevis Medical Solutions, who will further develop the workstation to actually bring it to the market for clinicians.'

HAMAM builds on two earlier EU-funded projects, Screen and Screen-trial, which developed approaches to reading mammograms from a digital display screen rather than from traditional x-ray films. The HAMAM project is funded under the Seventh Framework Programme for research.

(1) 'Highly accurate breast cancer diagnosis through integration of biological knowledge, novel imaging modalities, and modelling.'

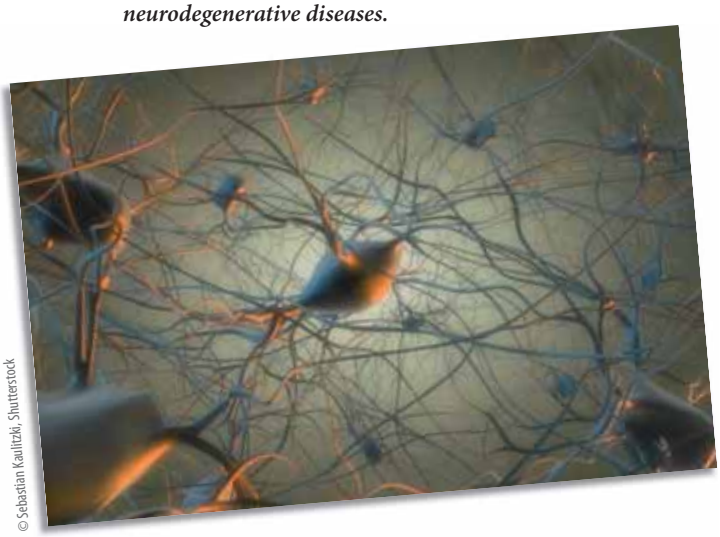
Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91326

Frequent acronyms

ERA	European research area
FP5/6/7	Fifth/Sixth/Seventh Framework Programme of the European Community for research, technological development and demonstration activities
ICT	information and communication technologies
IST	information society technologies
R & D	research and development
SMEs	small and medium-sized enterprises

Sometimes it takes two for nerve cell development

Researchers have helped to outline the interlinked role of two particular chemicals in nerve cell development in the gut of the mammal. Details of the chemical partnership could help stroke sufferers and patients with neurodegenerative diseases.



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The cell cycle is the series of events ultimately leading to cell division. Controlling the cell cycle may be one key to switching cell division on and off as needed. As such, scientists would then have a lever on the plant calendar — from germination and growth, right through to reproduction.

The progression from a stem cell that has no particular function and an undifferentiated structure to a fully operating neuron or nerve cell involves a complex web of chemicals. Add to that lifelong changes in nerve interconnections and the result is memory and an amazing basis for learning.

Being able to control the changes from the undifferentiated cell to a neuron means that many neurodegenerative diseases like Parkinson's could have a cure. The EU-funded project 'Glial cell line-derived neurotrophic factor' (GDNF) took up the challenge of studying the project's namesake. GDNF is a chemical responsible for growth of many neurons in the central nervous system — brain and spinal cord.

There are of course many other molecular players on the development field of a nerve cell. Project researchers centred their focus on two particular chemicals. First, a member of the GDNF family, 'Rearranged during transfection' (RET), involved in sending messages, a signalling chemical.

Second, but by no means least, acting along with RET, is 'Endothelin receptor type B' (EDNRB). This molecule also acts as a signaller transferring chemical messages from outside to inside the cell.

The two cellular communicators were found to have a special relationship with each other, specifically in the sphere of gut or enteron nerve cells in mammals. Together, the researchers found they played a large part of controlling the development.

When EDNRB was activated, it enhanced the communication role of RET in the development of as yet 'uncommitted' gut nerve cells. Ironically, they can also act in opposition to each other, antagonistically, in the movement of progenitor cells, similar to stem cells, but further towards their final destiny as a differentiated nerve cell.

To complete the picture, a chemical bridge between RET and EDNRB signalling systems was found. An enzyme, protein kinase A, has many roles but in the enteric nervous system, it is one of the molecular entourage that link the two systems.

Multifunctional molecules create a seemingly infinite number of possibilities for development pathways in biological systems. The work of this team in the GDNF consortium has filled in a small but important gap in the understanding of the mechanics of mammalian neuron development.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: information exchange/training.
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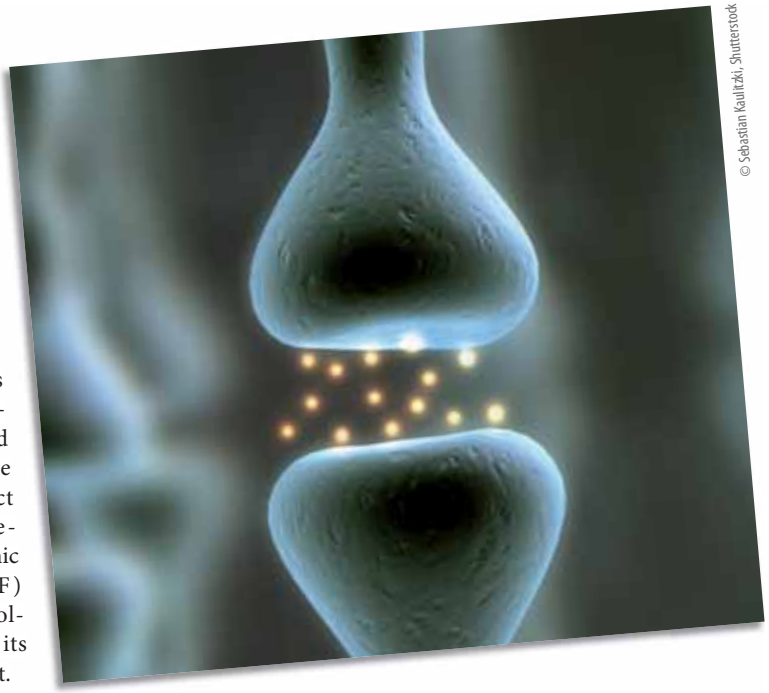
Making the right connections in the brain

EU researchers have researched into a molecular duo that plays an important role in development of brain cell connections. Together, they help to make sure that there is a precise nerve cell architecture for the release and subsequent docking of neurotransmitter chemicals.



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The human brain is composed of billions of nerve cells or neurons. One reason the brain functions in such a subtle manner lies with the way messages pass from neuron to neuron. Chemicals (neurotransmitters) travel from one nerve cell to another across a gap or synapse. Once the molecule locks onto the recipient neuron, the chemical can decay, having done its job, and the electrical message continues on its way.

Finding out the secrets of development of neurons, and in particular synapses, could be the key to a cure for many diseases including Parkinson's disease and Alzheimer's. The EU-funded project 'Glial cell line-derived neurotrophic factor' (GDNF) looked to the molecule which gave its name to the project.

The formation of neural synapses is a finely organised process. It involves the formation of machinery for neurotransmitter release and a complementary structure after the synapse to receive the compounds (the receptor). Previous research has pointed to GDNF as a key player.

GDNF is a small molecule with a huge impact. Almost single-handedly it controls and promotes the development and survival of many types of nerve cells.

A project team from the Karolinska Institute in Sweden specifically studied the role of GDNF in the hippocampus area of the brain, involved in memory. This happens to be one of the first regions to suffer damage in Alzheimer's disease.

The researchers tested if the presence of either GDNF or one of its receptors, 'GDNF family receptor alpha1' (GFRalpha1) had an effect on development of nerve cells. With both molecules present, synapse development was very evident because the required proteins and neurotransmitters were manufactured. In the absence of GFRalpha1, formation of the neurons was markedly reduced. Mutant mice lacking the GDNF gene were tested and results showed that the molecule most probably plays a role in forming synapses *in vivo*.

All this indicates that GFRalpha1 acts as a so-called cell adhesion molecule playing the architect and the surveyor to make sure the synaptic contacts are the correct design. This dual-purpose molecule also prepares the synapse for development in the early stages.

Effective therapies for diseases like Parkinson's need a molecular picture of what is happening in neuron function. The GDNF project research has provided a grass roots account of the events in nerve cell development.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: information exchange/training.
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Technology for people living with dementia

Alzheimer Europe reports that at least 5.7 million Europeans, aged between 40 and 80, have Parkinson's disease or dementia. With an ageing population, an estimated 10 million new cases of Parkinson's and dementia is expected within the next 40 years. But technology may offer a solution.

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Care is provided by nursing homes and specialised centres to 70 % of advanced dementia patients. So today, European researchers are tackling the problem of how people with these diseases can keep their independence and quality of life longer, while safely living in their own homes.

Parkinson's disease and dementia are examples of neurological diseases. They are both progressive, so the symptoms worsen with time as the disease progresses. Dementia starts off with the patient having cognitive problems (for example, remembering daily activities). Despite continuing research, there is no cure and no way to halt the progression of the disease. But adapting the environment of those who suffer the disease is a good step in minimising the negative effects the disease will have on their everyday lives.

The 'Guidance and awareness services for independent living' (Rosetta) project is based near Frankfurt, Germany. The goal is to develop so-called 'assistive and intelligent' environments for patients to live in, where irregular changes in their behaviour will raise an alarm. This is the function of one development called 'Early detection system'. The technology involved is not considered to be an invasion of privacy, since no pictures or sounds are recorded. The system does nothing more than tracking and analysing the person's position in the environment.

Elizabeth Athmer-Aghina, an 85-year-old sufferer of dementia, had to spend three hours lying on the floor after a fall. Now her home has been fitted with sensors that send data to a remote centre, giving her security in knowing that if the alarm should go off, someone will come to her aid.

Another system, being developed in Holland and tested at a nursing home in Soest, is called short term monitoring. It enables people with dementia to take more responsibility from their daily needs.

A touch screen has also been created to help dementia sufferers remember basic tasks and communicate with others. For example, the screen will sound an alarm when the patient should be having a meal. It is designed in particular to assist the carers of sufferers.

The trial period for these technologies and others continues until 2012. In 2011 testing will commence in three European countries, whereby 30 houses will be set up with sensor systems and assistive technologies.

It is expected that care institutions will be key players in the initial investment of these technologies and getting them into the homes of patients. The institutions will benefit from the reduced labour costs, while the patients benefit from the prolonged period of independent life.

Rosetta was funded under the Ambient Assisted Living Joint Programme.

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http://ec.europa.eu/research/infocentre > search > 16615

INTERVIEW

Bioinformatics, 'the right reward for the right R & D' — *research*eu results supplement* catches up with François Képès of Genopole®


© François Képès

Mr François Képès

One look at Dr François Képès' resume and it becomes obvious that here is someone who is more than just dedicated to the pursuit of science and knowledge. He is impassioned by it. It reflects in his work and his research to uncover the latest in systems and synthetic biology.

A distinguished academic, a brilliant cell and systems biologist, and an editor of three international journals, Dr Képès reflects the very best in the field of Europe's science and technology. He's edited a dozen books and penned over 80 scientific articles. And he won first prize in foundational research at Massachusetts Institute of Technology (MIT) in 2007.

Today, he holds multiple positions. On the one hand, he is a research director at CNRS, the widely respected French National Centre for Scientific Research. On the other, he is the founding director of the Epigenomics Project, the institute of advanced studies at Genopole® that is central to this exceptional interview. Genopole® focuses on creating a research cluster in genomics, post-genomics and related sciences. It also helps foster the development of the French biotech industry and provides a centre of excellence in life science teaching and training.

But in his spare time, Dr Képès organises and chairs numerous international and national scientific events — including several in synthetic biology — a theme for this issue of *research*eu results supplements*. At the European Commission, he provides expert advice and analysis on systems and synthetic biology. The intersection between biology, medicine, and technology is a field with an exciting future. The potential of biotechnology is massive. And, though he may not admit it, Dr Képès is central to its European realisation.

• Any story about genes and IT has to start with Watson and Crick's double helix and probably has as its middle part, the human genome project… but how does the story end?

I have no answer. I would not put it in those terms. Why should there be an end to this story? Bio-IT has enormous untapped potential.People tend to think of it as IT providing a storage and processing resource for rapidly increasing biological data. This is correct but misses several much more important points. One, well-known to the specialist, is the immense potential for developing better or novel algorithms to decipher the mysteries of biology at a rapid pace and low cost that benchwork cannot meet. Another one is the possibility of describing biological phenomena in information theoretical terms. A totally different one is to drive theoretical advances in computer science through something like 'bioinspiration' or through solving challenging issues raised by the life sciences.

• It's been called 'the right treatment for the right person at the right time', but how would you describe personalised medicine? How much of it is wishful thinking and what, in your opinion, are the major hurdles to making it happen?

This is an excellent definition from the patient's perspective. Another definition from the pharmaceutical sector's perspective could be 'the right reward for the right R & D'. Why? Think of the numerous drugs that have been painstakingly brought to market after full clinical trials, and withdrawn a few months later because there was 1 reported incident in 10 000 patients. How about the 9 999 other patients that could have benefited from this drug? Personalised medicine comes into play here. By genotyping patients before treatment, practitioners can uncover the genotypic risks an individual faces when taking this drug, and then treating the majority at no risk, while avoiding harmful side-effects in the minority. This aspect of personalised medicine will become a treasure trove for the 'pharmas'. However, we are currently not very good at exploiting complex genotypic patterns towards this goal.

> *I would think that predictions about scientific developments beyond 10 years should remain the exclusive domain of poets.*

• The 'Genetic networks: emergence and complexity' (Gennetec) project that you coordinated provides its results free to academia through partner websites etc. What's the rationale of this 'open source' approach to knowledge? Is it not going against the grain with more and more organisations trying to patent and 'own' even the smallest of genetic discoveries?

Most Gennetec results obtained by the academic partners have been published by the usual means. The Gennetec consortium includes a Spanish software editor which, as a private company, is commercially minded. They developed new software based on algorithms set up by academic partners. Because this consortium was financed by the European Commission, it is only appropriate to make the outcomes, including this software, publicly available and free of charge via the internet. However, software versions that represent significant improvements over the state of the art at the end of Gennetec will be licensed by this company to the private sector, with royalties paid to the academics that were involved.

Generally, I favour protecting intellectual property, until it becomes socially counterproductive by driving up the cost of innovation. This is a delicate balance to achieve.

• Brussels congratulates itself a little on having seen the writing on the wall with the growth in bioinformatics, and the opportunity to establish credible centres of excellence in the life sciences? Do you agree with this sentiment? How has EU funding helped to galvanise the research community around complex problems, genomics and proteomics?

The European Commission performs a remarkable and balanced lobbying job which, in addition to maintaining

> We have to foster new talents, junior scientists who would be strong in one domain and good novices in complementary domains.

internal expertise, allows it to capture our rapidly changing scientific world and convert it into timely calls for proposals. I witnessed myself the Commission's ability in the field of complex systems (under the IST FET programme([1])). This was also the case in synthetic biology during FP6, but unfortunately European Union support in this area declined during FP7. The Gennetec project was clearly ambitious. But this can be interpreted differently depending on your mindset. If you take the view of several agencies where we applied for funds it means 'overly ambitious, unforgivable risk taking'. Whereas the EU backed us in the spirit of 'blue-sky' research, understanding that sometimes 'no pain means no gain'.

Of course, the European Commission wasn't without its doubts. I remember during our first-year project review, the general sentiment was 'your project is very ambitious, we are afraid you will not be able to deliver anything close to what you promised'. However, two years later, the final review changed tune, noting that while 'Gennetec was a very ambitious project, [it] achieved many new and important results... In our opinion this project resulted in very good value for money to the EU taxpayer... The project has fully achieved its objectives and technical goals for the period and has even exceeded expectations.' Meaning that taking risks and being ambitious is forgivable in certain places, including Brussels!

• Are there any areas in the life sciences and/or bioinformatics where you think Europe has a distinct advantage or is at a disadvantage compared to major research centres around the world, such as in Asia and the US?

Development of traditional life sciences is rather costly research, and Europe is at a disadvantage because funding is lagging behind. With excellent mathematicians and physicists, Europe has a better chance in biology at the interface with hard sciences, and should seize it. For instance, Europe is a distant second to the USA in the development of synthetic biology — the rationale engineering of biology but also a techno-science that will bring wealth during the 21st century, much like synthetic chemistry did over the 20th century, and for similar epistemological reasons. It is essential not to miss this development, and now is the right time. I am taking this example because synthetic biology gathers engineers, biologists, computer scientists and mathematicians towards a common effort, spreading the benefit of IT amongst others.

• How important is it to nurture young talent in this increasingly complex field of bioinformatics?

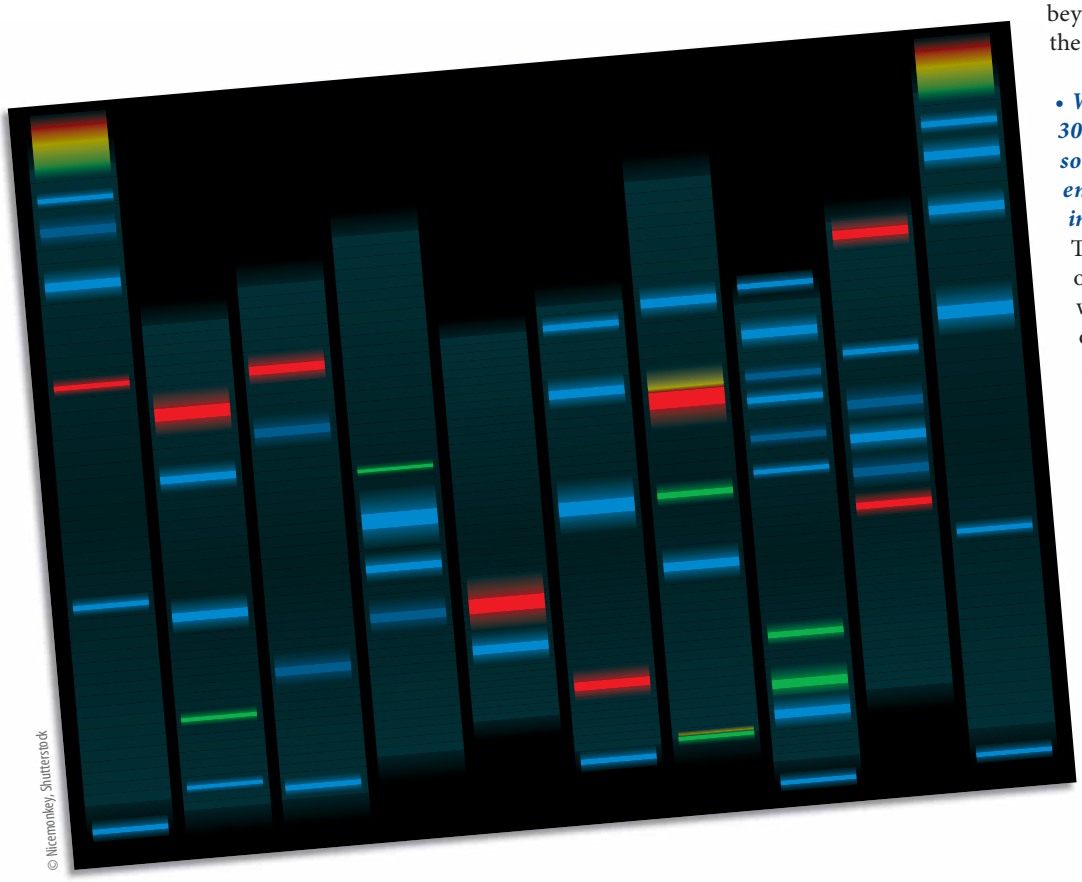
Essential! We have to foster new talents, junior scientists who would be strong in one domain and good novices in complementary domains. Perhaps later we shall see an increasing number of scientists who are multidisciplinary in today's sense, but all packaged in their 'single brain'. That of course would be most efficient, as can be observed with the very few individuals who already have this capacity.

