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Special feature



Education, training, 'edutainment': access for the new model society
Interview with Georg Thallinger of Salero

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From the blackboard to the computer

Throughout millennia, humans have been grappling with questions, both metaphysical and physical. The effective transmission of knowledge has shaped how we live and how we evolve. What's more, the quest for knowledge and the way we share it has been heavily influenced by technology.

*Europe's long legacy of education, from Greek antiquity to the very latest in medicine and space, are pillars upon which society has been built. And thanks to the advances in software and hardware, access to education is improving in Europe. People who were once isolated can now follow a course at distance. Interactive games that immerse the player into an educative environment help stimulate learning. Indeed, how we learn and its medium is in constant evolution. The common chalk and blackboard is giving way to computer aided graphics — perhaps to the dismay of traditionalists but to the joy of others. This is why we chose to dedicate this issue of *research*eu results supplement* to 'Education, training, "edutainment": access for the new world model.'*

We look at a cross-section of some of the latest achievements from EU-backed research consortia, including long-distance learning and computer games with an educational twist. And we discuss some of the latest developments and issues in the field with Georg Thallinger, project coordinator of the EU-funded 'Semantic audio-visual entertainment reusable objects' project (Salero).

Also in this issue, the biology and medicine section leads with an intriguing story about EU-funded researchers who have developed a breakthrough technology that will use cancer seeking nano-particles to improve therapy.

The energy and transport section leads with an article on passive housing, its challenges, and benefits.

The top story in the environment section looks at how scientists are grappling with some of the fundamental sustainability issues related to the harvesting of our natural ecosystems. Are we able to replenish resources faster than we are consuming them? Find out inside this issue.

In our IT and telecommunications section, scientists are using some of the more innovative aspects of space technology to facilitate learning. Their terrestrial broadband system would help people living in remote areas follow courses online.

The industrial technology section leads with a story that combines both fashion and nano-technology. EU-funded scientists are developing smart textiles with whole range of applications.

The issue then ends with a list of exciting events and upcoming conferences 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 Georg Thallinger of Salero for his contribution to the 'special' dossier in this issue

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Frequent acronyms

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

Nano-drugs home in on cancer

European researchers posted promising, preliminary results for enhanced cancer therapy using cancer-seeking nano-particles. The new drug delivery system promises safer, more effective tumour treatment with photodynamic therapy (PDT).

PDT provides an effective treatment for many cancers by using a combination of photosensitiser, red light and oxygen found in cancer cells and tissue. The photosensitiser is a chemical that can be excited by light. Once excited, it will react with oxygen and in this state it causes cell death in the tumour where the photosensitiser accumulates.

While PDT is an effective treatment, it could be improved. Currently the dose of photosensitising drugs affects patients' healthy tissue as well as their tumours. Doctors have to use a high dose of drug to obtain good tumour control, which makes the treatment more expensive. Using a high dose also leads to greater side effects, more complications and longer hospital stays.

Enter the EU-funded Nanophoto (1) project, an initiative to develop targeted nano-systems for improving photodynamic therapy and diagnosis of cancer. The team behind the research is creating a nano-particle drug delivery system that behaves like a tiny, cancer-seeking homing missile, attaching itself to the tumour and then delivering the drug payload.

'The major achievement should be the development of a bio-compatible nano-system decorated on its surface with an agent, such as particular ligands or antibodies, capable of recognising cancer cells in a selective manner,' explains Dr Elena Reddi, coordinator of the Nanophoto project.

Once the drug attaches to the targeted cancer cell, PDT continues as normal. Photo-stimulation activates the drugs that attack the cancer. Since drug delivery is more targeted, it uses a much smaller dose. This makes it cheaper because it uses fewer drugs. There are also fewer side effects and patients do not need to stay in hospital as long.

It is promising, but there are challenges, too, most notably in the biocompatibility of the nano-particles, and the risk that the bloodstream's immune system will attack the particles before they can reach their target.

So the Nanophoto project developed a highly-focused research plan to characterise and test three promising nano-particle candidates, namely liposomes, organically modified silica (Ormosil) and poly(lactide-co-glycolide)-co-polymer or PLGA.