• If you went back 30 years in time and a journalist had asked you to predict the future in this field by 2010, how close would have gotten?

Off the wall; off the planet. In 1996, I was working on yeast as a cellular and molecular biologist when the yeast DNA sequence was published. Only then did I ask myself what will change in yeast research in the (post-)genomics area. I started to think about it with a mathematician in 1997, and I switched fields in 1999. I believe it was not before 2000 that I could see clearly where we were heading on that side. Since then, I contributed to the development of systems biology. I would think that predictions about scientific developments beyond 10 years should remain the exclusive domain of poets.

• Will your field still exist in 30 years or will it be called something completely different? Here's your chance to invent a profession!

The fields of systems biology and synthetic biology will synergistically become of prime importance during the 21st century. Why synergistically? Because systems biology explores 'life design' principles, while synthetic biology exploits them. Whether the names will change in the future is immaterial in my opinion; these are long-term trends.



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(1) The FP6 'Information society technologies' programme focused on 'Future and emerging technologies'.

Gene identified as tumour suppressor

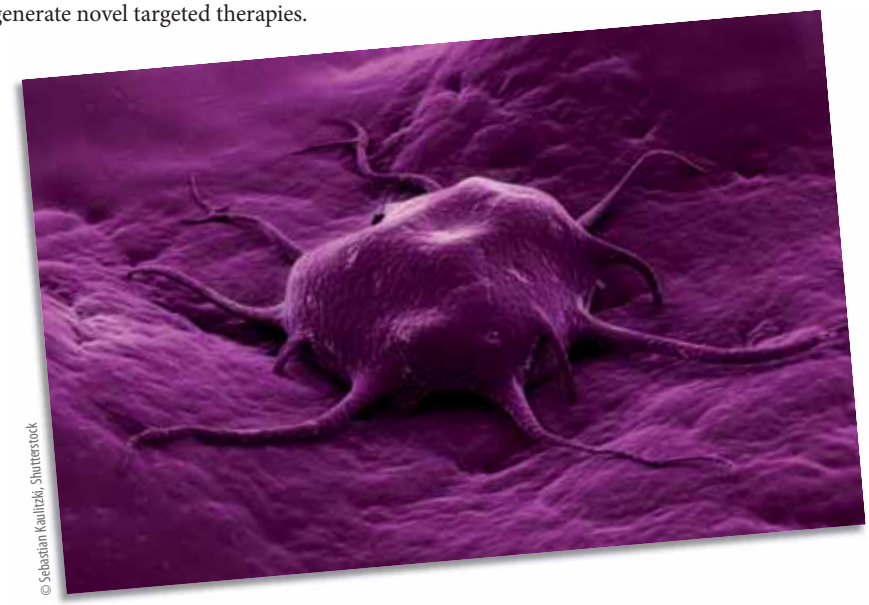
European scientists have linked failure of the protein 'Tyrosine phosphatase non-receptor type 2' (PTPN2) gene to the development of acute lymphoblastic leukaemia (ALL).

When PTPN2 stops working or is lost altogether, it causes cancer cells to grow faster and live longer. So the gene acts as a tumour suppressor when it is fully functional. The study is part of the project 'Molecularly targeted therapy for T-cell acute lymphoblastic leukemia' (Moltall), which was funded to the tune of EUR 1.4 million by the European Research Council (ERC) under the Seventh Framework Programme (FP7). Findings are published in the journal *Nature Genetics*.

Moltall is headed by Jan Cools, an Associate Professor at KU Leuven in Belgium who is a group leader of Flanders Institute for Biotechnology (VIB) and received an ERC starting grant in 2007 — the scheme provides emerging researchers with the opportunity to consolidate their own research team and conduct their own independent research in Europe. The aim of the project is to examine the molecular pathogenesis of T-cell acute lymphoblastic leukaemia (T-ALL) and to generate novel targeted therapies.

In the current study, Mr Cools worked with a team of European researchers, including VIB/KU Leuven PhD student Maria Kleppe, and Dr Peter Vandenberghe of KU Leuven and Hôpital Saint-Louis in France. The scientists discovered during their research that the PTPN2 gene was lost in the deoxyribonucleic acid (DNA) of the cells of some leukaemia patients (causing cancerous cells to multiply), and identified PTPN2 as a negative regulator of the activity of a specific kinase. Overall, their research provides evidence that the gene has a tumour suppressor role and is a major player in the onset of ALL.

The study has also provided new leads on kinases and phosphatases (enzymes able to switch specific cellular functions on and off) in cancer development. It has been known for some time that errors in kinases and phosphatases are potential causes of cancer.



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The study now demonstrates that when these errors occur together, the carcinogenic effects can reinforce one another. The team also found that these errors can make the cells more resistant to kinase inhibitors (cancer treatments).

ALL is a fast-growing cancer that affects the lymphoid cells, one of two main types of white blood cells. Abnormal cells, or 'leukaemia cells', develop and grow quickly, overwhelming the normal red and white blood cells and platelets (irregularly shaped cell fragments) that the body needs to remain healthy. Patients with ALL and other types of leukaemia are typically susceptible to infections since white blood cells protect against viruses and bacteria.

The 'acute' in its title refers to the speed of the disease; if left untreated it can cause untimely death. ALL represents almost one third of all cancer diagnoses in children under the age of 15. It is known to impact children most prominently during the ages of 2 to 5 years. But the disease can also affect adults, usually over the age of 45.

T-ALL is a high-risk type of ALL. With this leukaemia, cells that would usually turn into white blood cells start to divide uncontrollably creating a large number of immature cells. There have been very few factors associated with a higher risk of developing T-ALL. As a result of the research, however, it is apparent that T-ALL develops when mistakes occur in several genes at the same time.

The emphasis for the scientists is to identify genes that underlie T-ALL but also to unravel the specific combinations that spur on the disease. The team believes this is fundamental to the development of therapies that focus on more than just one target.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16633

The genetic secrets behind eye colour

EU-funded scientists have discovered new genes involved in determining human eye colour. More than just blue, green and brown, the team believes that our eye colour has many more dimensions and variations than previously documented.

This new lead has the potential to be used in forensic science, providing investigators with a 'face' to genetic clues left at a crime scene. Findings from the study are published in the *Public Library of Science (PLoS) Genetics* journal.

Led by the Erasmus University Medical Centre in the Netherlands, the researchers uncovered three new genetic loci (the locations of gene sequences on chromosomes) that significantly contribute to the natural and subtle eye colour variations that distinguish one person from the next.

Learning about the role of the three loci (referred to as LYST, 17q25.3, and TTC3/DSCR9) has added to a more comprehensive and concise understanding of the genetic basis of human eye colour. With the new knowledge generated by the team, we now know more than half of the attributes in eye colour variance. Although the LYST gene had previously been acknowledged as a pigmentation gene in mice and cattle, no association with pigmentation had ever been made to the other two genes prior to this study.

Summarising the results in their published paper, the scientists write: 'Our quantitative prediction model explained over 50 % of eye colour variance, representing the highest accuracy achieved so far in genomic

prediction of human complex and quantitative traits, with relevance for future forensic applications.'

The genome-wide study involving almost 6 000 Dutch Europeans (and a further 3 500 individuals from Australia and the UK for study replication) was the first ever to be conducted on quantitative human eye colour. Their novel approach was to measure hue and saturation values of eye colour from high-resolution digital, full-eye photographs.

The approach was so effective that the researchers recommend fine phenotyping as a useful strategy for finding genes involved in human complex traits, highlighting the method as being extremely cost effective, portable and time efficient.

Indeed, it was due to the fine phenotyping approach that the scientists found that variation in human eye colour is a constant (unbroken) grading from the lightest shade of blue to the darkest shade of brown or black. For the team, human eye colour varies in more ways than the one represented by the blue, green and brown categories studied in the past.

Dr Manfred Kayser of the Erasmus University Medical Center referenced the remarkable potential of the research results in helping with criminal and forensic investigations, 'where appearance prediction from biological material found at crime scenes may provide investigative leads to trace unknown persons'.


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In addition to researchers from several departments within Erasmus University Medical Center, the project included teams from the University of Cologne in Germany, King's College London in the UK, and Australia's Queensland Institute of Medical Research and University of Western Australia.

The research was supported by the projects 'Genetic factors for osteoporosis' (GEFOS) and 'European network for genetic and genomic epidemiology' (Engage), which received a total of EUR 15 million in funding under the Health theme of the EU's Seventh Framework Programme (FP7).

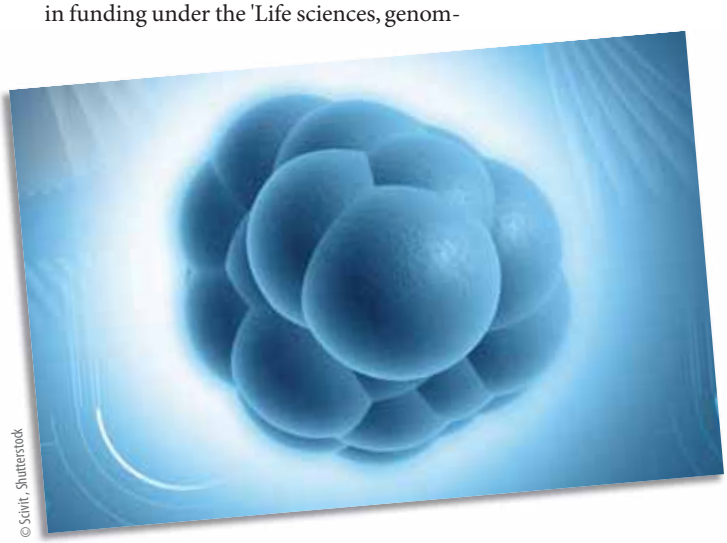
Also contributing to the study was the FP6 initiative, the 'European training in myopia research' (My Europia) — a 'Marie Curie research training network' which received EUR 3.17 million, and the FP5 project 'Studies of European volunteer twins to identify genes underlying common diseases' (Genomeutwin), supported under the 'Quality of life and management of living resources' programme.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16433

EU study finds potential ES cells replacement falls short

In 2007, scientists discovered human induced pluripotent stem cells (iPS cells). Just like embryonic stem cells (ES cells), iPS cells can self-renew and turn into any kind of cell or tissue. The added advantage is that they carry almost none of the practical and ethical limitations that hinder ES cell research. A new study has found, however, that iPS cells do not have the same scope for use in some applications.

The findings were presented at an event hosted by the project 'Platforms for biomedical discovery with human ES cells' (Estools), which received EUR 12 million in funding under the 'Life sciences, genomics and biotechnology for health' thematic area of the EU's Sixth Framework Programme (FP6).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The landmark discovery of iPS cells signalled new hope for science. The key difference to ES cells is that the cells are obtained by genetically reprogramming an individual's somatic cells. By eliminating the concerns that surround the use of ES cells, iPS cells provide the opportunity for use in research and regenerative medicine and as models for diseases that cannot be easily studied in humans. Nevertheless, questions remain if iPS cells do in fact have the same application capacity as ES cells.

Results of a study conducted by the Hebrew University of Jerusalem in Israel (an Estools partner) and the Children's Hospital Boston in the US suggest they are not able to entirely replace ES cells in some basic research and clinical applications.

The research findings were published in the May issue of *Cell Stem Cell* and presented in Lisbon, Portugal at the 'Stem cells in biology and disease' international symposium in May 2010. The symposium was organised by Estools, which represents the largest European consortium of researchers studying human embryonic stem cells (22 partners in total; 19 academic research institutes and 3 companies).

In the study, the team compared properties of iPS cells obtained from the skin cells of people affected by fragile X syndrome (the most common form of inherited mental impairment among males), with those of ES cells with the same genetic defect (isolated from embryos). They found that

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FMRI (the fragile X gene) was active in ES cells but not in iPS cells.

The lead author of the study, Hebrew University of Jerusalem's Dr Nissim Benvenisty, said: 'We saw a difference between iPS and embryonic stem cells, although they have the same mutation.' He noted that the results might underline a more general phenomenon of epigenetic differences between the two.

'Until we understand better the differences between these two types of cells, the optimal approach might be to model human genetic disorders using both systems, whenever possible,' Dr Benvenisty added.

Professor Peter Andrews from the University of Sheffield in the UK agreed that Dr Benvenisty's findings show that ES cells and iPS cells are complementary tools that in some cases may give different insights into fundamental disease processes. 'They emphasise the importance of continued research with both types of pluripotent human stem cells. The results also confirm the value and importance of European funding of research consortia like Estools,' Prof. Andrews explained.

The Estools project is coordinated by the University of Sheffield. The symposium that took place between 26 and 28 May 2010 brought together international experts to exchange the latest advances in human stem cell research. The 'Third ethics workshop' was a parallel event, organised by Estools participant Göran Hermerén of the Lund University in Sweden and the European Group on Ethics in Science and New Technologies (EGE). A number of public outreach events also took place, including the play Staminalia, and the 'Smile of a stem cell' photographic exhibition.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16593

Animal to human: hidden diseases

Several decades ago there were very few emerging diseases compared to today. One EU research project is investigating the increase in emerging diseases in a changing European environment. In the Konnevesi forest in Finland researchers are trying to understand the increase in diseases transmitted from animals to humans.

As well as climate change, social changes are also critical in the transmission of diseases. An example could be seen in the central and Baltic European countries following the collapse of the Soviet bloc. Economic troubles led to people going into the forest to gather mushrooms and berries. This led to an increase in diseases being transmitted through contact with ticks, insects and rodents.

Rodents transmit diseases like hemorrhagic fever with renal syndrome, a disease that most of the EDEN team of scientists working in the Konnevesi forest have suffered from. Rodents are a very important factor in the spreading of disease. A tick or mosquito that bites an infected rodent will be able to pass the disease on to humans. But even when certain diseases appear to have disappeared in humans and are thought to be eradicated, they will often be preserved in populations of rodents.

Biodiversity plays a key role in minimising the risk of rodent populations carrying a virus becoming too large. Normally there is a stabile state of many species of rodents living in low densities. However, if forest is destroyed (e.g. for agriculture) there may be but one or two species that survive. This leads to a serious problem if one of the remaining species is carrying a virus, since their densities will become much higher with time.

Scientists, including those in the Konnevesi forest, are gathering rodent samples all over the world. Together with efforts to study the rodents in their natural habitats, the scientists wish to understand the rodents and exactly how a virus is transmitted to humans. Many of the samples are sent to the laboratories of the Department of Virology at the University of Helsinki in Finland, one of the best laboratories in Europe for animal to human disease transmission. They are bringing the ecology work, involving the collected samples, together with the virology, which involves studying the virus genomes as well as patient samples to see whether the viruses are causing diseases in humans.

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Genetic analysis results are sent to the Centre for Biology and Management of Populations in Montpellier in southern France. After having classified each rodent, they find out whether a virus being carried by one species could be passed onto other species of rodents. In this way the scientists want to know if a given rodent species arriving in a new country or environment will be able to transmit viruses to the native rodent population. It may be that the local rodent species lacks a particular genetic characteristic, making it insusceptible to certain diseases. This scenario represents a realistic threat: it is easy enough for a rodent, or another animal such as a mosquito, to take a ride in a plane or ship container and be introduced to a new environment.

The fact that disease does not recognise borders made it important for the project to involve as many as 48 institutions from 24 different countries. The ultimate goal is to understand what happens in local parts of Europe and to use that knowledge to create predictive models for how, where and when outbreaks might occur. The idea is to have a tool of anticipation, to know how a disease will spread before it does and be in a position to act in time.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16613

A tale of underground alchemy

In a coal mining area around Katowice in southern Poland, a team of scientists has been set to work. However, rather than extracting coal, they are using a mine to experimentally assess an alternative method of energy production — introducing steam and oxygen to coal produces hydrogen.

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This experiment is being carried out as part of the EU research project 'Hydrogen oriented underground coal gasification for Europe' (HUGE).

Hydrogen can be used to power gas turbines, heat boilers and for a synthetic fuel. But its production in the depths of the coal pits is, at this experimental stage, complex and risky. Firstly, a tank delivers liquid oxygen to the site of the mine. The liquid oxygen is allowed to flow into a secure pool, where it expands and evaporates into a gas. Control valves guide the gas through pipes into the mine, direct to the coal deposits, where the gasification process begins.

The experiment is carefully monitored with sensors and underground cameras, on the search for irregularities. Monitoring methods are a vital part of the research; while the coal undergoes gasification various dangerous and explosive gases are produced. So measures must be taken to ensure that there are no explosions or leaking of dangerous gases.

Monitoring is also done from the surface by geologists and chemists, 25 metres above where the gasification occurs. The researchers want to be sure that gas does not leak through porous soil layers. They use a georadar to see if there are any structural changes in the underground cavity. They also check for possible gas leakages.

Another city with a long history of coal mining is Liege, in Belgium. It was here that coal gasification was investigated in a laboratory before beginning the full-scale experiment in Poland. The coal in a mine is not fully exposed, so to recreate the inside of a coal mine realistically, pieces of Polish coal were mixed up with a neutral material.

The mix was then placed within the laboratory reactor, where different gases were introduced at different temperatures and pressures. These parameters control just what happens during the gasification process: for example, a higher pressure yields more methane, while a higher temperature yields more hydrogen and carbon monoxide.

The technique of chromatography was used to analyse the resulting gases. There are three types of coal gasification: gasification with carbon dioxide gives a gas high in carbon monoxide, gasification with steam gives a gas high in hydrogen, and gasification with hydrogen will produce a gas with a high methane content – forming the base of synthetic natural gas found in energy networks.

In Poland the experiment has been running successfully during a three week period. About 50 kg of coal has been gasified per hour without any traces of a dangerous leak. The researchers have been sampling and analysing the resulting hydrogen and other gases. Chromatography is used to identify the various gas components: carbon dioxide, carbon monoxide, hydrogen, nitrogen, oxygen, and some pollutants, like sulphur compounds, for example.

Further research will most likely focus on improvements to increase the production rate of hydrogen and decrease the levels of dangerous gases. Gasification has the great advantage of also utilising the smaller deposits of coal that are traditionally overlooked.

This automatically increases the economic potential within a mine and could give new life to struggling coal regions within Europe. Furthermore, with less waste of coal, more energy will be produced in a more environmentally friendly manner.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16614

Flying into the future

There is little doubt that — short of a worldwide economic collapse — the aviation industry will continue to grow in the foreseeable future. A joint effort by European scientists was undertaken to forecast the shape of transport demand and its environmental impact.

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Civil aviation is one of the world's fastest growing industries. It has expanded at an average annual rate of 3.8 % between 2001 and 2005 and currently is growing at 5.9 % per year. The success of the aviation industry is poised to continue over the coming decades.

Continuing rapid growth in aviation would provide economic benefits and allow greater mobility amongst the world's population. However, these benefits would come at a cost — most notably a significant increase in aviation greenhouse gas (GHG) emissions.

Most projections are based on scenarios that try to imagine what the future would look like if air transport corporations continued to apply existing policies. Still, there are many projections for global aviation emissions and this makes it hard to establish one 'business as usual' case.

Efforts to provide projections taking into account changes in technology as well as in society have been undertaken by the project 'Quantification of constrained scenarios on aviation and emissions' ('Consave 2050'). For example, even though there have been significant improvements in fuel efficiency through technological innovation, this has been outweighed by the increase in air traffic.

'Consave 2050' project partners allowed for social, political and economic uncertainties by developing four possible scenarios for the growth of global (national and international) aviation emissions. Each of these scenarios is a more aggressive, or a less likely, departure from the current situation in terms of policy and technology.