In the Nanophoto project, these potential delivery systems carry mTHPC, or meta-tetrahydroxyphenyl chlorine, marketed under the names Foscan and Temoporfin. This drug is a photosensitiser that Nanophoto chose to validate the concept. The final system will be able to adapt to a wide range of therapeutic and diagnostic drugs.

The concept is ingenious and could open the way for targeted delivery of a wide range of drugs to treat a large number of con-

ditions. It is also a tough technical challenge. Progress so far, however, is very good. In the first half of a three-year project the Nanophoto team has racked up considerable success.

'We have already identified some nano-carriers that produce at least three-fold increase of drug accumulation in the tumour in comparison to the standard formulation currently used in clinical PDT,' notes Dr Reddi.

Stealth particles

This made the subsequent PDT treatment dramatically more effective, particularly because pharmacokinetic or active properties of mTHPC improve significantly when it is delivered by nano-carriers. Essentially, the drug punches above its weight when it is delivered using the Nanophoto system.

Moreover, Dr Reddi reveals that the results promise significant potential in reducing adverse side effects such as skin photosensitivity in patients treated with PDT.

Stability is an essential element of drug nano-particles used intravenously because prolonged circulation in the bloodstream is essential to ensure tumours are sufficiently dosed with the required drug. To this end, Nanophoto worked on the development of so-called 'PEGylated' nano-particles, which Dr Reddi stresses is the most important breakthrough of the project so far.

This simply means coating the carriers with polyethylene glycol (PEG), a phenomenally useful chemical formulation whose primary novelty is that it remains undetected by the immune system. This let Nanophoto create stealth particles.

'PEGylated nano-carriers with stealth properties that can be used for a new formulation of mTHPC will bring a substantial improvement to clinical PDT treatment,' suggests Dr Reddi. Indeed, the team noted a direct correlation between the density of PEG chains on the nano-particle surface and its success at evading immune response.

The research also threw up unexpected challenges along the way. There was some leakage from the nano-particles when they were exposed to blood serum, particularly Ormosil. To prevent leakage, the team bound the mTHPC with the nano-particle using covalent molecular bonding. The drug retained its ability to excite oxygen in cancer cells.



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In the first 18 months the consortium demonstrated that the three nano-particles can deliver the drug, PEGylation improves biocompatibility and that tumours take up three times more of the drug than with the standard delivery. Put another way, clinicians could reduce drug doses by two thirds and still see the same therapeutic benefits of PDT.

Nanophoto is a translation research project, meaning it is intended to move research from the lab to the real world, from the Petri dish to the patient. Nanophoto brings together scientists and clinicians from a large range of disciplines and commercial partners to undertake work ranging from synthetic and cellular assays through to preclinical-animal testing.

The project has scored a number of achievements in a short time. Already the consortium of five partners has produced dozens of journal and conference papers, and it will continue

its work until the middle of 2011, allowing the team to tackle remaining challenges.

‘Now we are facing the tremendous challenge of imparting to these nano-systems the capacity to deliver the drug even more specifically to cancer tissues by exploiting active mechanism of targeting. This is being achieved by decorating the nano-carriers with molecules able to seek cancer cells, binding to them and placing the drug cargo inside them,’ notes the project coordinator.

Nanophoto project received funding from the Health programme of the Seventh Framework Programme (FP7) for research.

(1) ‘Targeted nanosystems for improving photodynamic therapy and diagnosis for cancer’.

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One step closer to pre-empting breast cancer

Validation of new hypotheses related to breast cancer is paving the way for early diagnosis and supporting novel treatments.

Being the most common cancer in women, breast cancer is of particular interest for European researchers who want to cure this physically and emotionally scarring disease.

One EU-funded initiative in this direction focuses on ‘Identification and validation of new breast cancer biomarkers based on integrated metabolomics’ (Metacancer). The researchers are studying metabolite levels in cells associated with tumour development and progression. Metabolites represent certain

types of small molecules, and metabolomics is the study of metabolites.

Metacancer has for the first time used combined technologies for metabolic profiling of patient samples on a large scale. These technologies are being used to identify new prognostic and predictive biomarkers — biological indicators that help identify the presence or proliferation of cancer cells.

Supported by a large tumour biobank and studies from consortium partners, the Metacancer project is testing four different hypotheses regarding changes in metabolite levels: the first is that changes in metabolites will reflect amplified changes in metabolism. The second hypothesis stipulates that these changes can be used to classify breast cancer based on tumour biology. The third and fourth hypotheses involve the specific identification of prognostic biomarkers and new therapies.

During the first year and a half of the project more than 450 frozen tissue samples were analysed by the project partners to validate these hypotheses. Each tumour

sample was measured by three different methods. All three methods have been able to generate valid metabolomic data from the samples.

This has allowed the researchers to link metabolic changes with clinical pathological data. It has also allowed them to determine differences in metabolites between different subtypes of breast cancer. The project has made it clear that metabolic profiling is a valid approach to analyse frozen tumour biopsies.

The Metacancer team has succeeded in validating the first two hypotheses so far. While the main technological approach of the project is currently focused on metabolic profiling, the project turns its focus to the link between metabolites and the biomarkers in tumour tissue. The next area to look at would be the enzymes that might be central for the metabolic changes involved.

With the expected validation of the next two hypotheses, the one in eight western women who suffer from breast cancer may benefit from improved diagnostics and treatment. Early diagnosis in breast cancer is crucial, and Metacancer is well on the road to helping achieve this target, among others.

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New discoveries in prostate cancer testing

Better diagnosis and testing of the molecules that cause prostate cancer is set to avoid wrongful diagnosis and to contribute to treatment.

While prostate cancer is the most common male malignancy in Europe with over 200 000 cases a year, there is a high rate of over-detection and over-treatment of the disease. This means that better diagnostic, prognostic and therapeutic tools are needed, particularly since diagnosis has mostly relied on limited classical methods.

In recent years, the widespread use of prostate specific antigen (PSA) tests on asymptomatic men and an ageing population has been leading to false alarms and unnecessary treatment of the disease. There are currently no tools to reliably identify patients who need aggressive treatment.

Up to now, no major mechanisms of prostate cancer growth have been identified. Recently, it was discovered that specific ribonucleic acid (RNA) molecules known as ncRNAs play a role in the development and progression

of prostate cancer. The project 'Prostate cancer: profiling and evaluation of ncRNA' (Prosper), funded in large part by the EU, has been aiming to elucidate the role of ncRNAs in prostate cancer and its diagnosis.

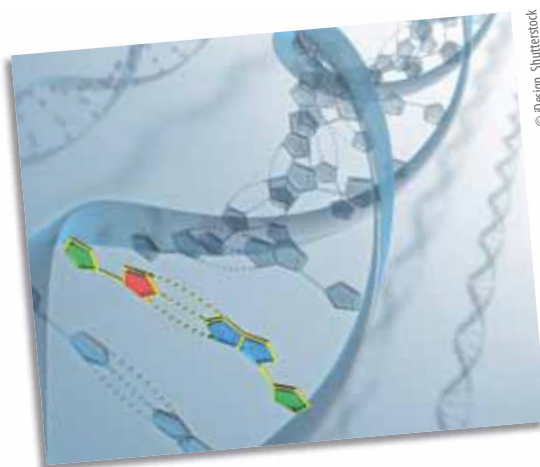
Certain types of ncRNAs called miRNAs were particularly implicated in prostate cancer, according to the project partners. At least 20 novel miRNAs were discovered, one of which has been identified as a tumour suppressor in prostate cancer. A considerable number of miRNAs were also found to discourage the spread of cancer cells or to play a role in killing cancer cells altogether. The project developed intricate screening systems which will be used in secondary analyses

to further probe the effects of these miRNAs.

By the time this project ends in 2012, the European research community should have a much better understanding of what affects miRNA molecules. With this, the road to correctly diagnosing prostate cancer and combating it will be much clearer.

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Identifying more cancer genes helps combat the disease

Pinpointing key cancer genes can help diagnose and prevent the disease, as well as develop novel testing methods and treatments.