These scenarios range from the so-called 'down to earth', requiring policy action and regulations, to an 'unlimited skies' scenario, which is comparable with an unconstrained demand situation. The latter also includes the assumption that fuel efficiency of the global aircraft fleet improves at an annual rate of 1.5 %. In addition, it is contingent on improvements in air traffic management and airport operations. These assumptions are broadly consistent with those of scenarios developed during the project 'Aeronautical stakeholders tools for the European research agenda' (Astera) which supports the mission of the Advisory Council for Aeronautics Research in Europe (ACARE).

Without significant policy action at an international level, air transport corporations are more likely to be on a path resembling Consave's 'unlimited skies' scenario. In this case, the global aviation emissions have been estimated to account for a significant proportion of the total allowed emissions in 2050.

The 'Consave 2050' project partners argued that the four new scenarios can establish a baseline against which changes caused by new policies can be evaluated. Furthermore, they should provide incentives to reduce aviation emissions and thereby limit the risk of undesirable climate change.

Funded under the FP5 programme Growth (Competitive and sustainable growth).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5465

Public approval for trans-European rail corridor

The Reorient transport corridor stretches from Scandinavia to Greece, passing through 11 countries and forming the basis for a trans-European integrated freight rail system. European researchers gauged public support for the corridor by canvassing the views of the voting population and local politicians from the countries affected.

Researchers in the 'Implementing change in the European railway system' (Reorient) project found that people in central and south-eastern Europe associated road transport with noise, pollution and congestion. Furthermore, rail passengers were prepared to accept longer trips and waiting times in order to aid the flow of international freight traffic. Scandinavians, however, believed road transport had only a minor impact in their countries, but considered it a problem in the rest of the EU.

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Popular support for rail transport was not just a result of the perceived problems surrounding the carrying of freight by road. People also believed that the railways could help solve these problems, both in their own countries and throughout Europe.

Findings by the Reorient project showed transportation of international freight by rail was supported in all the corridor countries. In addition, local public approval can benefit rail transport from Turkey and the Black Sea via Romania to western and northern Europe.

Rail and freight industry operators are in the fortunate position of enjoying significant popular support throughout the countries hosting the Reorient corridor. This is a major benefit for national groups promoting rail solutions and will help boost Europe's infrastructure and economy.

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5467

Rail competition put to the test

Increasing competition can give a boost to any business sector and railways are no exception. An EU-funded project has delved into the market dynamics of deregulation and its impact on inter- and intra-modal competition.

The push to increase the use of rail for moving freight across and within European countries so that traffic congestion and pollution may be lessened is ongoing.

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With rail deregulation directives in place, it was assumed that intra-rail rivalry would boost the use of rail rather than road, making rail the winning option for transferring large volumes of freight. So far, however, the expected outcomes fall quite short of the predictions. In part, this is a result of an indefinite connection between how complete market deregulation actually is, and what forms of competition exist.

The analysis conducted by the project 'Implementing change in the European railway system' (Reorient) found several factors which have come into play. Intermodal competition in some countries is well-established but lacks intra-sector rivalry. In other cases the intra-rail rivalry is solid even with incomplete market deregulation and no road-rail competition. The indications are that more intra-rail competition between national and international rail freight will boost intermodal rivalry.

The findings of the analysis will help new rail entrepreneurs better understand what they are up against when venturing into the freight sector. This will be useful in building managerial knowledge for risk-taking and accessing the capital needed.

Funded under the FP6 programme Sustdev
(Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5471

Public transport vision for 2020

A European project has provided a platform for stakeholders to discuss major trends in public transport. Transport specialists, research centres and local authorities came together to create a vision of European, local and regional transport for the year 2020.

Imagine a future where there is a dramatic reduction in private car use resulting in less traffic congestion and pollution and increased energy savings. This could all be possible with the help of cleaner, faster and more easily available public transport thanks to the project 'Vehicle for mobility — advancing public passenger transport in Europe' (Voyager).

The project was organised into two phases; the first was concerned with analysing the current situation of the public transport sector. The second phase focused on strategic discussions for developing future research and policy, addressing the barriers that could face the public transport sector in 10 years' time.

Researchers prepared for talks by analysing significant trends that reflected major developments within society. Although some of the general tendencies were not directly linked to public transport, they could still influence the sector and were employed to reassess barriers identified during the initial phase.

Examination of these trends enabled key challenges to be identified for the public transport sector and used as a basis for recommendations by key decision makers. Policy suggestions concerned research and technology development and legislation at the European, national and local level.

Recommendations for stabilising and improving public transport were aimed at all stakeholders and included greater efficiency and an improved response to customers' wishes. Other improvements included better funding and financing, and increased safety and security.

The environmental impact of public transport was also addressed with new levels for reduced traffic noise and air pollution. Voyager has therefore contributed to the quality of life for Europe's citizens by creating a vision of clean, safe, efficient and cost-effective local and regional transport for all.

Funded under the FP5 programme Growth
(Competitive and sustainable growth).
Collaboration sought: further research or development support.
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Thinking up new approaches to public transport

Public transport is a competitive arena. The EU-funded 'Thematic network for understand mobiliby prediction' (Think-up) has taken an in-depth yet broad look at the segmentation of transport markets through a thematic approach to better understand mobility prediction.

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The researchers came to many conclusions in analysing passenger transport markets. Primarily, the rise of low-cost airlines may be a hindrance to the growth of rail as a preferred choice for passenger transport. Comparing rail and airline operations, value added tax (VAT) is not added to international airline tickets. Airline companies also have the advantage of not having to pay tax on fuel. This inequality between the two modes of transport leads toward a market misrepresentation.

Project workshops revealed the correlation between land-use planning and transport infrastructure. By integrating the two rail and air public transport could have better prospects for more efficient and appealing services. Also analysed were the attitudes about mobility: that how a passenger gets there is just as important as the destination.

As the findings cover a broad scope, they will be useful for a holistic approach. The aim being to raise awareness and move toward a softer approach to improve the image and appeal of passenger transport services.

Funded under the FP5 programme Growth
(Competitive and sustainable growth).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5480

A menu of options for eco-friendly transport

It's probably harder than you might think to change Europeans' motoring habits to save the planet. One European project brought together experts on transport modelling to improve the mutual understanding of the impact of policy measures aiming to enhance the share of environmentally-friendly modes of transport.

Compared to overall greenhouse gas emissions which have decreased, the emissions of the transport sector have increased by 25 % for the period 1990 to 2005. To meet the global EU target of 8 %, it is therefore necessary for the transport sector to reduce greenhouse gas emissions substantially.

The focus of new urgently required policies to achieve this target is set on the use of more environmentally friendly transport modes. To support the implementation of these measures, knowledge of the maximum potential for a shift from road to rail and ship is necessary. The 'Thematic network for understand mobiliby prediction' (Think-up) aimed to draw together transport demand modelling and scenario building, and compare the methodologies used and results obtained.

In particular, the project considered the passenger transport market. Highly complex, the researchers used segments to subdivide the market into groups such as trip distance, mode and purpose. The segmentation approach very much resembles the parameters influencing the transport demand models.

The potential for a modal shift in passenger transport can be evaluated through demand modelling by changing different factors, influencing the passenger's choice, such as transport costs or time of trip. In the European Union, there are a range of models for determining passenger transport demand.

According to the Think-up project, these models can be subdivided into different categories. Representations can be used to determine short distance mobility according to household income and the characteristics of different transport means and models that provide an estimate of the probability of making one or another choice of transport mode.

Transport demand can also be estimated by comparing the volume of transport between regions based on the regions' economic data. The problem in using this brand of information, for which a high level of detail is needed, is that the connection between transport and the economy is usually missing.

These methods for calculating the potential for a modal shift constitute the best approaches for achieving results that are as reliable as possible, because they are based on data that reflect the 'real' behaviour of passengers. They also allow the inclusion of factors for which no data is available. For example, the trip purpose, socio-demographic and socio-economic factors are indirectly considered.

The outcome of different passenger transport models were integrated into the meta-model developed during the subsequent Expedite project. Not intended to replace the detailed models, this meta-model offers the possibility of a quick scan for the effects of a large number of policy options. Detailed studies for promising measures could then be done on specific segments of the transport market.

Funded under the FP6 programme Sustdev
(Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
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The road is open for universal public transport access

An EU-funded project, Uniaccess, has completed a comprehensive review of public transport accessibility. This represents a huge leap towards equality of access for everyone, regardless of status.

It's an experience we have all shared, some more than others, unfortunately. Equal opportunity to access to public transport is a right but is not always attainable. Disadvantage comes in many guises to all social groups. As a mother with a push chair, a disabled person in a wheelchair or simply wading through a difficult booking procedure, the effect is the same. The denial of an inalienable right.

The objective of the FP6 project Uniaccess was to redress the injustice and ensure universal access to all forms of transport – buses, trains and airplanes alike. The list of criteria covered and stakeholders involved are extensive. Major factors include good repair of vehicles, the use of available space efficiently, reduction of time wasting and safety assured.

This ambitious goal requires a high degree of coordination. All parties must participate equally with the objectives of universal access at the forefront of their minds. End-user feedback is a very important element - their needs must be communicated and outcomes validated. Designers and manufacturers must not only use state-of-the-art technology which works in reality as it did in the laboratory, but it has to be cost-effective.

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The response to these demands came as three key results achieved by the project. Essential is the accessibility review which unearthed shortcomings and successes in infrastructure, vehicles, legislature and standards which varied from country to country.

The second achievement is a roadmap. Logically organised, it starts from the planning stage where travel information and booking occur through to the final stage at journey's end. Whether the steps in the procedure were fraught with difficulty or proceeded smoothly is apparent through the scenario-based approach.

The collected information was then organised for application of the most technologically advanced solutions to accessibility problems. Experts collaborated to provide the input to the development with feedback from all key users, from the passenger to the maintenance manager.

Regional differences in policy, a major problem to date are ironed out to make the initiative seamless across Europe. Legislation, standards and enforcement were all reviewed with recommendations geared to pan-European requirement. For abolition of discrimination, there is a centralised agency.

The achievements of the Uniaccess project clearly map out the route, making sure everyone regardless of status, can take public transport to the destination of their choice. Nobody would deny it's a rocky road to travel but the way ahead, thanks to Uniaccess, may well be the freeway we are looking for.

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5483

Traffic technology for a cooperative commute?

Could chatty cars spearhead a peaceful revolution and traffic communications act as force to unite commuters instead of a curse to enrage them? Thanks to new 'intelligent traffic' technology developed by European researchers, we could be in for a more cooperative commute.

It's good to talk, and new 'intelligent traffic' technology developed by European researchers should make traffic a whole lot chattier.

It is all part of the much larger vision to create cooperative vehicle infrastructure systems that communicate with all the elements making up the road system: vehicles communicating with each other and with road signs and central services, and drivers who don't know each other talking about their route.

Moreover, they do so cooperatively and proactively. Cars and infrastructure constantly monitor their surroundings and will warn nearby or approaching vehicles of a patch of black ice, a vulnerable road-user, or an emergency braking manoeuvre, all with the aim of making roads safer, more efficient and easier to use.

It is like an 'automobile internet' and, like the internet, it requires dozens of enabling technologies, from telecommunications hardware to data transport software, protocols and application programs.

'Where possible, of course,' explains Paul Kompfner, head of the cooperative mobility sector at ERTICO – ITS Europe, and coordinator of the 'Cooperative vehicle-infrastructure systems' (CVIS) project, 'we have built upon existing technology and standards.'

The International Organisation for Standardisation's (ISO) CALM standards are a case in point. CALM stands for 'Continuous air interface for long- and medium-range communications'. This family of standards specifies a common architecture, protocols and interfaces for wired and wireless vehicle-infrastructure communications.

It was designed for robustness and reliable performance in the extremely dynamic traffic management environment, an environment where there are many actors all moving simultaneously, and where even the traffic light timing is constantly and unpredictably changing as it adapts to the current vehicle flows. It is an extremely tough communications scenario.

Crucially, CALM's job is to maintain a continuous connection to a vehicle by managing access to a wide range of standard technologies like GSM, UMTS, satellite, infra-red, 5Ghz micro-wave and mobile wireless broadband like Wi-Fi and WiMAX.

'In CVIS, we did a lot of work to help finalise the CALM standards, to develop them in the most open, universally applicable way,' Mr Kompfner explains. 'But within the CVIS project we use CALM-compliant equipment almost like a "black box", a stand-alone, all-in-one communication

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solution for cooperative traffic systems. It should provide connectivity to a vehicle travelling anywhere in Europe.'

Essentially the same 'black box' can easily be adapted for use in both fixed roadside units and in mobile cars, trucks, motorbikes, and even pedestrians' handsets.

Just adding a standard communication package is a revolutionary step forward in traffic management systems, which are notoriously non-interoperable. It also reduces risk for automotive manufacturers that the communication unit they build into new vehicles will not be outdated before they hit the showroom. It means that both car and infrastructure manufacturers can be confident that their system will be able to work everywhere.

'A lot of the top carmakers already have incredibly advanced applications in their high-end vehicles, like software that can tell when a light will change, but they all work on proprietary systems, so they cannot work together,' explains Mr Kompfner.

Proprietary systems cannot scale economically unless they become the most successful technology. Achieving dominance is itself a lengthy, uncertain and above all expensive process.

Developing a universal communication standard removes that uncertainly. Once the communications technology is in place, clever application developers can come up with all sorts of ways to take advantage of it.

For example, many cars with the lowest emission scores achieve their performance by turning off the engine at traffic lights. By communicating directly with the nearest traffic lights, a car could restart just in time for the green phase.

This would work even more efficiently, however, if the cars could avoid stopping altogether, the driver keeping to a suggested speed that would ensure arriving during the green.

And even better would be to adapt the traffic signal timing to match the approaching vehicle flows. This is just what the CVIS cooperative traffic control achieves, with time savings of up to 20 % compared to today's systems.

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It is good to talk, but it is perhaps more important to understand each other, too. Just adding a communication layer to traffic is not very helpful in itself. So CVIS has developed software that can bring in external, online information services.

For example, a new service might collect current traffic conditions and weather, combine that with data from Galileo or GPS and offer the drive a live, real-time weather and traffic forecast for the next 10, 20 or 50 km of the journey.

Mash-ups, new services that bundle together stand-alone information like real-estate listings and maps to create powerful new applications, are hugely successful on the internet, and CVIS ensured its platform could offer the same unlimited openness.

By developing this open application management middleware, CVIS has made it easy for application developers and service providers to offer new products, with functionality that remains as yet unimagined.

The middleware also separates the pure communication tasks from the high-level applications, thus enhancing security by keeping elements of the system separate.

But that is just the very beginning of what cooperative, intelligent traffic systems can achieve. CVIS partners have created many demonstrator programs in test sites across seven countries in Europe.

A dynamic lane management application can, for example, temporarily change the status of bus lanes or the hard shoulder to adapt to current traffic conditions. A filling station application can find and guide you to the nearest station for your actual route and fuel reserve. It can even take account of your preferred brand of petrol and today's prices.

The eCall, or automatic emergency call, is a compelling application for alerting the emergency services to an accident even should the driver be unable to call for help, while other applications like car-pooling, collision warning, and vulnerable user warning can dramatically enhance safety and economy.

The list of potential applications is almost endless, and once an open platform accepting third-party applications is available then a developer community will spring up to create further new services.

So the vision is firmly established and by providing the enabling technologies CVIS has fulfilled a remarkably ambitious research agenda. Now the question remains, how will society move from the laboratory to the real world, deploying along the 100 000s of kilometres of Europe's roads and streets? Stay tuned…

The CVIS project received funding from the ICT strand of the Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91364

Putting hydrogen fuel in the driving seat

A European project has proved to be a coordinated action to boost the uptake of hydrogen and fuel cells in European transport. Large-scale demonstration activities were undertaken to raise public awareness of hydrogen as a fuel for vehicles and prove the effectiveness of the technology.

Showcasing the technology provided valuable lessons for participants by focusing on the infrastructure required for hydrogen-powered vehicles and their refuelling needs. The Hylights([1]) project constructed an assessment framework and carried out a gap analysis to compare best practice results with stakeholder expectations. The analysis included technical parameters with financial and legal aspects together with real-world experiences.

An accurate assessment enabled large-scale demonstration activities to be successfully organised and planned down to the smallest detail, providing a solid basis for major financial investment. An agreed European assessment framework can also benefit the international commercialisation of hydrogen and fuel cells by complementing research work currently underway in Japan and the US.

Researchers also conducted a questionnaire with local authorities to gain valuable feedback on the results of demonstration activities carried out in Europe and the US. Respondents listed energy security,

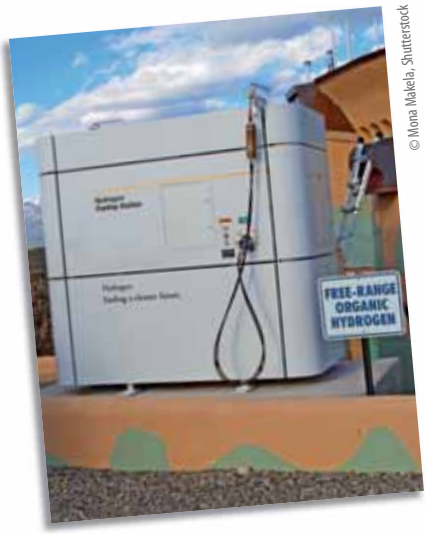
climate change and environmental protection among their main reasons for participating in the projects. Expected environmental and societal benefits included a reduction in emissions from public transport and decreased dependence on fossil fuels.

Important technical issues were also raised, including the capacity of the refuelling infrastructure and the driving limit of vehicles. Project partners recommended that more vehicles should participate in future demonstration activities and information exchange should be improved. Representatives from local authorities requested a clear framework for safety regulations and standards, subsidies for hydrogen production and liquefaction, and greater financial support in general.

The Hylights project can help maintain Europe's commitment to sustainability by promoting hydrogen fuel technology and helping it gain wider acceptance. The work can also build on the public support required for developing further research and infrastructure.

(1) 'A coordination action to prepare European hydrogen and fuel cell demonstration projects.'

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5470



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EU wind power gathers speed

Widespread integration and use of wind power in Europe is set to become a reality. A major player pushing for a greener future is the EU-funded Twenties(1) project, which will help pick up the pace of new wind power technologies across Europe.

With a budget totalling EUR 56.8 million (over half of which was provided by the Energy theme of the EU's Seventh Framework Programme), the project is one of Europe's largest industrial energy initiatives ever undertaken.

The 26-partner consortium plans to remove the existing barriers and help us embrace the new era of electricity. Some of the world's leading transmission system operators (TSOs), generator companies, manufacturers and research organisations in the electricity sector have committed time and resources as partners of the Twenties project.

Coordinated by Red Eléctrica de España, a TSO of the Spanish electricity system, the project partners will undertake full-scale demonstrations over the next three years to prove the benefits of the new technologies, the innovative approaches to the management of the electricity system, and the system services (such as voltage and frequency control). The aim is to find the right solutions to the current problems being faced by the industry in order to make way for the integration of more wind energy.

The project is a pragmatic measure in response to EU and global targets in the battle against climate change and for greater security in energy supply. These targets include the EU's vision for 2020 (i.e. 20 % reduction in CO_2 emissions, 20 % improvement in energy efficiency, and 20 % share of consumption from renewable energy sources) and those outlined in the 'Strategic energy technology plan' ('SET plan'), which seeks to accelerate cost-effective low carbon technologies.


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Under Twenties, various experiments, tests and demonstrations will take place across Europe. In Belgium and Spain, testing will take place on increasing the flexibility of transmission networks. In France, high-voltage, direct current (HVDC) meshed networks will be validated using simulations and experiments of two different HVDC circuit breaker technologies. In Denmark, the team will demonstrate two concepts and conditions: wind farms with flexible generation and loads using a scalable IT platform developed by a generator; and offshore wind farm shutdowns under stormy conditions (using the world's largest offshore wind farm).