Cancer has stumped researchers in recent decades to the extent where many laboratories around the world are trying hard to find the root causes of this troubling disease and develop new treatments.

In this vein, the EU launched a project called 'Identification and functional

characterisation of genetic cancer risk variants' (Cancergene) which focuses on different aspect of cancer genetics. The project aims to discover more factors that predispose people to cancer, validate these results in human cells and identify certain biological properties associated with prostate cancer among others. Much of the testing was based on genome-wide association studies (GWAS) to identify common genetic factors that influence the onset of cancer.

The project brings together various key players such as the Karolinska Institute in Sweden, Torino University in Italy and contractors Islensk Erfdagreinng EHF of Iceland. The academic institutions are currently testing people for several genetic variants associated with cancer to try to pinpoint the causative variations of common

cancer types. These include colon cancer, lung cancer and prostate cancer.

Patent applications for five cancer-risk variants have so far been filed. Four variants linked to prostate cancer and one variant linked to urinary bladder cancer have also been identified in the course of the project so far. As more of these variants emerge, early testing will uncover more and more people who are at risk or in early stages of developing cancer. This will mean improved treatment and higher rates of success.

Another major goal of Cancergene is to identify new cancer risk variants to produce additional tests and increase the usability of existing tests. The project is expected to increase our knowledge about the biological pathways that play a role in cancer initiation and progression. This knowledge will no doubt ultimately help investigators develop more effective prevention and treatment strategies in this field.

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Mini-probe to shed light on neurodegenerative diseases

Thanks to the development by European scientists of a new miniature probe, observation and control of neurodegenerative diseases is coming of age.

As the baby boomers across Europe approach old age, neurodegenerative diseases such as Alzheimer's, Creutzfeldt-Jakob and Parkinson's are on the rise. Small cell-signalling molecules called cytokines are known to play a crucial role in triggering neuro-inflammatory ailments, but their observation and control has been very challenging so far.

Funded under the EU's Seventh Framework Programme, the Cell-Microprobe (¹) project has come much closer to improved observation and control. As the name suggests, the project has developed microprobes to stimulate single neuronal cells and detect inflammatory signalling compounds in real time. This required the development of a miniature — or microfabricated — electrochemical probe (EP) that has a 200 µm wide flat tip with four independent microelectrodes, each 20 µm long and 20 µm apart.

The new probe sheds light on the dynamics of isolated cell secretion and has led to an innovative biosensing approach. The latter involves bringing the sensing part of the probe (antibody-functionalised electrodes) much closer to the cell in order to detect the excreted proteins. Testing of the new methods showed that the probe was almost twice as effective as previous methods in concentrating critical protein molecules for better observation. Calculations also showed that detection can be performed within 10 minutes, a time-scale adapted to the actual protein release rate.

However, some tweaking of the system was needed to detect antigens. So the team introduced palladium nano-structures into the tip of the electrode surface on the probe, resulting in a conductive surface that was 10 times more effective than before.

This nano-structuring technique, according to the team, could lead in the near future to improved immobilisation of nano-bodies and higher biosensing properties of the probe. This means that the scientific community is one step closer to understanding neurodegenerative diseases and hopefully treating them more effectively at an early stage.

(1) 'Microfluidic electrochemical probes for both stimulation of single neuronal cells and real-time detection of inflammatory signalling compounds released from the cell.'

Funded under the FP7 specific programme People (Marie-Curie actions).

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Students tackle tricky topics in 2WAYS project

Youngsters across Europe have been grappling with some of the life sciences' trickiest ethical dilemmas thanks to the EU-funded 2WAYS (¹) project. 2WAYS received almost EUR 1 million from the Science in Society programme of the Seventh Framework Programme (FP7).

Over the past two years, the 2WAYS team has organised 29 'science parliaments' in 29 cities in 17 countries. Each event lasted up to two days and attracted between 50 and 100 students aged from 17 to 19. So how did these events work?

'All these science parliaments had four committees,' explains project coordinator Peter Rebernik of the European Science Events Association (EUSCEA) in Austria. 'These committees were like in a normal parliament — they invited experts, discussed their issues and voted on resolutions. These resolutions came to the plenary session and the plenary session then finalised these resolutions.'