In the case of the latter, the effect that storms can have on energy production is difficult to predict. 'This could affect the stability of the grid causing it to be blacked out at worst unless the system is ready to handle these situations and can provide the lost production from elsewhere,' explained Poul Sørensen from Risø DTU National Laboratory for Sustainable Energy in Denmark.

Risø DTU and Denmark's Energinet.dk, along with other project partners, will demonstrate ways to cope with the reduction in energy production — so that it does not end abruptly and is easier to predict. Indeed, with several large wind farms scheduled for construction in the North Sea by 2020, it is critical that large wind farms have the capacity to withstand heavy storms.

Work conducted as part of Twenties will be evaluated and documented in a report, due for release when the project concludes in 2013.

(1) 'Transmission system operation with large penetration of wind and other renewable electricity sources in networks by means of innovative tools and integrated energy solutions.'

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16693

EU launches forestry sustainable development tool

EU researchers have developed a tool to help governments and industry make sustainable development the number one goal of the EU forestry sector. The 'Tool for sustainability impact assessment' (TOSIA) allows policy-makers to consider in equal measure the economic, social and environmental elements of sustainable development.

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EU support came from the project 'Tools for sustainability impact assessment of the forestry-wood chain' (Eforwood), one of the biggest ever European forestry research studies, with a budget of EUR 20 million, including a contribution of nearly EUR 13 million from the 'Sustainable development, global change and ecosystems' thematic area of the EU's Sixth Framework Programme (FP6).

The European Commission's recently announced 2020 vision sets sustainable development firmly at the heart of EU policy-making and with the creation of TOSIA, a computerised decision-support tool, the EU is making sure that the forestry sector will be at the forefront of this vision.

According to researchers, TOSIA provides objective information showing how changes in the forestry industry influence factors such as employment, the economy, biodiversity, and greenhouse gas emissions.

'It is not an instrument for predicting the future nor is it a means of determining whether something is good or bad,' said Kaj Rosén of the Forestry Research Institute of Sweden, the programme's research coordinator. 'TOSIA helps provide objective answers to what-if questions and to highlight the consequences of various conceivable futures.' He gives as an example the potential effect on greenhouse gas emissions if the construction of timber buildings were to increase by 25 %.

Policy-makers who decide to take advantage of the system will gain access to the TOSIA toolbox — a data collection protocol that explains where to find and how to calculate the indicator values needed for a sustainability impact assessment, the data client and Eforwood database, the TOSIA calculator, and evaluation tools and database for policy analysis.

With this toolbox, TOSIA examines the whole value chain of the forestry sector, from forest to finished product, and recovery to the end of life, using indicators to describe the economic, environmental and social aspects of sustainability and how they change over time. Analysis can be personalised to fit specific requirements. For example, geographically it could cover a single property or region or be aggregated up to EU level. Likewise, an analysis could be made of an entire value chain or just one part of it, or be limited to just one or two sustainability indicators.

The researchers admit it can be less than straightforward to interpret the results from TOSIA — how, for instance, should a government weigh an increase in employment against a reduction in biodiversity? They have therefore created a variety of techniques aimed at guiding the user through such difficulties including cost-benefit and multi-criteria analyses. The latter allows the user to prioritise the various indicators and combine them into a sustainability index, making it possible to compare variables that, in theory, cannot be compared.

The Eforwood project, which brings together 38 partners from 21 countries, was put to the test via 4 case studies: (1) in Västerbotten, northern Sweden, researchers analysed the effect on sustainable development if new technologies, such as lumber-scanning to identify defects in the wood, were introduced in sawmills; (2) in Baden Württemberg, southwest Germany, they looked at what would happen in the forestry sector if the EU's 20-20-20 policy on renewable energy were to be fully implemented in the region; (3) in Iberia, researchers examined consumer behaviour and its effect on the consumption of forestry products; and (4) across the EU they analysed what would happen to the sustainability of the European forestry sector if the nature conservation directive (Natura 2000) were implemented on a more ambitious scale.

The TOSIA programme is free, but users are advised to hire a consultant from the project consortium to run an analysis.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16713

Stopping the loss of our ozone

Scientists conducted experiments in the polar regions to increase their understanding of key chemical reactions that could control ozone loss in the atmosphere.

The EU-funded 'Tropospheric halogens — effect on ozone' (Thaloz) project investigated the role of reactive halogens, including iodine, in the depletion of ozone in the troposphere, the part of the atmosphere closest to the earth's surface. Gases that act as a source of atmospheric iodine are easily broken down by sunlight in a process known as photolysis, which provide iodine atoms. The atoms react with ozone to form iodine monoxide (IO), which can speed up ozone loss.

One possible answer to the IO problem is to find a molecule that will act as a reservoir. IO reacts with nitrogen dioxide (NO_2), another gas found in the troposphere. Together they form gaseous iodine nitrate ($IONO_2$). Scientists from the University of Cambridge measured the ultraviolet (UV) absorption spectrum of $IONO_2$ to deter-


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mine the part it could play in mopping up the reactive gas, IO.

The measurements taken by the Cambridge team revealed that under normal sunny conditions $IONO_2$ has a lifetime of under a minute. Therefore, it would not appear to be a stable reservoir of atmospheric iodine during the hours of daylight.

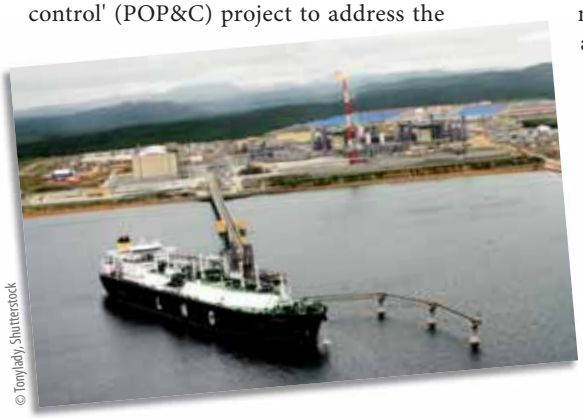
Dated collected by the Thaloz project was used to build more accurate computer models of atmospheric chemistry and ozone depletion. The models can help scientists gain a greater understanding of how chemical processes affect atmospheric composition and the climate and how it could change in the future.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).
Collaboration sought: information exchange/training.
http://cordis.europa.eu/marketplace > search > offers > 5454

Safer, greener oil tankers

An EU project funded by the Sustdev programme created a risk assessment framework to help design safer and more environment-friendly oil tankers.

Accidents involving oil tankers can have a catastrophic impact on the marine environment, with serious economic and health repercussions for local communities. Not surprisingly, stopping oil spills has become a major priority for the EU who established the 'Pollution prevention and control' (POP&C) project to address the problem. The consortium improved ship design and operation for existing and new vessels and included some of the most important actors in the field of marine safety in Europe.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Scientists developed a risk assessment model based on the area of an oil slick, the length and area of contaminated coastline, and the level of toxicity in the water column. The model used historical data from accidents involving Aframax class tankers and focused primarily on environmental risk, as well as the threat to lives and property.

Project partners also conducted a number of case studies that investigated a range of risk control and pollution control options. An additional case study based on a theoretical Aframax tanker was used to apply some of the findings from the POP&C project.

The financial viability of new ship designs was assessed, taking into careful consideration the cost of construction, operation and fuel. The findings indicated that significantly more environment-friendly tankers are achievable.

The global economy is currently dependent on fossil fuels. The POP&C project can avoid damage to the marine and coastal environment by helping reduce the risk of transporting oil by sea. Therefore, the project can help protect Europe's natural heritage, its citizen's health and the economy.

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5478

History helps prevent oil spills

Production of oil by some countries only means that the crude product must be transported, more often than not by tankers. Assessing how a vessel may behave in an accident is crucial to the prevention of oil spills.

An oil spill can be catastrophic, one that may never be properly remedied. The effects of a collision can wreak havoc if the ship breaks up and capsises, an event that can happen all too quickly. Combine the events leading to the demise of the Titanic with a cargo of crude oil and the environmental effects would be devastating.

The best possible situation is that, even in the event of a collision, an oil spill is prevented. The crucial factor is the damage stability of the tanker. The 'Pollution prevention and control' (POP&C) project assessed the so-called survivability of ships. Providing reliable probability data will mean that the industry can use vessels where an oil spill can be delayed until appropriate action is taken.

The research focused on all types of accident including grounding, collision, contact, fire and explosions. Aframax tankers in particular were assessed. These vessels tend to be used as they carry less than 120 000 tonnes of oil and are used if access is required through small canals and harbours.

Concern about the dangers of water pollution has resulted in a vast amount of data collected prior to the POP&C project. A valuable asset, the researchers assessed how this may be used to best advantage.


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A marine convention, Marpol, first convened in 1973 and amended as oil disasters occurred, was put under the microscope. First initiated to eliminate both dumping and accidental spillage of toxic substances into the sea, POP&C recommended its use for allisions where contact occurs with another vessel. It was also shown that Marpol damage survival criteria set the lowest acceptable level of risk.

Another EU project 'Harmonisation of rules and design rationale' (Harder) had collated information for the most comprehensive database to date. When assessed however, distributions calculated from the database proved inadequate for use with smaller tankers where collision damage could be underestimated.

Overall, Aframax tankers have a high rate of survivability even when watertight integrity has been lost. The POP&C project research has been able to predict the behaviour of this type of tanker in the event of grounding and collision. The best possible design types that can avoid oil spillage when an accident does occur can therefore be selected.

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5477

Salvage response to oil spills

From monitoring fishing catches to tackling criminal activity at sea, the European Commission is supporting concerted action aiming to protect the marine environment. The 'Pollution prevention and control' (POP&C) project, which has developed the means to help oil tanker owners better understand and deal with the risk of oil spills, is one classic example.

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Its role as the prime resource for the production of energy renders crude oil an important commodity of worldwide trade. Today, about two thirds of the oil traded, including crude oil and petroleum products, is transported by tankers, representing 30 % of the international trade of goods.

Although the sea appears by statistics to be the safest mode of transportation, marine accidents always happened and will continue to do so. The POP&C project partners conducted a study on the impact of key regulations which aim to prevent oil tanker accidents from happening.

The study concluded that — despite the increase of the tanker fleet over the past few years — on average the number of reported accidents has decreased. However, it is expected that the volume of oil transported by tankers will increase further in the future and so will the world tanker fleet.

Even if the probability of accidents does not increase with the world tanker fleet, the number of accidents is expected to increase. In an attempt to face this issue head on, the POP&C project partners focused on reducing the risk of pollution by determining which tank vessel design alternatives would be more effective.

Furthermore, they focused on the use of systems onboard for navigation and decision support tools (DSTs) that could help the crew to handle the abrupt motions of the ship under extreme conditions. For this purpose, six causality categories were identified as the key hazards leading to the loss of watertight integrity.

To examine the efficiency of the DSTs to minimise the risk of collision, contact, grounding, accidental structural failure, fire and explosion, dedicated simulation scenarios were developed. These scenarios were subsequently used to investigate whether the automatic identification system (AIS) and integrated bridge system (IBS) can ensure early and accurate evaluation of the ship's condition under critical circumstances.

By providing the means required to assess the oil spill potential of existing oil tankers, it is expected that the POP&C project will contribute to the development of new regulatory framework governing oil tankers. Among others, this will include revised phase-out timelines for substandard ships.

Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5479

Distance is key in speciation

A new EU-funded genetic study from the UK is offering evolutionists a new twist in biodiversity: lizards originating from the same island but living in different, yet adjacent habitats are inter-breeding less than lizards originating from different islands.

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The outcome is part of the project 'Testing the relative importance of factors in speciation: the Martinique Anoles' (Speciation factors), which received almost EUR 160 000 under the Marie Curie scheme of the EU's Sixth Framework Programme (FP6). The findings, published in the *Public Library of Science* (PLoS) *Genetics* journal, provide insights into the role of geographical isolation in speciation.

For years, scientists have conducted evolutionary studies on islands around the globe, such as in Indonesia, Asia, and the Galapagos off the west coast of South America. These islands have helped researchers determine the conventional theory of allopathic speciation, in which closely related populations are separated geographically, restricting the gene flow between the groups.

Martinique in the Lesser Antilles as we know it today is made up of a number of ancient islands that have only recently coalesced into a single entity. Based on phylogeny and geology data, these ancient islands have been home to a tree lizard (anole) species for the last 6 to 8 million years.

'Over the last 150 years, since Darwin's study of islands and his *Origin of Species*, island archipelagos have played a central role in the understanding of evolution and how species multiply (speciation),' the authors write. 'Islands epitomise the conventional view of geographic (allopatric) speciation, where genomes diverge in isolation until accumulated differences result in reproductive isolation and the capacity to coexist without interbreeding.'

Professor Roger Thorpe from the School of Biological Sciences at Bangor University in the UK, along with his colleagues, genetically tested the lizards for reproductive isolation from one another. The use of selectively neutral genetic markers helped the team determine that the anoles are freely exchanging genes and are not behaving as separate species. Furthermore, according to the researchers, greater genetic isolation exists between conspecifics from diverse habitats than between those lizards hailing from separate ancient islands.

'Indeed, there is more genetic isolation between adjacent populations of the same species from different habitats than between separate putative allospecies from the ancient islands,' the authors write. 'This rejects allopatric speciation in a case study from a system thought to exemplify it, and suggests the potential importance of ecological speciation.'

Commenting on what steps need to be taken next, Prof. Thorpe said: 'The next step is to identify the genes controlling the traits influencing the process of speciation.'

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http://ec.europa.eu/research/infocentre > search > 16333

Finding the right tools for the urban sustainability job

Sustainable development is an important ally in the drive to improve the quality of life in Europe's cities. A review carried out by the 'Practical evaluation tools for urban sustainability' (PETUS) project identified tools for encouraging sustainability and improving the management of urban infrastructure.


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Decision-makers need access to a wide range of tools if urban areas are to be properly managed. They can provide valuable information and guidance about water, sewerage, waste, transport and energy, which are all crucial to the built environment.

The PETUS project was set up to create a database of tools and case studies that could be used to bring about sustainability in urban areas. Both the public and private sector benefited from the work, which helped them to manage projects in a better way. The funding was provided in part by the EU through its 'Energy, environment and sustainable development' programme.

Project partner, the Welsh School of Architecture, Cardiff, carried out a literature review of tools and benchmarking data used for assessing sustainability in cities. The researchers identified different theoretical and practical tools, including those used for assessing environmental, social and economic impacts and those which dealt with specific sectors.

An important issue highlighted through the review was the limited availability of benchmarking data, which is used to determine an organisation's or government's performance. A further problem was that the available data was found to vary widely between different sectors and was often difficult to calculate and implement.

According to the review, available tools were not being used despite the interest shown by those individuals and organisations that would normally put them into practice. This finding highlighted a gap between what should happen in theory and what actually happens in practice. A positive feature arising from the review was the use of tools to improve links between decision makers and the general public.

The study carried out by the Welsh School of Architecture can be a major benefit to those responsible for developing and maintaining the infrastructure of Europe's cities. The tools and benchmarking data identified can enable these decision makers to make better and more informed choices when managing sustainability in modern urban environments.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5378

Green homes don't translate to sales success

Results from new EU-funded research show that home buyers are unwilling to buy new, energy-efficient houses. Poor communication between builders and buyers is a big part of the problem, say experts studying the behavioural barriers to better and broader acceptance of renewal energy.

The project results are part of the 'Create acceptance'([1]) and 'Changing behaviour'([2]) projects, which received EUR 3.83 million in total EU funding.

The housing sector currently accounts for 40 % of Europe's energy needs. The lack of energy conservation in this sector is believed to be partly due to energy prices and voluntary regulatory measures.

Both European research initiatives support the need for change in energy use and services across consumer and industrial groups, and are headed by Finnish institutes working in collaboration with a number of researchers from Europe and abroad.

Together, the experts studied the so-called 'sticky information' problem inherent in a project that aimed to promote low-energy technologies used in sustainable housing. Sticky information refers to the way that the knowledge of energy efficiency experts and that of potential buyers remains 'stuck' in their respective worlds, indicating poor communication flow and exchange.

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As part of this project, a competition was organised that invited housing manufacturers to produce energy efficient homes. Potential buyers were also involved in stages of the competition and included as members of the competition jury. As a result, 10 competitors received the 'green label' branding that both acknowledged the energy conservation efforts and aimed to inspire greater purchasing power.

Despite some success with raising general awareness of energy conservation and services provided by the technologies, house sales generated by the competition were disappointingly low. Some buyers wanted to make modifications that would render the houses no longer energy efficient. Other buyers did not trust the information supplied to them or simply remained unconvinced of the urgency to conserve energy.

For the 'Create acceptance' and 'Changing behaviour' researchers, the project fell short of the mark because of poor communication between the housing manufacturers and the buyers themselves. For instance, the team believes the builders did not adequately address the diversity of potential buyers, the buyer's willingness to participate in the process and be informed, and their desire to tailor the houses to suit their own personal needs.

Looking forward, the researchers recommend greater use of participation methods to improve communication, such as consumer research and focus groups, and by exploring the concept of co-design with buyers. Importantly, these methods would need to be adapted to suit the needs of both manufacturers and buyers and not compromise the overarching goal of low-energy, sustainable housing.

They also point to the option of regulatory instruments on new energy standards, such as building codes, if voluntary strategies fail to work. These would need to be developed in synch with communication strategies to maximise their potential. Beyond regulatory measures as a way to stimulate energy efficient practices, the experts say government bodies could play a greater role by improving the flow of information.

The 'Create acceptance' project was funded EUR 1.35 million under the 'Sustainable development, global change and ecosystems' thematic area of the EU's Sixth Framework Programme (FP6). It brought together experts from Finland, France, Germany, Hungary, Iceland, the Netherlands, Poland, South Africa, Spain and the UK.

The project is complemented by the more recent 'Changing behaviour' project. It gets as part of the EU's Seventh Framework Programme (FP7) EUR 2.48 million under the Energy theme. The 'Changing behaviour' partners are from Germany, Estonia, Greece, Latvia, Lithuania, Hungary, the Netherlands, Finland and the UK.

(1) 'Cultural influences on renewable energy acceptance and tools for the development of communication strategies to promote acceptance among key actor groups.'
(2) 'Contextualising behavioural change in energy programmes involving intermediaries and policy-making organisations working towards changing behaviour.'

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16353

Sand eel survival in the balance

There is undoubtedly complex interaction between marine ecosystems and fisheries management in the North Sea. An EU-funded project Impress([1]) has tried to unravel a food web to save the waning population of sand eels.

The sand eel is not an eel at all but a small carnivorous fish found in temperate seas of the northern hemisphere. This curious common name fits the habit of this species of fish since in April to June sand eels are known to swim in shallow waters of 10–20 metres above sandy bottoms. In November they live in deeper waters and can actually dive head first into the sand.

It is not surprising that the sand eel is a convenient source of food for other fish, birds and certain mammals especially while very visible in shoals during Spring. They are also of economic value since they are used for the production of fish meal and fish oil and are also used as fishing bait.

Although the industrial sand eel fishery is the single largest in the North Sea, the correlation of prey density and availability to one of its main predators, seabirds, is not clear. The Impress project used the advanced technology of oceanography and combined it with basic ecology to determine species distribution to examine the interactions between this top predator and its prey.

The researchers took an ecosystem-based approach to incorporate the effects of changes in populations of seabirds over the last 20 years. The results highlighted the complex way factors like feeding success, location, competition and facilitation when one of an interacting pair benefits without harm to the other interact.