In early December, delegates from each national science parliament gathered at the European Parliament in Brussels, Belgium, for the first-ever young European Science Parliament. There, the adopted resolutions were handed over to European Parliament Vice-President and German Member of the European Parliament (MEP) Silvana Koch-Mehrin, who is also involved in the European Parliament's Science and Technology Options Assessment (STOA).

The resolutions summarise the youngsters' thinking on four major issues in the life sciences: the use of embryonic stem cells, the use of the results of gen-

etic tests, the implications of the discovery of a gene for aggressiveness, and the threats and opportunities of DNA analysis.

On stem cells, most parliaments came out in favour of using stem cells derived from *in vitro* fertilisation (IVF), albeit with certain restrictions. Meanwhile, youngsters also want more research on adult stem cells to replace embryonic stem cells and do away with the need to destroy embryos. The discussions, which forced the students to debate when human life begins, were often lively.

Today, genetic tests exist to determine an individual's risk of developing over 500 diseases. Most youngsters recognised that these tests could ultimately prove useful as part of efforts to prevent and treat diseases, but expressed concern that if the results are not fully confidential, they could be abused by insurance companies and employers. The resolutions also express concern

regarding the psychological impacts of knowing that one faces a greater risk of a potentially deadly disease.

The discussions on the so-called 'aggressiveness gene', which lowers an individual's threshold for violence, were also interesting. Most resolutions recognise that an individual's personality is a combination of both genes and the environment. Many note that individuals with this gene could face discrimination. Others fear that the gene could be used as an excuse by criminals seeking a lower sentence. However, others suggest that it could be used not to reduce the level of punishment but to tailor rehabilitation efforts.

An impact study of the parliaments revealed that the youngsters learnt a lot from their experience and that they felt

more encouraged to ask questions and engage in discussions.

The 2WAYS project is now drawing to a close. However, many of the cities involved plan to organise further science parliaments themselves. Furthermore, Dr Rebernik reports that he hopes to have a young European science parliament at the European Parliament every two years.

(1) 'Two ways for communicating European research about life sciences with science festivals and science centres/museums, science parliaments' impact survey'.

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Cell communication, the EU way

European researchers are working hard at developing new approaches to cell communication systems that generate building blocks for biological computation devices. Biological computing addresses shortcomings that impact our lives including helping researchers devise more innovative methods for disease treatment.

Scientists from the 'Biological computation built on cell communication systems' (Cellcomput) project are providing insight on how complex devices consisting of two, three or more programmed cells can be designed and constructed, and are forming building blocks for such devices. Cellcomput has clinched EUR 1.72 million under the 'New and emerging science and technology' (NEST) thematic area of the EU's Sixth Framework Programme (FP6).

The Cellcomput researchers say communication between genetically modified cells is possible, describing them as being electronic circuits. Led by the University of Gothenburg in Sweden, the researchers have made major headway in enabling complex systems to be built in the future where the body's own cells help maintain our health. The research was recently presented in the journal *Nature*.

The researchers used yeast cells to generate synthetic circuits based on gene-regulated communication between cells. They genetically modified these cells, thus making them 'sense' their surroundings on the basis of set criteria and in turn they send signals to other yeast cells by secreting molecules.

The team said combining these different cells is like combining Lego® bricks, effectively generating more complicated circuits. Researchers could perform complex 'electronic' functions thanks to the construction of yeast cells with different genetic modifications, according to the researchers.

'Even though engineered cells can't do the same job as a real computer, our study paves the way for building complex constructions from these cells,' explained Kentaro Furukawa from the Department of Cell and Molecular Biology at the University of Gothenburg, a co-author of the study.

'In the future we expect that it will be possible to use similar cell-to-cell communication systems in the human body to detect changes in the state of health, to help fight illness at an early stage, or to act as biosensors to detect pollutants in connection with our ability to break down toxic substances in the environment.'