Fish populations are under major threat, from not only fisheries but climate change. Using top predators to predict the effects of fishing on the sand eel population is attractive through its simplicity. However, the findings suggest that ecosystem-based fisheries management is not adequate to protect endangered animals like the sand eel. The Impress project has provided a valuable information base to save the day for vulnerable members of ecosystems before it is too late.

(1) 'Interactions between the marine environment, predators, and prey: Implications for sustainable sand eel fisheries.'

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: information exchange/training.
http://cordis.europa.eu/marketplace > search > offers > 5449


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Free, open virtual laboratory for infectious diseases

Doctors around the world will soon have a powerful new tool at their disposal in the fight against HIV and other infectious diseases: a virtual laboratory that will help them match drugs to patients and make treatments more effective.

The new virtual laboratory, the core components of which are scheduled to be available online in 2010, uses the latest advances in machine learning, data mining, grid computing, modelling and simulation to turn the content of millions of scientific journal articles, disparate databases and patients' own medical histories into knowledge that can effectively be used to treat disease.

Developed by a multidisciplinary team of European researchers working in the EU-funded 'Virtual laboratory for decision support in viral diseases treatment' (Virolab) project, the virtual laboratory is already being used in seven hospitals to provide personalised treatment to HIV patients and is eliciting widespread interest as a potent decision-support tool for doctors.

'Virolab finds new pathways for treatment by integrating different kinds of data, from genetic information and molecular interactions within the body, measured in nanoseconds, up to sociological interactions on the epidemiological level spanning years of disease progression,' explains Peter Sloot, a computational scientist at the University of Amsterdam and the coordinator of Virolab.

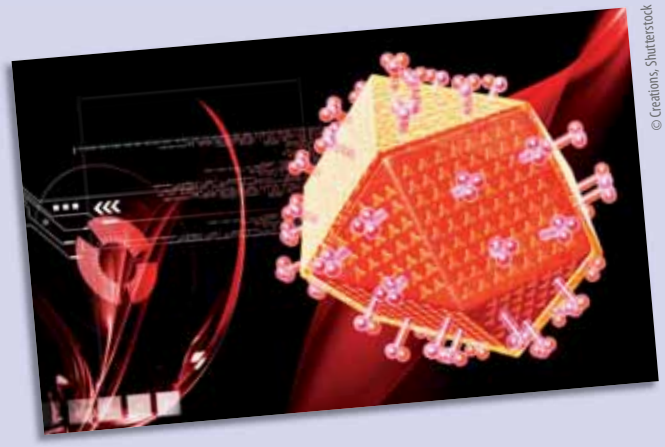
Mr Sloot came up with the idea for Virolab a decade ago when he met a virologist at a scientific conference who told him about the problems doctors face when trying to find the right cocktail of antiretroviral drugs to treat people infected with HIV, the virus that causes AIDS. Because HIV frequently mutates and can quickly become resistant to drugs, doctors need to know which medications are likely to be effective in slowing the progression of the disease. For that, they must take into account not only the strain of the virus the person is infected with but also the patient's own medical history, genetic information and even sociological factors.

'It's like a lock and key. Drugs are keys made to fit certain locks, which are part of the viruses. If the locks change then the key no longer fits — and each lock is different for each patient. That is why we need personalised medicine,' Mr Sloot explains.

Virolab's virtual laboratory uses a combination of technologies and methods to help doctors make decisions about the best medication to give each individual patient, accessed through a simple-to-use web interface.

The system continuously crawls grid-connected databases of virological, immunological, clinical, genetic and experimental data, extracts information from scientific journal articles (such as the results of drug resistance experiments) and draws on other sources of information. This data is then processed to give it machine-readable semantic meaning and analysed to produce models of the likely effects of different drugs on a given patient. Each medication is ranked according to its predicted effectiveness in light of the patient's personal medical history.

Crucially, the system incorporates the concept of provenance, ensuring that every step a doctor takes in creating a workflow to find the right drug for a patient and every step the system takes to provide a recommendation is recorded. Because of the distributed nature of the virtual laboratory, cases can be compared to those of other patients living a few streets or thousands of kilometres away.



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And the system can even generate models simulating the likely spread and progression of different mutations of viruses based not only on medical data but also on sociological information.

'Say a government has EUR 500 million to spend on HIV research and wants to know whether they should focus on funding the development of new drugs or on preventive measures such as encouraging people to change their sexual behaviour. We can give them an answer as to what would be more effective,' Mr Sloot says.

The Virolab coordinator says the project's focus on HIV was driven not only by the scale and importance of the epidemic but also by the wealth of information about it. 'I make mathematical models and for models you need data,' Mr Sloot notes.

The virtual laboratory could be equally effectively used to create personalised drug rankings to aid in the treatment of people suffering from other diseases. It is something Mr Sloot and other members of the Virolab consortium are exploring in the project 'Computing real-world phenomena with dynamically changing complex networks' (Dynanets), a follow-on EU-funded project that will look at drug dynamics in groups people infected with the H1N1 flu virus and co-infections, in addition to drug-resistant HIV.

Mr Sloot, who 'went back to school' during the project to study virology and epidemiology, puts the success of Virolab, which received funding from the EU's Sixth Framework Programme, down to the multidisciplinary nature of the team involved. It has proven to be a productive collaboration that is set to continue.

'We are committed to continuing our work with whatever funding we can get. We are not at present interested in commercialising this technology,' Mr Sloot says. 'We want it to be open and free. The goal is not to make money from it but to contribute something to the world.'

Virolab was funded under the ICT strand of the EU's Seventh Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91302

New tsunami early warning system stands guard

The 2004 Boxing Day tsunami killed 230 000 people. The next time a tsunami threatens Indian Ocean nations, a lifesaving early warning system spearheaded by the EU will be in place.

Starting a few seconds before 1 a.m. universal time on 26 December 2004, a 1 600 km segment of the Indian tectonic plate jolted downward just off the coast of Indonesia, lifting the seafloor by several metres and displacing some 30 cubic kilometres of water. With a magnitude of 9.2, it was the second strongest earthquake ever measured. The resulting tsunami waves — some of them 30 m high — began to hit just 20 minutes later. They wreaked massive destruction and killed an estimated 230 000 people in Indonesia, Sri Lanka and 12 other countries.

This disaster, one of the deadliest in recorded history, brought home the urgent need for an effective system to give at-risk populations around the Indian Ocean as much warning as possible the next time a tsunami strikes.

Europe quickly rose to the challenge. Germany was the first to take action with the joint German-Indonesian tsunami detection and warning system called Gitews. Building on the infrastructure and experience developed through Gitews, the EU funded and launched its 'Distant early warning system' (DEWS) in 2007 to include and provide protection to all the nations of the Indian Ocean region.

The DEWS project has now created and started to deploy a sustainable system to detect and analyse seismic events in the Indian Ocean, quickly assess their potential to unleash a tsunami, and warn all of the at-risk countries in time to save lives.

'It's almost impossible to give numbers,' says Andreas Küppers, researcher in charge of the DEWS demonstrator, 'but if DEWS had been in place in December, 2004, a very large number of lives could have been saved.'

An effective tsunami warning system starts with a network of strategically deployed detectors. In the case of DEWS, these include broadband seismometers, land and ocean-surface based GPS instruments, tide gauges and ocean bottom pressure control devices. The different kinds of sensors provide complementary information that allows more accurate assessment of the risk of a tsunami.

The data generated by this suite of instruments is streamed via communication satellites to a central station in Jakarta, Indonesia for processing. State-of-the-art open source software called SeiscomP3 developed by the German Research Centre for Geosciences (GFZ), the lead institute for the DEWS project prototypes, rapidly determines the magnitude and location of a seismic event.

'The former systems needed 11 or 12 minutes to detect a signal and locate the source,' says Mr Küppers. 'The same can now be done in 4 minutes.'

Once the system detects an earthquake powerful enough to create a tsunami, it begins to analyse and model the risk of a tsunami. If waves are detected from ocean bottom pressure sensors or newly developed GPS buoys at the sea surface, it's possible that a tsunami has been generated and will strike somewhere. The next question is where and with what run-up height.

Even with powerful computing capabilities, modelling an event as complicated as a tsunami in real time would take far too long. An earthquake along the Sunda arc — the source of the Boxing Day quake — can generate tsunami waves that hit the coast of Indonesia within 20 minutes.

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The DEWS researchers solved that problem by using libraries of temblors of different magnitudes and source locations, coupled with detailed simulations of the waves they would create around the entire Indian Ocean coastline.

When an actual earthquake shakes the region, the DEWS system automatically finds the simulation that best fits the event, and uses that to determine which coastal areas are at risk. 'It's not possible to do all the modelling of wave propagation and direction immediately after the event,' says Mr Küppers. 'But the system works well with our prefab models.'

With 20 countries to warn and a Babel of languages to deal with, the DEWS team has to put as much effort into the linguistic challenges and politics of how to warn all these countries and their at-risk population as into the technological and computational infrastructure.

The system has a component to compose and distribute messages and another to control if messages have been properly received or not. In addition, it is a multilingual system that can distribute different messages to different people in different languages, says Mr Küppers. 'It was even more difficult politically to get all the players together at one table,' he adds, 'but we are well on our way to overcoming those problems as well.'

The working system has been demonstrated in association with DEWS project conference. Decision-makers in local and regional authorities have expressed interest in the DEWS project working system.

Building on the success of DEWS in the Indian Ocean basin, the focus shifts to Europe, where a tsunami may occur at any time either in the Mediterranean Sea or in the north-east Atlantic.

Greece, Portugal and Turkey and are the countries at greatest risk, but all the nations bordering the Mediterranean could be safer once DEWS is implemented there as well. Many preliminary steps toward that goal will be taken by other EU-financed projects.

Perhaps the single greatest innovation flowing from DEWS is the realisation that minimising infrastructure damage and loss of life from a natural or manmade disaster requires an enormous amount of technical knowledge and a high degree of coordination. As a result, the consortium is advocating the development of a new profession — that of the 'early warning engineer'.

'If you want to tackle these problems properly, you have to take the time and effort to involve everybody,' says Mr Küppers. 'So we'd like to see people acquiring a new full-scale profession and be able to take care of the whole early warning field.'

The DEWS project received funding from the Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91371

The world: a global village called Babel

European scientists have developed groundbreaking technology to enable machine translation using statistical analysis. Now linguistic diversity can be found in translation.

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We live in a global village, and its name is Babel. As information and communication technologies unite the world into a global village, so the diversity of our global linguistic landscape creates new barriers. The smaller the world becomes the larger the language barrier looms.

Europe is an excellent example in microcosm. Political and social cooperation draw the diverse peoples of Europe ever-closer together, but language often separates them. Fully one half of the European population is incapable of conversing in a second language.

The issue is even starker on the world wide web, where English has become the *lingua franca*. But that status quo is under threat as China and India ramp up their scientific and engineering expertise and simultaneously produce more and more essential information in their native languages. How can we help people communicate now, and how can we overcome the emerging language barriers of the future?

The 'Statistical multilingual analysis for retrieval and translation' (SMART) project believes it has the answer. SMART sought to make statistical methods a viable alternative to current paradigms. In just three years the project has made the technology a robust alternative.

Machine translation is not new. In fact it is one of the oldest problems in computer science. 'It was one of the first problems tackled, with work starting in the 1950s,' notes Nicola Cancedda, researcher with Xerox and coordinator of the SMART project.

'Trained bilingual linguists would encode the rules of given languages into a computer program, and the software would use these rules to offer a best-guess at a particular translation.'

Statistical machine translation is not new either. It began in the early 1990s and lets a machine 'learn' translation between two languages by looking at thousands of real translations. SMART took that work further by producing robust technology that can match the state of the art in traditional methods. But their platform has not yet had the 'fine-tuning' applied to traditional techniques, and so SMART has opened the way to a very promising research path in statistical machine translation.

Their work was inspired in large part by the efforts of the 'Pattern analysis, statistical modelling and computational learning' (Pascal) network of excellence (NoE) which sought to develop cooperative ties among Europe's leading players in pattern analysis, statistical modelling and computational learning.

'Seven out of our ten partners come from the Pascal NoE,' reveals Mr Cancedda, 'And the impetus for the SMART project came from Pascal's work. We sought to develop more effective statistical learning methods, apply them to machine translation, and then prove the platform through rigorously measured case studies.'

Those case studies focused on computer-aided translation (CAT) and cross-language information retrieval (CLIR). Computer-aided translation is used by professional translators, with the software suggesting possible translations for individual sentences in the target language.

'In our case study, the SMART platform increased words per hour by 5 to 40 %. Most interestingly, the greatest improvement was seen among the slowest translators,' stresses Mr Cancedda.

This result alone represents an enormous boost in productivity and justifies the project's work. But SMART went much, much further.

While CAT might have the largest commercial potential, the project's work on CLIR will probably have the widest societal impact. CLIR takes place where people try to acquire information from a foreign language document. In the SMART case study, Slovene students, with varying competence in French, sought to extract information from the French Wikipedia.

In the project's subsequent tests, students using SMART's CLIR system could answer a significantly higher number of questions accurately than those students using currently available tools.

Another allied work effort saw SMART develop confidence estimation to accompany the statistical machine translation. The confidence estimate indicates the likely appropriateness of the translation.

'This is an essential element,' emphasises Mr Cancedda, 'because software providing inaccurate translations is worse than no translation. A translator is better off working alone with his or her dictionary than reading and correcting inaccurate suggestions.'

What makes this work even more valuable is that it could be applied to existing software to make that software even more accurate. Confidence estimation was also an important, and exciting, technical challenge in itself. How do you teach a machine to assess itself?

Again, statistical methods are applied, and the relevance and power of SMART's confidence estimation varies enormously between different texts. The questions of context and specialist knowledge play a huge role.

Although these are early days in the technology's development, it can already achieve up to 90 % estimated confidence in some cases – nine out of ten machine translated sentences are relevant.

In any case, SMART also advanced new research to tackle the problem of context. 'Imagine you have a million sentences on one topic, say software. In this case, you can easily use statistical machine learning to create a statistical machine translation software for that topic,' argues Mr Cancedda.

But what if you only have several thousand sentences on another topic, for example airport computer security systems? 'In this case, it is difficult to do statistical machine learning. You do not have a sufficiently large sample,' he says.

'So we developed a tool that can learn the bulk of its translation from one set of documents, and then be specialised to a particular topic with another, much smaller, set of documents. It is not perfect yet but early work shows that this approach could be very promising.'

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And finally, SMART's last contribution to statistical machine translation is perhaps the most valuable, particularly in cases where only a small set of initial translations exists. SMART developed real-time learning tools that can 'teach' software new terms and translations.

'Normally, software is developed and that is the way it will stay for months or years. We have developed tools where the software learns all the time, so it becomes much, much better over time, and so much more valuable,' states Mr Cancedda.

It is a packet of results for a three-year project with just a EUR 3.5 million budget, EUR 2.3 of it from the EU, but it illustrates the kind of focused research that can emerge from a network of excellence.

Now, elements of the SMART software will begin appearing in commercial products, notably those supplied by SMART partners Xerox and Amebis. Two open source machine translation systems developed in the STREP — the Sinuhe and the Max-Margin Based Translation (MMBT) systems — were released to the research community and are available for download from the project website.

In all, it means that our global village will be found, rather than lost, in translation.

The SMART project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91298

High-tech deliveries improve urban living

Transportation of goods from the factories that produce them to where they are needed is an essential part of modern life. However, the increasing volumes of traffic and the congestion this creates make it increasing difficult for freight transport to enter into the heart of busy urban centres.

The goal of the project 'Decision support system for integrated door-to-door delivery: planning and control in logistic chains' (MOSCA) was to improve freight distribution in Europe's towns and cities by addressing problems such as booking and reservation procedures, vehicle routing, and loading and unloading.


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The consortium developed a series of software tools that enabled transport operators to improve the efficiency of their door-to-door delivery services. The tools are capable of communicating with one another and with external systems, and help in organising deliveries and planning the best route.

Project partners adopted a collaborative approach for solving the problem of urban freight distribution, providing both demand and supply side information in a single system. Components of the supply system included dynamic road network models for predicting arrival times. Local authorities, who have responsibility for maintaining the road infrastructure, represented the supply side. The demand side was made up of the companies that produce and transport the goods.

Start-of-the-art technology was used by the MOSCA project to help meet customers' needs while benefiting the wider community by putting an end to traffic-clogged streets. This will result in less air pollution and a quieter, safer urban environment, thereby improving the citizen's quality of life.

Funded under the FP5 programme IST (User-friendly information society).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5484

Scholars investigate Europe's cultural memory

Historians from the Netherlands, Austria and the UK have teamed up to investigate how medieval societies used the past to establish ideas about people and their identity, and how these ideas continue to play a major role in today's society.

The project, called 'Cultural Memory and the Resources of the Past, 400-1000', is a joint collaboration between the Universities of Cambridge and Leeds in the UK, and the Universities of Vienna (Austria) and Utrecht (the Netherlands). The project is supported by a EUR 1 million grant from the 'Humanities in the European Research Area' — Joint Research Programme (HERA-JRP) under the ERA-NET scheme of the Seventh Framework Programme (FP7).

The researchers will focus on six centuries of western European history — from the period 400 to 1000 AD. Their work, which will be carried out over a three-year period, will centre on how earlier traditions, along with other sources like the Bible, were instrumental in forming state identities following the deposition of the last Roman emperor in the West in the fifth century.

The team will spotlight two key issues: how texts were 'transmitted' from one individual centre to another; and what challenges people faced in forming identities in early medieval Europe's complex social, political and religious mix.

Questions to be answered by the researchers include how the Roman imperial past influenced people's state of minds during the medieval era and how today's Europeans are still impacted by the concepts of ethnicity and society that emerged during that period. They will also investigate the complex processes by which ideas


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were exchanged between the Greek-speaking Byzantine world to the East, and the Latin-dominated West.

Europeans recognise how influential a role the early Middle Ages played in western European history. However, questions remain regarding Europe's cultural inheritance, particularly how ideas were absorbed, as well as how that process has affected us over so many years.

For 600 years, Europeans faced myriad changes in their lives including the creation of new ethnic identities and the development of novel ideas about diverse western European societies. As far as religion goes, Christianity spread like wildfire during that period. Rulers of that time referred to the Latin Bible as a source of supreme law and as one of authoritative history, and commentary on the present, according to the scholars.

They were also in awe of the classical world. For them, Rome was considered the centre of all, a place to associate cultural and religious power, especially since Rome was the hub of Latin texts. Classical texts during this period were used to establish traditions and ideas for Europeans.

These events led to the foundation of several modern myths that continue to impact the lives of Europeans today. Moreover, current ideas about national origins and the Christian identity of Europe, among others, were formulated during the early medieval period.

This latest project will tackle how these events emerged and how they have influenced us ever since. This project is one of several HERA-funded projects investigating European inheritance and identity. The partners will establish a website allowing public access to preliminary reports, materials and results during the course of the project.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16313

Breaking down the web barriers bit by bit

Computers and the internet can enable you to communicate globally and provide access to vast stores of information — provided you have the ability to access it. A system to remove barriers to the internet faced by people with disabilities is gaining ground.

Technology can open doors, but only if you have the capacity to use it. Written information, using a mouse and the way information is presented can act as barriers to those with limited motor skills or those who find it difficult to maintain attention on a topic for long periods.

The 'e-Inclusion for communication disabilities' (Navigabile) project is designed for a wide spectrum of children and adults. It is not just one solution. It is based on profiling at the entry point so that the user is offered the most customised solution possible.

'We normally think of people with disabilities as if they were one homogenous group,' says Leopoldo Ferrè of Exeo Consulting, project manager of Navigabile. 'We imagine they will face similar situations and have similar needs. That is not true. They are all individuals with different characters, needs and motivations. Navigabile developers need to investigate case by case.'

To serve such a diverse audience, Navigabile profiles each user by asking them a series of questions about the way they like to receive and view information, and how they like to communicate.

The profiling can define the size of the font, the level of screen contrast and the way the interface looks. Users with motor difficulties can choose to have documents scroll slowly by so they can read without having to constantly change the page. Or a computer voice can read the text out. For those with limited reading ability, Navigabile supports picture languages like DCS or Bliss — or text can be limited to simple vocabularies.

'Profiling is the core — we look to start from the most customised solution possible,' says Mr Ferrè. 'Through profiling, Navigabile adapts to the needs of each user. Normally it is the other way around — users have to adapt to the needs of the system. We have not solved all the problems facing people with disabilities who want to use computers, but we can offer more than one million options at this stage. The most successful parts of Navigabile are the sentence writer and the simplified mailing system. What many users really value is to be able to communicate with others — to publish a sentence or picture with their comments and to enter discussions. They are most interested in being part of a social network.'

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The number of people using Navigabile regularly has grown quickly. The software developed in the EU-funded project is also offered more than 30 centres for people with disabilities in Italy.

Most Navigabile users are not fully autonomous in navigating the internet. They need some help. There are now several hundred trained Navitutors and teachers who can support system users. An online training course for these user supporters has been developed and the Navigabile team maintains a central helpdesk to answer users' questions.

Supporters are not only crucial in helping Navigabile users overcome physical limitations, they can also play an important motivational role, Mr Ferrè points out.

'At times, Navigabile cannot offer users some of the more attractive parts of the internet. The program must present information in a simple way. For example, Flash® or video might simply cause confusion for someone with a severe mental impairment. For some users, communicating can be very hard work. The supporter can help them gain the benefits of that hard work and encourage them to continue.

'We experimented with Navigabile in Italy for three years before looking internationally. The opportunity to have a multi-language system was a logical step forward. Why not include the needs of people from all around Europe?' the project manager asks.

It offers Navigabile opportunities to learn from different cultures and processes used in working with people with disabilities in other countries, he notes.

'We also wanted to increase awareness of the opportunities that Navigabile offers. We are sure that there are many supporters and teachers who would take up the training we offer if they knew about it. The training is not that long. We offer

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e-learning training and we maintain networks where they can exchange knowledge and experience.

Navigabile is something that can never finish because people with disabilities in the future will also have new and different needs. It will require continuous effort. 'Each time we add a new feature we include a new group of people — but often each specialist feature increases the total population by a very limited number,' he says.

Part of that development challenge is to exploit the rapidly expanding range of web technologies. 'We are researching how to turn Navigabile into a Web 2.0 platform, making it easier for the users' families, supporters and teachers to have more opportunities to communicate with each other,' confirms Mr Ferré. 'We want to create communities of people who work with users where they can exchange their success stories.'

Navigabile was funded under the eTen market validation scheme. It has the backing and continued support of a number of influential Italian and global companies. It is an initiative of Fondazione Italiana Accenture, in partnership with Fondazione Don Carlo Gnocchi Onlus, Fondazione Francesca Rava — NPH Italia Onlus, Ministero della Solidarietà Sociale, HP, Microsoft, Nuance, Studio Delta, Dart, Univeristat de Valencia, e-Isotis.

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Building better, more secure software

How can you be sure the software on your computer is secure? Improving software security is at the heart of the recently finished European project.

The project in question, called 'Detecting known security vulnerabilities from within design and development tools' (Shields), received EUR 3.25 million under the 'Information and communication technologies' (ICT) theme of the EU's Seventh Framework Programme (FP7). The project, which officially ended in June 2010 has helped tackle the software security challenge.

Even today, with the rapid pace that technology progresses, software systems continue to be hampered by security vulnerabilities. In fact, progress has much to do with the problem itself. For instance, rates of failure have increased with the need to protect mounting volumes of critical information and systems (known as 'software controlling'). Also, as software has advanced and become more complex, so have the flaws. Finally, with software-intensive systems increasingly seen as economic and political targets for well-resourced attackers, the threats to these systems have likewise escalated.

Trusting firewalls and anti-virus applications to protect software is no longer sustainable, with experts increasingly pointing out the need for security to be built as a fundamental part of the software itself.

At the industry level, the Shields team believes that some of these problems persist because information on known vulnerabilities are not made available to software developers or integrated into the tools they use to build software. Typically, vulnerability databases that may be accessed by developers contain only general information on the problems, and on risk assessment, solutions and tools (normally written, in any case, with users and not developers in mind). The lack of information for developers means a lack of support for finding and removing security vulnerabilities.

Since the Shields project was launched in 2008, the team's approach has been to focus on the knowledge and communication gap that exists between security experts and software practitioners. By providing software developers with important information from sections of the industry, the aim for Shields has been to prevent known security vulnerabilities from being inadvertently written into new software. New tools would make it easier and faster for security experts to deliver the information on security vulnerabilities, which would, in turn, help developers avoid, detect and remove them.

The solution for Shields was to develop a shared repository of security information for all kinds of software security tools and methods named 'Security vulnerability repository service' (SVRS). The SVRS is the central element of Shields services. Its main purpose is serving as an intermediary between security experts and software developers. It stores and manages complex interconnected security knowledge.

In addition the team has designed two certification programmes for the industry: 'Shields compliant' and 'Shields verified'. The first is for tools that are compatible with SVRS, and the second is used for certifying that software has been checked for security vulnerabilities during the development process.

The Shields project has successfully undergone several reviews, where the Shields approach and model-based testing tools were demonstrated. Case studies have shown a reduction in software security problems and that the tools are appropriate for both security experts and software developers. Almost all eight evaluators involved rated the Shields tools as quite high in detecting security vulnerabilities.

Over the course of the 30-month project, work undertaken by the team has also created tools that are in synch with new technologies, and provided better information for software developers and buyers. These tools allow for a wide range of testing, monitoring, editing models and performing inspections.

The Shields consortium includes Institut Télécom/ Télécom SudParis (France), Montimage EURL (France), Fraunhofer IESE (Germany), Search-Lab Ltd (Hungary), TXT e-solutions SPA (Italy), Sintef (Norway), European Software Institute (Spain), and Linköpings universitet (Sweden).

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Audio-visual answer to modern computing

An innovative project to develop an audio-visual search engine could have implications as diverse as improving the lives of documentary makers to preventing international crime. It could also transform the usability of audio-visual platforms such as YouTube.

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The concept behind developing an audio-visual search engine is, on the face of it, rather simple. It addresses a fundamental weakness of computers up to now: while they are experts at finding words in text, finding objects in images and video is another matter.

To understand why, think about how much interpretation is directly encoded in writing: while we are speaking on the phone, we are creating a physical signal. But by the time this information is written down, this physical signal has been encoded into a series of digital symbols — the letters — placed one after the other. Computers are very efficient at manipulating these symbols because they don't really have to interpret them but only find patterns among them.

But this is not true for video. Imagine, for example, 10 distinct video snippets of cats. A textual description of their content would be very easy to search because (in English) we would use the word 'cat' to describe each of them. But in each of the snippets the set of pixels that depicts the cat is going to be very different in terms of shape, size and colour. It is very difficult for a computer to recognise that these very different sets of pixels all depict the same kind of object, a cat.

In order to address this problem, the EU-funded project 'Interactive semantic video search with a large thesaurus of machine-learned audio-visual concepts' (Vidivideo) has developed an interactive semantic video search with a large thesaurus of machine-learned audio-visual concepts.

Vidivideo is a research project and as such does not have the goal or the resources to solve this problem in its entirety. Rather, it sought to provide the building blocks to enable computers to identify — with speed, consistency and accuracy — what an object is in video format.

'We have been working on video analysis for a long time,' says Marcel Worring, associate professor at Amsterdam University and one of the coordinators of the Vidivideo project. 'But we found that there were things missing. There are three levels to video analysis: breaking up the video into shots, trying to describe what is in the video, and finally machine-learning. We felt that the shot segmentation could be done better, and wanted to work with the top experts in the world on machine-learning. We also wanted to add another element that was missing: speech and audio.'

This was the impetus behind the Vidivideo project. There is certainly a lot of video out there. Every minute, for example, more than 24 hours of video is uploaded onto YouTube. In order to keep up and make sense of what all this content is about, we need to develop systems that work very fast.

'A major challenge is speed and scalability,' said Prof. Worring. 'The tools we have now are far more accurate, but it still takes computation time. We have to train our systems by example videos for which expert users have labelled the content, and this is a time-consuming task.' Part of the solution is to let the system perform its task in parallel with lots of computers. But the Vidivideo team also realised that using a system with modular architecture would also be very important: you start with a little bit of intelligence, and add more as it becomes available.

But how does Vidivideo, which received funding under the EU's Sixth Framework Programme for ICT research, work?

Imagine you have a group of people watching a video of a complicated procedure, such as assembling a Japanese printer. The first two people recognise that the scene contains a printer. The third person comes in and recognises where the cartridge is, while the fourth person (who can read Japanese) recognises the make of the cartridge and so on. At every point, there is something more to say about the printer, something that makes the picture more precise.

Vidivideo functions in exactly the same way. Up to 1000 specialist modules have been developed, which look at a video at the same time. When one of them recognises what they have been trained to recognise, they flag it up. On their own, these modules are not generally intelligent, but working together, they provide a more and more complete picture.

Another advantage of Vidivideo is that its architecture is highly flexible, allowing scientists and researchers to add modules at will to the collective intelligence of the system. At the start of the project in 2007, there were about a hundred; by completion at the beginning of 2010 there were over 1000. Vidivideo also contains audio modules which have been trained to recognise a large number of different sounds, from birds and gunshot to rain and thunder.

The search engine has been validated with end-users in the fields of broadcasting, surveillance and cultural heritage. The search engine has proven its quality in the three major international benchmarks in the field namely Trecvid, 'Pascal VOC', and Imageclef. In all three benchmarks the Vidivideo search engine received the top rank in automatic image/video annotation, while at Trecvid it also ranked first in interactive search.

Some of the partners involved with the project have gone on to work on the 'safer internet' project I-Dash in order to help in the fight against child pornography. This is serious organised crime: thousands of videos are often produced by the same source. Vidivideo technology helps establishing connections across videos. For example, the same visual detail — a plant, a piece of furniture — may appear in more than one video. This tool therefore allows officers to bunch together videos they think were filmed in the same room, potentially helping them to identify the location of the criminals.

Surveillance is another area of huge potential. Until now, the detection of physical objects in video has been emphasised, but Vidivideo can also be used to recognise forms of behaviour. For instance, someone walks onto a stage with a suitcase, and walks off without one. This change can be picked up. Such possibilities could be interesting as a police application to counter terrorism.

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When you consider that in the UK there are more than 4 million CCTV cameras it is clear that technology providing at least a first level of interpretation would be useful. In many city centres, there is the threat of violence, especially late at night. Vidivideo could be trained to identify certain precursors to violence, such as raised voices, or aggressive movements, before trouble begins.

Another, perhaps more mundane but equally significant opportunity opened up by this technology is effective audio-visual archiving. Documentary makers looking for specific examples of video would be able to zero in quicker on exactly what they are looking for, and the same goes for public platforms such as YouTube.

What if your search query for 'cat' was based not on how videos are labelled but on the actual-visual content itself? Experiments with social websites have already shown that this technology has enormous potential. Vidivideo promises a future that not only capitalises on our digital audio-visual world, but also one in which the barriers and limitations of language are significantly removed.

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Lights, camera, real-time 3D action

The 3D movies on today's cinema screens rely on visual tricks to cope with fast action. A new generation, produced at lower cost but delivering higher quality with real-time action, is soon to follow.

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The cost to produce digital movies will be slashed by a streamlined and standardised way of taking movie images from the camera through post-production phases and onto cinema screens, thanks to work by European researchers.

Digital movies go through a series of post-production steps after they are shot to add or adjust special effects, or to correct the colours, sound or the picture balance. Special equipment and software has been developed for each step — but there has been no agreed industry standard on the image file format for post-production. As the digital file is decompressed, modified and recompressed at each stage, valuable data can be lost.

A prototype camera developed for a research project called 'Enhanced digital cinema' (Edcine) records — alongside the images — metadata on the settings of the camera and its position, plotted from GPS. By shooting in JPEG 2000 format and using that format at every stage through post-production, that metadata remains intact. Data that 'watermarks' the cinema image and sound files to protect against piracy or data that carries multilingual subtitles can be carried through the process in the same way.

Researchers on the Edcine project are leading the way in handling high-quality, high-throughput and high-value data streams for digital cinema. By moving away from proprietary technology to interoperable technology using the shared JPEG 2000 standard, the Edcine team showed a way to reduce post-production equipment manufacturing and development costs.

The advantage of the wavelet-based JPEG 2000 compression format is that it allows frame-by-frame multilevel access for single frame editing, and the JPEG 2000 files can be decompressed and recompressed without loss of data. At the end of production, the image can even be compressed a little more for electronic transmission to cinemas which helps with distribution.

Preserving the quality of older films when digitising them to the JPEG 2000 standard was another focus of the EU-funded project.

'The idea is to streamline the transmission of the image within the production process using a lossless variant of JPEG 2000 compression,' explains Benoit Michel, Edcine project manager from the Université Catholique de Louvain (UCL), Belgium.

'If you do it properly you don't lose any metadata accompanying the image. It always comes back to the question of money. Greater interoperability means less problems and less costs along the whole production chain.'

The Edcine team's work is influencing movie industry development right around the world. IntoPIX, a spin off company from UCL has provided JPEG 2000 decoders to 80 % of the cinemas equipped for digital movies worldwide.

Edcine researchers also played a leading role in amending industry standards to meet the requirements of the next generation of fast-action 3D cinema blockbusters. The arrival of 3D has boosted cinema viewer's interest in the ongoing digital revolution. But movies like the recent Hollywood blockbuster Avatar are an intermediate step. They are projected at the industry standard 24 frames per second which is not considered good enough for fast movements, and it is more noticeable in 3D than in 2D. Movie-makers are forced to use visual tricks, such as blurring backgrounds to make objects appear to be travelling more rapidly than they are.

If movies are to be shot and projected at faster frame rates, then equipment manufacturers need standards agreed industry-wide to optimise quality, robustness to transmission errors, content security, and stereoscopic imaging, amongst other things. The Edcine team completed much of the groundwork for amendment to the industry's DCI standards at higher speeds, up to 60 frames per second.

Members of the Edcine team are now tackling some of the challenges in 3D image making for live transmission. At present, the vertical differences between the left and right images that come together to make a 3D image need to be corrected by hand in post-production, a slow and costly process. The team aims to find solutions to enable stereoscopic cinema to run in real time at good quality.

The Edcine project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91291

Can the human brain inspire computer science?

The neocortex is the most sophisticated computer on the planet, but its inner workings remain mysterious. If we understand the human brain better, could we design better computers? European researchers can now answer that question.

The tennis ball makes a dull 'thuck' in the child's palm as she lazily catches it above her head. To the child, it is a simple game to pass an idle summer afternoon. To computer scientists, it is an inspiring demonstration of the most awesome computer on the planet.

When the child's playmate throws the ball, the visual cortex surges into action, tracking the ball using a host of long-evolved tricks: shadow, light and movement separate the ball from the background; texture and velocity hint at its composition and weight; depth perception judges the distance and velocity of the ball. All these different aspects of the moving ball are calculated by different parts of the visual cortex.

These are combined instantly to provide complete perception of the ball, and the brain can estimate some of its properties by comparing and remembering the way it moves through the air — a tennis ball and a foam ball behave very differently.

That visual perception, combined with the proprioception of the somatosensory cortex, which senses the relative position of the body and limbs, reaches the association cortex which plans how to catch the ball — predicting its trajectory and interception.

This information drives the motor system to move the arm and hand to the correct position and then to grip the ball when it makes contact. All these processes are required for what seems quite a simple task; all of them are performed in an instant.

Of course, the brain in this case is not number-crunching as we understand it; it does not perform differential calculus as conceived by Newton. It has its own methods and processes for achieving the same ends. For example, the gaze fixates on the ball and then tracks the angle of flight. Each process is executed by neural structures that are far more sophisticated — and mysterious — that any silicon circuits currently available.

We understand more about the moon than we do the ocean floor, and we know the ocean better than we do the human brain. But however mysterious its structures might be, neural architecture is also supremely effective.

Now European researchers at the DAISY([1]) project have completed an ambitious and wide-ranging research programme on one novel, and ubiquitous, brain structure: neocortical daisy architectures.

'If you look at the performance of animals, particularly of vertebrates, what you find is that their behavioural performance increases in sophistication with the size of its cortex,' explains Professor Rodney Douglas, director of Zurich's Institute of Neuroinformatics and a lead researcher at the DAISY project. 'So it looks as if the cortex is some kind of general-purpose machine that improves your general performance in the world.'

'Thus far, every significant concept or artefact on the planet has arisen from the intelligent processing of these brains. Moreover, these brains are still incomparably more effective in dealing with real-world tasks than even the most advanced man-made computers,' says Prof. Douglas.

'The neocortex is very likely the sub-system of the vertebrate brain that is the most relevant, intelligent and effective means of interaction with the world.'

And it has a uniform architecture consisting of local circuits formed by patchy lateral projections, or 'daisies', made up of populations of pyramidal neurons.

The project worked towards to main achievements: acquiring a deep understanding of the qualitative and quantitative functioning of a vital brain structure, on the one hand; and to use that understanding to inspire new approaches to computer design, on the other.

The ability to build a general-purpose, adaptive computer architecture based on a better understanding of cortex-wide daisy principles can change, in the long run, the nature and scope of computer applications, Prof. Douglas explains. It could cope effectively with vision and speech interpretation, and be capable of specialising for a unique task in a unique environment without explicit programming. It could also greatly reduce programming effort and total development cost.

'Our project was the first, that we were aware of, to make a comprehensive attack on establishing the computational significance of a general and prominent feature of cortical architecture, such as the daisy architecture,' explains Henry Kennedy, director of the Stem Cell and Brain Research Institute in France and DAISY's coordinator. 'It was also the first project we're aware of that combines world leaders of neuroscience in a multidisciplinary team to approach directly the relationship between cortical computation and the architecture that supports it.'

To that end, the team had to complete a vast and highly ambitious programme of work in its four-year programme. It sought to characterise daisy architectures, determine what type of processing they support and develop hardware and software to emulate cortical processing. Each of these objectives contained a large series of other tasks.

The project's work provided, for the first time, a coherent description of neural connections within areas of the cortex and between different areas in the cortex overall. The anatomical studies showed that there is not a single hierarchy of cortical areas, but instead the connections between areas depend on context. This was important, because it provides a major shift in neuroscience, which for nearly two decades thought there was a single hierarchy.

'So much for the anatomy, but then the question is can you nail down some function on top of this?' queries Prof. Douglas. 'That was the role of Professor Amiriam Grinwald at the Weizmann Institute, Israel who does this amazing large-scale cortical imaging. His functional imaging confirmed this hexagonal pattern inside the functional cortical signal. So there is every reason to believe that the functional signal is determined by this underlying anatomical structure.' This breaks new ground too, and is a key issue for any attempt to replicate cortical processing.

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That work led to the question of what kind of algorithms are running on this kind of architecture to create the functional signal. 'Most of the models of how neurons are working mostly come down to ad hoc models of neurons typically spiking neurons interacting with one another,' notes Prof. Douglas.

Explaining the observed cortical activity was a difficult task, but the team simplified it enormously by picking three candidate approaches which they knew from experience had some likelihood of emulating the perceived behaviour.