In silico cells are being designed, making it possible to communicate in a predictable matter to form communication systems. According to the scientists, synthetic biology is just starting to

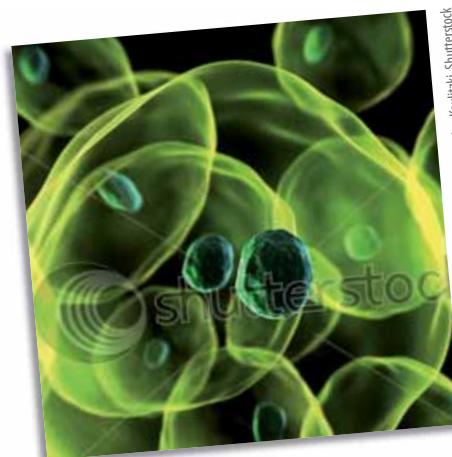
find a niche in the world of research. 'One application is the design of biological systems that are not found in nature,' they said. It should be noted that past studies in the development of various artificial connections within genetically modified cells, including oscillators, sensors and circuit breakers, have been fruitful.

A number of these artificial networks could be used for both medical and industrial applications such as in biosensing, bioremediation (use of microorganismal metabolism to remove pollutants), and agriculture. But the researchers said that despite the huge potential for these artificial connections, there are technical limitations to date, mostly due to the artificial systems in individual cells that fail to work as expected.

Researchers from Germany and Spain contributed to this study.

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Project sheds new light on neural communication

Researchers have developed innovative methods for studying how different parts of the brain communicate with one another. The European project's results could eventually result in new diagnostic tools for brain diseases and injuries.

Scientists already have a good understanding of neural communication at the local level (i.e. involving single neurons or individual brain areas). However, less is known about communication between different neuronal assemblies. Neuronal assemblies are groups of neurons that are well connected and are often active at the same time.

The neurons in an assembly can be scattered throughout different regions of the brain, and one neuron can be part of a number of different assemblies.

Working to boost our understanding of how assemblies exchange information is the EU-funded project 'Large-scale interactions in brain networks and their breakdown in brain diseases' (Brainsync). Launched in 2008, Brainsync is investigating how variations in neuronal communication relate to variations in behaviour.

In its second year, the Brainsync partners came up with an array of innovative methods for recording, analysing and modelling neural signals in both humans and non-human primates.



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For example, one research group has succeeded in using magnetoencephalography (MEG) data to view interactions across brain regions in the resting state. Another newly developed method draws on MEG data to pick up consistent lagged signal interactions between regions.

Elsewhere, Brainsync researchers have pioneered the combination in humans of transcranial magnetic stimulation (TMS) and functional magnetic resonance imaging (fMRI). The team recently extended this approach to study interactions between different parts of the brain during active behaviour.

The potential clinical applications of the Brainsync project's work extend to the many neurological and psychiatric diseases and conditions which may be characterised by abnormal neural communication, including stroke, head injury, multiple sclerosis and Alzheimer's disease.

Funded under the FP7 specific programme Cooperation under the theme Health.

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Brain researchers think outside the box

European scientists have now confirmed that neuronal networks in the brain function much like the 'hubs' of activity found all around us, from the internet to air traffic flow.

A team of European scientists came together to prove a point — well, several points. First, they confirmed what they suspected: that when you cross scientific disciplines like mathematics with neurobiology you get some novel and thought-provoking results.

Partners in a European project, called 'Functional connectivity of developing hippocampal networks: characterisation of circuit-hubs' (Circuit-Hubs), had a theory about the way networks function. To prove it, they turned to the outside world, rather than microscopes and magnetic imaging, for proof. Their idea was that 'synchronous network events' are dependent on precise connectivity patterns between neurons in the brain.