The algorithms comprised 'Bayesian networks', factor graphs and dynamic link architectures. Factor graphs and 'Bayesian networks' are graphical processing algorithms which factor complicated global functions into a product of simpler ones, while dynamic link architectures encode and recognise objects thanks to dynamic composition of neuronal interactions: how connections are made and dropped between nodes.

Of the three, factor graphs offered the most promise after early tests and it has previously shown good performance in extremely high-level tasks such as object and speech recognition. Factor-graph computation is highly efficient and is already used in coding and decoding algorithms used by the telecom companies. DAISY's work promises further advances in the understanding of both cortical processing and factor graphs. For example, an important area where factor-graph computations are still not well understood is with richly interconnected graph structures containing multiple loops. Just like the structure of the cortex.

'At the high level, we knew we could use factor graphs for that kind of processing, and then try to bring those ideas down into a form we could express as neuronal processing,' reveals Prof. Douglas. 'We really did get them to work at a neuronal level, but the cost in terms of neurons is high, so it is not entirely elegant at the moment, but one can see an interesting path.'

Many of these tests were performed in emulators, but the project developed hardware, too, creating neuromorphic analogue/digital neurons which could implement the architectures found experimentally.

'It definitely goes in the direction of saying that we should see the cortex as one big continuous sheet probably with a very fundamental underlying structure which is modified locally to carry out specific operations. And this is exciting because it gives you a sense that we begin to understand the cortex as one large, rather uniform computational machine,' Prof. Douglas states.

In all, the project made important advances in neuroscience and neuroanatomy, developed a working hypothesis for cortical processing and created demonstrators to show that hypothesis could be replicated in hardware. All these results are groundbreaking and will influence the diverse fields of factor graphs, silicon chip design and neurology for many years to come.

In the meantime, the consortium members will continue with the work through their own research and new projects and, one day, perhaps soon, we will have machines that begin to process information the way people do.

The DAISY project received funding from the FET initiative of the EU's Sixth Framework Programme for ICT research.

(1) 'Neocortical daisy architectures and graphical models for content-dependent processing.' Promoted through the CORDIS Technology Marketplace. http://cordis.europa.eu/marketplace > search > offers > 5532

A quantum leap in computer technology

The world, it appears, is getting smaller and smaller, and this certainly holds true for the world of computing. The last decade has seen quantum physics exert an increasing influence on the electronics sector, to the extent that the age of the quantum computer may be just around the corner.

It is not that simple of course. While micro-electronic chips have continued to shrink in size, research into quantum computing — in which the active components often can be measured at the molecular level — is still in its infancy.

'This might provide breakthroughs in high-performance computing in 10 to 20 years,' says Göran Wendin, professor of theoretical physics at the Bionaro System Laboratory at Chalmers University in Gothenburg, Sweden. 'But most likely, it will provide a paradigm shift; looking back in 20 years, we will see how technology changed in ways that were difficult to anticipate.'

This research has been largely focused on what are known as ion trap quantum 'computers'. Ion traps are chains of up to ten ionised atoms, each of which can be made to behave like a two-level spin-half system, called a qubit. These qubits have the power to represent significantly more information than a bit in a classical computer, and could one day be used to perform certain types of calculations that classical computers can never do. And if large-scale quantum computers can be built, they will be able to solve certain problems much faster than any current classical computers.

But before we get carried away, it is important to recognise the limitations of current research: as Prof. Wendin points out, a ten-qubit computer is to quantum computing what a 1950s computer was to the dawning digital world. And there is a further difficulty: present ion traps are not scalable. In order to develop larger systems with 50–100 qubits, solid-state nanotechnology is needed to scale down the components and build microtraps in which ions can be stored.

Scaling down solid-state systems has therefore become a focus of current research in the development of quantum computing, and it is where the EU-funded 'European superconducting quantum information processor' (Eurosqip) project comes in. This project has pioneered the development of superconducting electronic circuits by using lithographically fabricated artificial atom qubits in superconducting nano-and microscale electronic circuits. Superconducting circuits have no resistance, and over the past decade it has become evident that these devices can be used as qubits.

'Eurosqip addresses long-term issues in micro-electronics and information technology,' says Prof. Wendin, who coordinated the project.

Eurosqip, a four-year initiative completed in April 2010, builds on the work achieved in two previous European projects: Squbit (2000-03) and Squbit-2 (2003-05). Many of the partners involved in Eurosqip worked previously on these projects, setting the groundwork for avenues of research that have been further developed in the current project.

Solid-state superconducting circuits have been in development for fundamental physics research since 1985, but according to Prof. Wendin, it was the breakthrough experiment conducted by Nakamura *et al.* in Tsukba, Japan in 1999 that really opened the door to quantum computing research, and to the impetus behind the Eurosqip programme. By designing and implementing simple yet functional hardware platforms, Eurosqip hopes to make a significant contribution in scaling up qubit systems in practical solid-state projects.

Quantum computing certainly opens up some interesting possibilities. For example, a quantum computer has the potential to be much more efficient in integer factorisation than an ordinary computer, which is capable of only factoring large integers if they are the product of few prime numbers. A quantum computer could therefore decrypt many of the cryptographic systems in use today, with implications for electronic security. Furthermore, quantum algorithms could lead to significantly faster query searches than is possible with classical algorithms in use today.

While working with solid-state systems opens the door to new possibilities, it also presents significant challenges. One of the greatest challenges is controlling or removing what is known as quantum decoherence; any interaction with the external world causes the system to decohere, an effect that is irreversible. This means that the system needs to be as isolated as possible from its environment, but at the same time open in order to allow programming and readout of information.

Controlling decoherence is the key. It is impossible to avoid some decoherence from both communication channels and imperfections in the materials used to fabricate the qubit register. There is no way around this; the only way to go is to continue to improve materials and find better means of controlling this.

'There are no revolutionising solutions in view, just very hard work long term to control the coherent properties of solid matter and solid-state devices,' says Prof. Wendin.

Basic funding for personnel and infrastructure for Eurosqip came from national programmes and was greatly boosted by EU funding from the previous 'Quantum information processing and computing' (QIPC, 2005-09) programme. In the current QIPC programme, Eurosqip is being followed by a new project, also coordinated by Prof. Wendin, called SOLID.

Several Eurosqip/SOLID partners have also received prestigious European Research Council grants. SOLID, which runs until 2012, aims to broaden the perspective and include other types of solid-state qubits, such as quantum dots and impurity centres in diamonds, trying to build hybrid platforms based on microwave quantum electrodynamics, and providing links to quantum optics.

Research into quantum computing may have a long way to go, but progress is being made, with Europe very much to the fore.

Eurosqip received funding under the FET-Proactive scheme of the EU's Sixth Framework Programme for research.

Nanospheres stretch limits of hard disk storage

A new magnetic recording medium made up of tiny nanospheres has been devised by European researchers. The technology may lead to hard disks able to store more than a thousand billion bits of information in a square inch.

With consumer PCs now being sold with hard disks of a terabyte or more — enough to record more than two years of music — storage capacity seems to be expanding without limit. But the limits are there and industry insiders know that they are approaching fast.

Present-day hard disks record information on a ferromagnetic layer. The layer is made up of grains about 7 nanometres across and each 'bit' of information is contained in a magnetised cell covering perhaps 60 to 80 grains. When the magnetic field is pointing one way a '1' is stored and when it points the opposite way a '0' is stored.

One way of packing information on to a disk would be to make the cells smaller. But with fewer grains per cell, the signal to noise ratio rises and with it the probability of a bit being misread.

The obvious answer is to use a recording medium with smaller grains, but then thermal stability problems arise. 'Over time, if the thermal stability is not large enough, the magnetic orientation will flip to the opposite direction so it will lose its information,' says Manfred Albrecht of the Chemnitz University of Technology.

He favours a completely new approach using techniques from nanotechnology to construct a 'patterned' recording surface made up not of irregular grains but of purpose-made magnetic cells. 'The problem now is how can you produce these nanostructures on a large scale at low cost?'

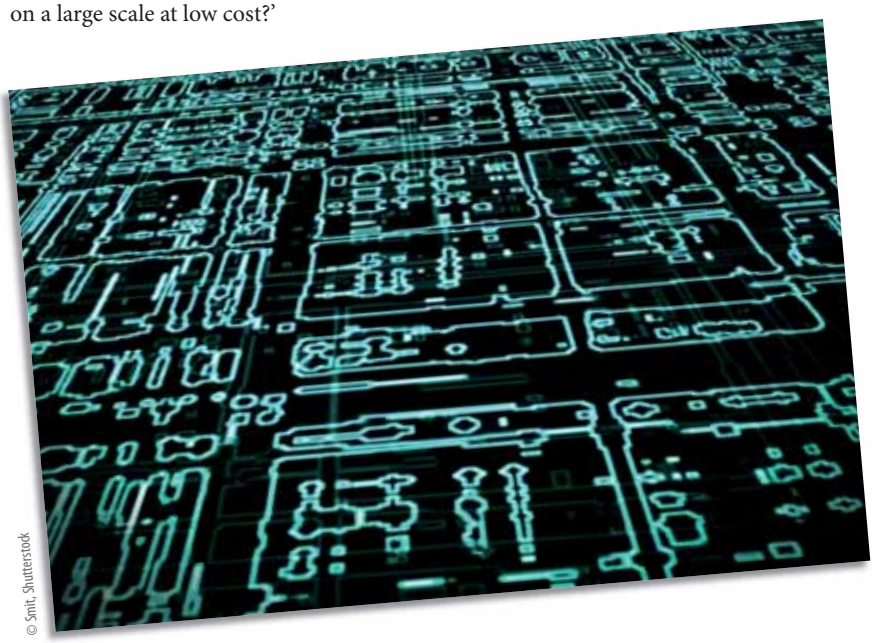
Mr Albrecht coordinated the EU-funded project 'Magnetic films on nanospheres: innovative concept for storage media' (MAFIN) which sought to build regular arrays of cells from tiny magnetised nanospheres. The spheres are made of silica and are commercially available in a range of sizes. After testing many different sizes the MAFIN team settled on spheres 25 nanometres in diameter, bigger than conventional grains but smaller than normal storage cells.

The attraction of using nanospheres is that they will assemble themselves into a regular array. The nanospheres are mixed with an alcohol-based solution that is dropped on to the substrate. As the alcohol evaporates the spheres are left in a regular pattern.

'We then deposited a magnetic film on top of the particles to form a magnetic "cap",' Mr Albrecht explains. 'And if you do it right then this magnetic cap acts as a single magnet, with a north and a south pole, and the array can be used as a storage device.'

Whether the cap is magnetised with a North or South Pole upwards determines whether it is storing a '1' or a '0'.

The magnetic film is an iron-platinum alloy that has already attracted interest within the magnetic storage industry. It is coated on to the nanospheres by magnetron-sputter deposition. As silica itself is non-magnetic, each cap is isolated from its neighbours and can hold its magnetisation well.



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Self-assembly of the nanospheres is guided by pre-patterning of the silicate substrate by x-ray lithography to create tiny pits for the spheres to settle into.

'I believe that self-assembly-based approaches have the largest potential because they are not expensive,' Mr Albrecht says. 'They are very low cost.'

A spacing of 25 nanometres between spheres is equivalent to a storage density of one terabit (1000 gigabits) per square inch. Using the same approach with smaller spheres researchers should be able to attain densities up to six times higher.

As well as looking at the recording medium, MAFIN researchers have also investigated recording techniques. Iron-platinum is harder to magnetise than conventional media, so modifications will be needed to allow information to be easily recorded and read.

The team investigated using a probe with a fine magnetic tip to magnetise and read each of the nanospheres instead of a conventional recording head.

MAFIN finished in May 2009 but its work has carried over into a successor EU project, 'Terabit magnetic storage technologies' (Teramagstor). While MAFIN was concerned with a proof of concept, the new project aims to demonstrate a hard disk with a storage density exceeding one terabit per square inch.

Mr Albrecht sees opportunities for European industry to develop the manufacturing processes that new, nanostructured storage media will require. 'In Europe we don't have a real industry that produces hard drives,' he says. 'It's all in Asia and the USA. But we have manufacturers of deposition tools and expertise in sputter technology.'

The glass substrates of conventional hard disks will not be suitable for the high-temperature processes needed to deposit alloys, so European companies with know-how in ceramic materials may also have a role to play.

MAFIN received funding from FET-Open initiative of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91318

Ultrasound cleaning improves membrane efficiency

The use of ultrasound (US) for cleaning bio-membrane filters contaminated with organic material was investigated by the Agroiwatech(1) project. Researchers combined membrane technology with activated sludge treatment to remove organic matter from wastewater.

Agricultural industries such as brewing and food processing require enormous amounts of water which become contaminated with organic matter. This material is contained in wastewater, requiring biological treatment at a water treatment plant before being discharged into large settlement tanks. By replacing the use of tanks with a membrane biological reactor (MBR) system, the concentration of dry material can be increased. The material can then be reused in the form of fertiliser and soil conditioner.

The use of membrane technology also increases the concentration of beneficial micro-organisms which help boost the cleaning ability of the system. The drawback to MBR is that its effectiveness is reduced through scaling and the build up of unwanted matter. The result is that large quantities of chemicals and considerable time and effort are required to clean and maintain these membranes.

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The Agroiwatech project investigated the use of US for cleaning membranes while still in the system to improve their efficiency. This technology has a lower environmental impact than conventional techniques because it uses fewer chemicals and less energy. The consortium studied different membranes with test substances at different US frequencies to determine the flux rate compared to pressure.

Researchers selected one membrane in particular for further study, subjecting it to US at a frequency of 15.5 kHz. Results showed that US did not damage the membrane and improved the flux rate. However, after nine hours the membrane surface required cleaning in the conventional way. Following these initial tests researchers built small modules and an MBR system for further study.

Wastewater was treated with activated sludge and filtered using the membrane module. Activated sludge is wastewater containing air and micro-organisms causing the aggregation of organic matter. Following this dual treatment both the organic and ammonia content were significantly reduced, giving a much more efficient result than using the membrane alone.

Cost-effective recovery of potentially useful resources from wastewater constitutes an extra bonus in the bid to clean up Europe's heavily polluted waterways. Fertiliser and biogas fuel produced with a low energy bill will almost certainly prove to be very attractive possibilities for the direction of agro-industry.

(1) 'Cost-effective technologies for wastewater treatment and waste biodegradation in agro-industries with reclamation of resources.'

Funded under the FP5 programme INCO 2 (Confirming the international role of Community research).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5412

Fire fighters communicate with autonomous robots to help save lives

A burning industrial warehouse is one of the most dangerous environments for any fire fighter. Burning equipment, chemicals and other undisclosed obstacles prevent them from saving anyone who might be trapped. A team of dedicated robots could one day help.

Every time he enters an industrial warehouse engulfed in flames, a fire fighter puts his life at risk. The smoke is extremely toxic and visibility is very low. He has around 20 minutes of oxygen stored in his tank and typically, given the obstacles, he can only advance 12 metres a minute. That gives him a maximum range of 120 metres whereas, on average, a modern day warehouse is some 400x200 m².

Fire crews from the South Yorkshire Fire and Rescue in the UK told researchers that industrial warehouses are a particular concern. The combination of a large surface space and smoke makes it notoriously difficult and sometimes even deadly to navigate. Numerous fire fighters have lost their lives in warehouse fires. The near total black out caused from smoke easily disorients them. They risk getting lost.

Guardians(1), an EU-funded project, took its cue from there and constructed a swarm of specialised autonomous robots especially designed to assist fire fighters searching large warehouses. Swarming, in robotic terms, is based on pioneering research that simulates a flock of birds in flight. Guardians built on this concept so that their autonomous robots are able to move in a manner that is influenced by their geometric distribution.

'As far as I know, we are one of the first who are trying swarm robotics in a real environment,' says Jacques Penders, Guardians' project coordinator. 'The focus is to get the robots to cooperate with one another and be able to operate in both small and large groups.'

For fire fighters, every second and every minute count. In Worcester, USA, six fire fighters lost their lives when they became lost in a six-storey warehouse. Concrete walls, reinforcements and metal racks interrupted vital communication lines.

Similar tragic incidences have also occurred in Europe. The swarm of robots developed by Guardians, therefore, must provide viable guidance information between themselves, rescuers and in extreme conditions. This required the researchers to design and experiment with interfaces that present only the most essential information to guide the fire fighter. And in conditions that exposed robots could withstand.

A fire fighter will first move along the edge of a wall when he enters a warehouse. The wall is his point of reference. Only on very rare occasions will fire crews advance into a void because the smoke becomes progressively thicker. 'The smoke concentration increases the further away one moves from the walls,' according to Guardians' literature.

Most robotic sensors, like cameras or laser range finders (LRF), do not always optimally perform under these stressful conditions. Warehouses can contain metal racks with shelves that may also store metal-based packaging like tins or buckets.

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Because fire fighters are already under considerable mental and physical stress, the swarm must not present an additional burden or unnecessarily distract his attention. Instead, the swarm must complement the search and rescue mission.

This intricate metal landscape interferes with the transmission and reception of radio signals. And particles in the smoke deflect lasers.

'Fire fighters usually have a map of a building they are about to enter. As they enter the building they count their steps to keep their bearings and locate themselves. The robots basically do the same thing,' says Mr Penders.

The first robot positions itself at the entrance and establishes a beacon. It remains there throughout the search. The second robot moves along the wall, and then a third. The third robot becomes the third vertex of an equilateral triangle. More robots then advance and use a triangle of nodes and communication lines between relay nodes.

The robots are able to communicate with one another through a wireless communication network. 'Smoke interferes with the conventionally used, light-based sensors,' notes Mr Penders. 'This is why we are looking at using microwave,' he adds.

As the robots venture further into the building, they develop a grid that becomes a 2D metric map and they use networking behaviour to maintain and expand communications. However, if a robot becomes detached and loses the swarm's signal, it will either return to a 'predefined site, return to the last known position where the wireless signal was strong enough or be opportunistic and search forward assuming some fellow swarm members will soon be found,' according to the Guardians project.

Guardians also want the robots to actively support the fire fighter during the rescue operation. The swarm must be able to interact directly and coherently with the rescuer and determine the direction he should follow. At the most basic level, the swarm will react autonomously to the movement of a fire fighter. When he moves, the swarm will as well.

Researchers therefore had to ensure the robots express appropriate and consistent behaviour, as well as interfaces that allow fire fighters to keep their bearings. Most robot-assisted search and rescues are operated by a human outside the danger zone.

The Guardians project is unique because a human being is able to cooperate with several robots in the field. But this requires innovative interfaces which enable the fire fighters to interact with the swarm with no additional effort. Also, given the harsh conditions, fire fighters cannot rely solely on eyesight and hearing or even commonly used audio-visual technology.

To overcome these challenges, researchers designed a feedback interface — a visual device that is then installed inside the fire fighter's helmet. Researchers are also developing a tactile interface that can be installed on the fire fighter's body.

Guardians designed and built two light array visors. Each visor was tested by the South Yorkshire Fire and Rescue and enabled researchers to adjust settings to increase performance. However, this took multiple tests through trial and error as fire fighters expressed some initial ambivalence with the devices.

'Swarm robotics in combination with a human being was both interesting and challenging. The long-term aim though is to earn the confidence of the human being because the signals can sometimes distract,' says Mr Penders. 'We need to look at how the fire fighters can use this system.'

First of all, the interface needs to provide a visual feedback of the swarm's streaming data. This is done by displaying an array of RGB LEDs on the inside of the visor. At the same time, the fire fighter needs to have complete confidence that the information is correct. Understandably, few fire fighters will venture or stray from a wall or other landmark because of the inherit dangers involved.

The first visor tested indicated both the safest and best direction to take. During the test, fire fighters were asked to undergo regular search and rescue activity. They were also required to perform several additional tasks including verbally reporting to the coordinating researcher about their progress and to their fellow participating colleagues. Results indicated that the fire fighters sometimes ignored the RGB LED direction signal. The fire fighters informed the researchers that the direction data displayed inside the visor needs to be more simple and unambiguous.

The second visor was mounted on a fully operational fire fighting helmet. Alongside the LED display, researchers placed an internal measurement unit (IMU) sensor that detects the fire fighter's orientation while following commands. Like in the first test, the fire fighters were asked to perform a number of activities. But unlike the first trial, where direction information was constantly updated, the second trials provided the fire fighters with fewer commands.

The outside of the visors were covered so that the lead fire fighter had to rely on the visor's signals for navigational commands. A second fire fighter, also blind folded, then followed the lead fire fighter as is standard practice under normal search and rescue protocols. Both were tethered to a rope. The fire fighters were asked to count the number of times two different coloured lights flashed inside the visors. The flashing lights were added to create additional stress. The fire fighters were still able to follow the commands of the lead fire fighter.

Guardians has laid the foundation of promising research that combines cutting-edge technology with pioneering swarm techniques. The robots designed by Guardians can also warn the fire fighters of any toxic chemicals in the air. But these new systems could also be used in other disaster scenarios. The algorithms developed by Guardians mean the robots can follow a fire fighter without communication. It is this autonomous feature, along with their ability to transfer information to the fire fighter in specially designed visors, which makes the Guardians project stand out.

'We did a final demonstration at the South Yorkshire Fire and Rescue,' says Mr Penders. 'And they confirmed that the use of robots could help especially in high-risk situations.'

Guardians project received funding under the ICT theme of the EU's Sixth Framework Programme.

(1) Group of unmanned assistent robots deployed in aggregative navigation supported by scent detection.'

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http://cordis.europa.eu/marketplace > search > offers > 5534

Countering the counterfeiters — smart technology to secure product supply chains

Counterfeiting is a huge problem. Luxury goods are a favourite target, but so are vital products including medications and aircraft parts. European researchers have created a new way to stem the tide.

Have you ever been tempted by a 'designer' watch or handbag at an amazingly low price?

If so, you've been brushed by the burgeoning market for counterfeit goods. Nobody knows exactly how many billions of euros this market represents, but the number of counterfeit items seized at European borders surged from 100 million in 2004 to 250 million last year, including luxury goods, intellectual property such as music and movies, and potentially life-threatening ersatz pharmaceuticals and aircraft parts.

The aptly named EU-funded research project 'Stop tampering of products' (STOP) took on the challenge of applying state-of-the-art technology and systems analysis to safeguard vulnerable products. They're now able to offer a suite of solutions from sophisticated radio frequency identification (RFID) tags and handheld readers to software that helps businesses assess their security needs and determine how cost-effective STOP would be for them.

'We needed a new tool against counterfeiting,' says Harald Vogt, coordinator of the STOP project. 'What we demonstrated is an effective combination of technology and organisation, an overall system that can be implemented by businesses without extensive training or extra costs.'

The researchers realised that tackling a problem as widespread and multifaceted as product counterfeiting required an understanding of the vulnerabilities of products from the drawing board to the customer's hands.

Working with consortium partners that include leading aircraft, pharmaceutical and luxury-goods manufacturers, the researchers discovered that a fundamental shift was required from after-the-fact criminal investigations and legal action to system-wide prevention.

'The main business of the security departments of most businesses has been working with police and local authorities to try to shut down internet sites and actual shops selling counterfeit products, yet that addresses only a very small part of the problem,' says Mr Vogt.

Instead, he says, STOP's approach was to analyse and model an item's journey from design to delivery, and then integrate appropriate security measures throughout the process. 'By applying the right technology at the right time, we can make the security department's job much easier,' says Mr Vogt.

In addition to developing tailor-made RFID tags and user-friendly readers that work well in the factory and all along the supply chain, STOP also created systems and software to help companies assess their security needs and calculate costs, plus software for seamless product tracking and authentication.

The STOP researchers tested their RFID capabilities on one of the toughest products they could find — a high-end designer wristwatch.

'Luxury goods are very sensitive with respect to their design,' says Mr Vogt. Hiding an RFID chip in a luxury leather product might not be too difficult, but incorporating one invisibly into a watch, and passing radio-frequency signals through the watch's metal case was a significant challenge.

'The designers had to prepare space for the RFID tag and adapt the other parts of the watch to accommodate it,' says Mr Vogt. 'All that's visible from the outside is a small hole in the metal casing, which turned out to be necessary to allow the RFID tag to be read.'

With a unique RFID tag integrated into each watch, the item's authenticity can be checked as it moves from the factory through the wholesale and retail supply chain, up to the moment it is handed over to a secure and satisfied purchaser.

Mr Vogt was particularly pleased to find that incorporating this new level of security into a luxury product such as a watch did not add significantly to the product's cost.

'Designing and assembling this kind of item is a very complex task, and the RFID tag is really just another component to provide space for and incorporate into the production process,' says Mr Vogt. Design-to-delivery trials of luxury watches and leather goods showed that RFID tagging and tracking added surprisingly little to the cost of the products. 'It turned out to be quite manageable,' he says.

He views the project's field trials authenticating aircraft parts as very important, but still preliminary. They used the delivery of a limited number of parts to a single aircraft to test the technology, but more importantly to create a formal model of the entire supply process. Understanding that process, Mr Vogt says, is crucial to providing a high level of security.

'Our work with the airline industry laid the foundation for this strategic process analysis and modelling, which in the end will give more results than a single technological achievement could,' says Mr Vogt.

The STOP project has already spurred commercial applications. Project partner SAP, one of the world's leading software suppliers, created a new company called Original1, headquartered in Frankfurt, Germany, which will use STOP-inspired technology and approaches to deliver product authentication and anti-counterfeiting services worldwide.

'This new company is not bound to promote a single technology,' says Mr Vogt. 'It can propose the technology that best fits the product, and provide the tracking and authentication infrastructure. That makes it a very appealing business model.'

The STOP project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91310

Path to the perfect crystal

A European project Sinc-pro(1) has developed a blueprint for model predictive control of crystal production. Industry will find it easier to measure up to the demands for the correct dimensions of a crystal during mass production.

Crystallisation has a multitude of applications in industry. Major uses include production of artificial crystals on a mass scale, for uses as diverse as food sweeteners through to components of solar cells. Although crystallisation is one of the oldest unit operations in the chemical industry, product quality and process reliability can be problematic.

The European funded project Sinc-pro aimed to iron out the discrepancies in crystallisation using available commercial tools. To do this, they validated the use of model-based decision support to give uniform crystals. Properties crucial for optimum performance are size, colour and refractive index or angle of light as it passes from the crystal.

Trials were done at all levels — from the laboratory to the pilot and then on to the production scale. Overall, the Sinc-pro researchers determined when and where it was most wise to apply the automatic process activators.

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Selected measurement techniques were particularly important. Tests showed that it was very important to apply the actuators — mechanisms to kick start the measurements — at the early stages of optimisation. If applied at the later stages, there was a decrease in sensitivity as far as product quality.

Case studies involved different crystals including ammonium sulphate, used as a fertiliser, and dextrose, a food additive. In the trials, measurement techniques were shown to be strongly dependent on the crystal type.

A blueprint was prepared on the basis of the results of the tests. The model for application of measurement techniques does not give a single recipe for optimal crystal production. The plan overall gives more useful guidelines as to the range of measurement techniques that can be applied at any point in the production line.

The development of a generic optimisation framework and the use of commercially available tools hold many advantages. The same model can be used for simulation, experimental design as well as product quality control.

(1) 'Self learning model for intelligent predictive control system for crystallisation processes.'

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5462

Laser melting key to better aircraft engine parts

Manufacturing components for aircraft engines is not an easy task. The components must be lightweight yet strong enough to tolerate extreme conditions. They need to endure 1 000 rotations every second and withstand heat of up to 2 000 °C, and above all, they need to meet stringent safety standards. But a European project may have the solution.

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European researchers have not only developed a way to produce parts that tick all of these boxes but they have discovered a way to produce them quickly and at a reasonable price. The Fantasia(1) project was funded with EUR 3.78 million under the 'Aeronautics and space' thematic area of the Sixth Framework Programme (FP6).

The 20-member Fantasia consortium, headed by researchers from the Fraunhofer Institute for Laser Technology (ILT) in Germany, has demonstrated how selective laser melting (SLM) can be used to make both super strong and efficient complex-shaped aircraft engine components and repair damaged ones. In fact, tests have shown that the quality of components produced using this method is equally as high (or better) than those manufactured using conventional processes.

With SLM, the part is built one layer at a time, using a metal powder that is applied to the substrate and instantly melted into place with a high-power laser beam, creating a permanent bond with rest of the object.

'With this process we cannot only make perfect repairs to damaged engine parts but also build complete components that cannot be produced using conventional methods such as milling or casting,' explained ILT's Dr Konrad Wissenbach and Fantasia's coordinator. 'This also permits the kinds of geometries and designs we once could only dream of.'

Tests have also shown that manufacturing cycle times can be reduced by at least 40 % using SLM and other laser-based generative methods. This would ultimately mean savings of a maximum of 50 % of the material required, and a minimum of 40 % of repair costs.

Dr Wissenbach said that the SLM approach is not, as yet, appropriate for use with every turbine material but that the team has already noted very good results with Inconel 718, a nickel-based superalloy, and with titanium alloys.

He also noted that there is still research that needs to be undertaken specifically on materials that are prone to cracking or splitting.

The researchers are currently looking into ways of using melting or moulding to reseal cracks developed by components during use. But since prevention is always better than cure, the engineers are also experimenting with ways to stop the cracking in the first place, such as by varying the laser output power or using beam geometry.

Currently, other areas of focus for the researchers are the effects that construction-platform preheating has on product quality, and the need to improve on the productivity of the method (with a coating thickness of between 30 and 100 micrometers, larger components can take too long to produce).

'[The latter] is an area where we can combine a larger beam diameter for large surfaces with a smaller diameter for the contours,' added Dr Wissenbach. 'By doing this we want to increase our speeds by a factor of 10.'

Research for Fantasia was undertaken by research institutes and industrial partners from France, Germany, Italy, Latvia, Spain, South Africa and Switzerland.

(1) 'Flexible and near-net-shape generative manufacturing chains and repair techniques for complex shaped aero engine parts.'

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16553

Good news for the maintenance of ageing aircrafts

Aircraft maintenance requires being able to detect early signs of damage which are not easily visible and could very often be missed. A new class of non-destructive techniques developed by European researchers promises to make a significant contribution to aircraft and passenger safety.

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Aeronautics has become a key strategic sector for Europe. Growth is dynamic, with the annual increase in passenger numbers exceeding 8 % over recent years. Already in 2005, 3.3 million people were employed across the air transport system, with a turnover of EUR 500 billion and a total of 1.3 billion passengers.

With more than 14 % of turnover invested in research and development, aeronautics is also recognised as a research-intensive sector. But research only produces useful results if the funds are carefully invested. In light of this, in its Sixth Framework Programme, the European Union has invested more than EUR 3.5 million in the ambitious project 'Health monitoring of aircraft by nonlinear elastic wave spectroscopy' (Aero-news).

The Aero-news project is a perfect example of how investing in 'fundamental' scientific research can lead to practical applications and result in public benefit. It brought together the know-how of universities and research centres, and the experience of aeronautical companies with the aim of developing a more reliable and safer inspection system for aircraft structures.

The work of the Aero-news project partners involved experimental investigations of nonlinear elastic wave spectroscopy (NEWS) techniques on a range of aircraft components with various kinds of damage.

NEWS is a highly sensitive method of ultrasonic non-destructive testing that offers new possibilities for detecting incipient damage to aircraft structures.

The key to these techniques is that aged and damaged materials produced a unique acoustic response to different acoustic input which can be probed to evaluate the condition of the structure. This means that it can locate damage in the form of microcracks or delaminations, as well as the weakening of adhesive bonds more effectively than conventional techniques.

In addition, feasibility tests of several NEWS techniques have been conducted on extended aircraft structures, complex geometries and rotating parts. The long-term objective of the Aeronews project partners was to develop a system able to monitor, while in operation, the integrity of airframes and aircraft engines, as well as helicopter rotor systems.

Rather than temporarily attaching inspection equipment, they have envisaged that smart structures with embedded transducers could be used to monitor the aircraft and helicopter structures continuously. Such a system would result in a significant increase in aircraft and passenger safety, and contribute to substantial cost savings through the pre-emptive and adaptive maintenance.

Funded under the FP6 programme Aerospace.
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5485

The following upcoming events were selected from the event diary of the Directorate-General for Research and from the CORDIS event calendar.

For further information on past and upcoming events, please visit:

http://ec.europa.eu/research/events
http://cordis.europa.eu/events

Info day on the FP7 security research

The info day on the FP7 security research will be held in Brussels, Belgium on 9 September 2010.

Organised by the Research Executive Agency, this info day is meant to disseminate information on a new call launched on 20 July 2010 under the Security theme of the FP7 Cooperation programme. The FP7-SEC-2011-1 call is open to research institutions, universities, industries, SMEs, civil society organisations and any security stakeholders.

The event will help guide participants on their proposals as well as provide information on legal and procedural conditions. Attendants will also have the opportunity to network, present their ideas and find potential research partners.

Those wishing to attend will need to fill in an online form by 1 September 2010. Registration is restricted on a first come first serve basis. Please note that if the event is oversubscribed, the number of representatives per organisation will be limited. Attendants who wish to include a short presentation during the brokerage session are kindly requested to mention this while filling in the online registration form. Presentations then need to be sent by 1 September 2010 to REA-SECURITY-PROJECTS@ec.europa.eu

For further information, please visit :
http://ec.europa.eu/research/rea/sec_infoday2010.html

Third international workshop on academic software development tools

The third international workshop on academic software development tools will be held in Antwerp, Belgium on 20 September 2010.

The aim of the annual event is to explore the role that tools and tool-building play in applied academic software engineering research. Even though tool-building is a popular technique to validate research, it is neither simple nor cheap. Given the importance of tool building and the significant cost associated with it, the workshop will allow interested researchers to share their tool-building experiences and explore how tools can be built more effectively and efficiently.

Discussions at the event will not focus on any specific kind of tool, but rather the issues common to all tool builders, and builders of academic research prototypes in particular. Questions will include:
- should tool building remain a craft?
- should academic tools be of commercial quality?
- how to integrate and combine independently developed tools?
- what are the positive lessons learned in building tools?
- what are the pitfalls in tool building?
- what are good practices?
- what are effective techniques to improve the quality of academic tools?
- what is needed to build an active community of developers and users?
- are there any useful tool building patterns for software engineering tools?
- how to compare or benchmark such tools?
- what particular languages and language paradigms are suited to build software engineering tools?

For further information, please visit:
http://www.info.fundp.ac.be/wasdett2010/

'Connecting railways' brokerage event

The 'Connecting railways' brokerage event will be held in Berlin, Germany from 21 to 24 September 2010.

This four-day brokerage event is intended to help foster partnerships on railway technology, public transport, services, tunnel construction, information and communication technology, interiors and infrastructure. It is open to all businesses, universities and research institutes across Europe.

The event programme is designed as a 'one-stop shop' for networking. Participants will be able to schedule meetings potential partners in advance, exchange experiences and find out more about national and international funding opportunities.

The event will take place at the same time as Innotrans 2010, a trade show focused on passenger and freight transport technology.

For further information, please visit:
http://www.fav.de/innotrans/

Brokerage event for marine research in the Seventh Framework Programme

A networking event in the field of marine research, maritime activities, climate change and Earth observation systems will be held on 23 and 24 September in Istanbul, Turkey.

The main aim of the two-day event is to initiate competitive research project proposal in the field of marine, climate and earth observation for the upcoming calls of FP7 in the environment field.

Almost 100 high potential researchers from Europe, the Mediterranean and Black Sea countries, as well as Russia, are expected to participate. Delegates will:
- receive background information about the upcoming call on environment;
- meet potential collaboration partners on specified issues, especially on marine, climate and Earth observation research areas, and;

- learn about relevant networks and best practices of EU-funded projects.

For further information, please visit:
http://www.b2match.com/marineistanbul2010/

STEPS Conference 2010: pathways to sustainability

The STEPS Conference 2010 will be held in Sussex, UK on 23 and 24 September 2010.

This conference seeks to address some of the fundamental issues that affect society. It will question and explore how pressing issues like changes in the environment interlink with the numerous challenges facing rapidly evolving social systems. In particular, the event questions the link between environmental integrity and social justice. How might sustainable pathways conceptualize and build this link?

The conference, organized by Sussex University, will cover the following five themes:
- contesting sustainabilities;
- framing narratives;
- dynamics and sustainability;
- uncertainty, ambiguity and surprise;
- pathway-building and governance.

For further information, please visit:
http://www.steps-centre.org/events/stepsconference2010.html

Resetting the clocks: 2050

The 10th annual conference of the German Council for Sustainable Development, 'resetting the clocks: 2050', will be held in Berlin, Germany on 27 September 2010.

Organised by the German Council for Sustainable Development, this forward looking conference will explore today's issues and decisions and how they could potentially affect future generations. What will the world be like in 2050? What needs to be done today to guarantee our children's children a safe and productive environment.

The conference, in particular, will look at climate change, investments in building and infrastructure, impact assessment of demographic change, and, not least of all, fiscal intergenerational justice. The conference also offers a platform for individuals to share and express their ideas.

For further information, please visit:
http://tiny.cc/fkc5y

'Find your ICT PARTNERS face2face' brokerage event

The 'Find your ICT PARTNERS face2face' brokerage event will be held in Brussels, Belgium on 28 September 2010.

Ideal-ist is organising this brokerage event in collaboration with the Enterprise Europe Network in the field of information and communication technologies of the Seventh Framework Programme.

The event aims to:
- make research, innovation and business communities aware of funding opportunities offered by the Framework Programmes of the European Union;
- involve companies, universities and researchers from Europe and all over the world interested in sharing new project ideas and finding collaboration partners;
- support participants to facilitate the setup of FP7 project consortia and submit successful proposals for the calls of FP7.

For further information, please visit:
http://www.ideal-ist.net/f2f/

Workshop on simulation and ground support facilities for space programmes

A workshop on simulation and ground support facilities for space programmes will be held on 28-30 September 2010 in Noordwijk, the Netherlands.

The main objective of the workshop is to bring together representatives of space agencies and industry to review the latest in modelling, simulations and ground systems simulators as well electrical ground support equipment (EGSE). The event will also aim to discuss new ideas and solutions for the future.

Simulation is a key activity that supports the specification, design, verification and operations of space systems. In recent years, system modelling and simulation has grown. At the same time, there is recognition that a more coordinated and consistent approach to the development of simulation products across project phases can bring substantial benefits. This would promote the most effective use of simulation within the system engineering process to minimise the overall space programme schedule, risk and cost.

For further information, please visit:
http://www.congrex.nl/10C05/

Fourth companion robotics workshop

The 4th companion robotics workshop will take place on 30 September 2010 in Brussels, Belgium.

This fourth research workshop in a series continues a focus on research challenges relating to the adoption, integration and adaptation of companion robots as socially-aware assistive devices at home, or at work for enhanced life/work-style support, comfort and societal benefits.

Speeches will deal with the overall thematic framework of companion robotics design and integration research challenges. Topics are set to include:
- human-robot communication, robotic dexterity and spatio-temporal reasoning;
- robot cooperativity and coordinative capability to support teamwork;
- robot sociability: process integration, social acceptability and appropriation patterns;
- robot learning capability;
- future internet of people, robots, things and services sociality;
- companion robotics, technological convergence and integration requirements;
- dynamic usability relationship based evaluation of assistive technologies.

For further information, please visit:
http://eventseer.net/e/13725/

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