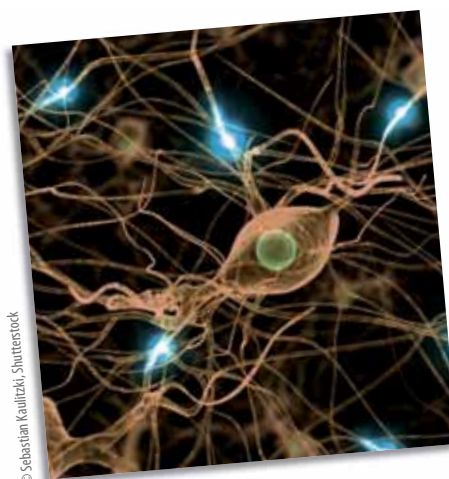
In particular, they tried to establish the existence of so-called 'circuit-hubs' of 'super-connected' cells which transmit information rapidly to developing networks in the hippocampus. And their efforts paid off. 'Our hypothesis was correct and in our project we were able to demonstrate, for the first time, the existence of neuronal hubs,' noted the project partners.

Specifically, using sensitive imaging techniques they managed to reconstruct the temporal dynamics of the network to identify the 'hub cells' capable of orchestrating oscillatory activity in a network. They also confirmed that 'hub' neurons are specific cell types (GABAergic cells), which further investigation suggests might be early developed neurons.

What's more they showed that brain research benefits from multidisciplinary thinking that bridges mathematics, physics and neurobiology and goes far beyond questions of developmental neurobiology.

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Tackling rare diseases on a pan-European level

European doctors and medical experts are developing new ways to handle rare diseases such as cystic fibrosis and lung transplantation.

In a drive to optimise European health-care different centres of expertise, which typically bring together doctors, patients, researchers, health administrators and insurers, are networking together to address several rare diseases.

A European consortium is testing the benefits of assembling these so-called 'European networks of centres of expertise' (ENCE) in tackling three rare disease groups: cystic fibrosis (CF), pulmonary lymphangioleiomyomatosis (LAM), and lung transplantation (LTX).

The process involves extensive mapping and analysis of available resources and structures, a thorough scoping exercise to design a framework for such networks, and a consensus process. These components are crucial for developing the requirements to build these networks that go beyond national borders.

So far, the first year of the EU-funded project has seen the completion of the first two components successfully. These were the mapping and scoping activities, performed separately for each of the disease. As a result, the needs and expectations of all stakeholders have been integrated on national and European levels.

This also resulted in a set of elements for the formation of ENCEs for each disease. The elements include patient registries, clinical trials networks, involvement of patient organisations, basic research, bio-banking, etc. Soon, these criteria will be recorded in separate consensus statements for each disease.

The project has isolated some common issues which appear to affect the three disease groups. These include the need to develop and improve the quality of

expertise, define standards of care, and facilitate cross-border travel. The organisational and ethical aspects of patient registries, data ownership and handling will also need to be addressed. The project will also look at the best way to organise European clinical trials in these diseases.

With more efficient use and bundling of resources for patient care and clinical research, the project team predicts patient care Europe-wide in these rare diseases will benefit.

Funded under the FP7 specific programme Cooperation under the theme Health.

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Catching sight of gene therapy potential

Gene therapy, although in its infancy, is advancing into mainstream medicine very rapidly. European scientists are applying this breakthrough treatment to inherited conditions that cause blindness.

Sight depends on the presence of cells at the back of the eye (the retina) that are photo- or light receptive. Death of these light catchers either through ageing, disease or genetic predisposition will mean the patient can experience serious loss of vision.

Inherited photoreceptor blinding disorders are caused by mutations in genes that are expressed in the actual photoreceptor cells themselves. With EU funding, the 'Gene therapy for inherited severe photoreceptor diseases' (Aaveye) project is aiming to develop solutions for just two of these — retinitis pigmentosa (RP) and Leber's congenital amaurosis (LCA). To date, there are no therapies available for these devastating diseases.

RP may not affect the patient until mid-life when the disease causes tunnel vision. LCA becomes evident at birth or in the first few months of life and results in severe vision loss or blindness.

The main prerequisites for gene therapy are that the rogue gene(s) has been identified and there is a safe, reliable vehicle for the new DNA to be delivered. The adeno-associated virus (AAV) — a small virus that infects humans without obvious disease

symptoms — has proved effective in delivering the gene to retinal cells. Moreover, the genes responsible for RP and LCA have been identified.

The Aaveye project is bringing together three eminent European academic institutions with links to eye hospitals



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and an emerging small and medium-sized enterprise (SME), Asper Biotech, with 10 years of experience in DNA and genetic testing. The project also has close ties with patient organisations in the US and across Europe.

The Aaveye team is tackling the task by first assessing the impact of the gene therapy on selected animal models by testing the improvement in vision. As

the project also has a large contingent of patients, the new gene transfer methods will be put on trial for humans — from bench to bedside.

Testing the safety and feasibility of transferring genes into the cells of the retina for the treatment of both RP and LCA is a first in the optical diseases world. Close collaborations with patient organisations will allow the

rapid spread of the research results and awareness of the new therapies. Recruitment of new patients for molecular analysis and future clinical trials will also be given a boost.

Funded under the FP7 specific programme Cooperation
under the theme Health.

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Molecular activator for cellular senescence

European scientists have discovered a molecular switch for cellular senescence that can make a significant contribution in the fight against cancer.

Cellular senescence is an important mechanism for cancer prevention in mammals that involves normal cells losing their ability to divide while undergoing a series of metabolic and morphological changes. The process is activated by cells in response to physiological stress, such as DNA damage, which can cause the development of tumours. Senescence is also thought to contribute to the ageing of the entire

organism and limit the renewal of normal stem cells.

Cultured cells are analysed to determine the different physiological triggers for cellular senescence, including the genes that activate the process. Recent studies have revealed that senescent cells can be found within benign tumours and may prevent these tumours from becoming malignant.

There is also evidence that stem cells — the body's master cells — experience senescence during ageing. However, the action of senescent cells within the actual organism and their subsequent fate is still not well understood.

The EU-funded 'Modelling senescence' ⁽¹⁾ project is studying cellular senescence within the organism, rather than cultured cells. Researchers have created a technique where the senescence process can be turned on at will, enabling scientists to determine the effects of the process on both normal and cancerous tissues.

Project partners have developed mice in which expression of the two main molecular activators of the process, the p16INK4a and p19ARF genes, can be induced in multiple tissues by administering tetracycline. This allows scientists to experimentally generate senescent cells and determine their molecular and functional traits.

Work conducted by the project consortium has provided the first genetic approach for studying this crucial biological process within tissues and organisms, rather than cultured cells. It will contribute to our growing understanding of the ageing process and cancer preventing mechanisms, as well as Europe's growing knowledge economy.

(1) 'Generation of mouse models for the study of cellular senescence in aging and cancer'.

Funded under the FP7 specific programme People
(Marie-Curie actions).

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Medications 'à la carte' upgrade prescription drugs

Genetics and advanced computer systems may change the way we manufacture medicines forever. Tailor-made drugs that target illnesses more precisely and efficiently are on the way to becoming reality.

With the realisation that one medicine doesn't fit all cases of a particular disease, the paradigm for treating illnesses and prescribing medicines is changing. Modern medicine has implicated hundreds of interactive genes in diseases like allergy, obesity and cancer. Armed with more genetic information and analyses than ever before, doctors are now able to personalise medication based on a few diagnostic indicators in the body called 'markers'. Such a system of treatment is bound to lessen costs and ease suffering as medications become more effective.

The challenge, however, lies in finding these markers within the body. The Multimod ⁽¹⁾ project is confident that intense clinical studies may indeed help identify markers for personalised medication of complex diseases. The studies are based on bioinformatics (advanced computing systems) and genomics (the study of genetics and DNA).

The project team is analysing disease-associated genes and identify groups or 'modules' of interacting genes with distinct biological functions. The modules are then dissected to find genes and pathways with key regulatory functions. These modules are multi-layered, meaning they integrate information about disease-associated changes on the DNA, RNA and protein levels. This involves both genetic and *in vitro* studies, but the ultimate test of the

modules will be if they are successful in clinical trials. To illustrate how Multimod works, changes in RNA may be caused by a specific mechanism in a regulatory region within the body. When this happens, the corresponding protein is tried as a marker to personalise medication.

So far, the project has analysed original genetic information from almost 5 000 subjects, as well as public data representing hundreds of thousands of patients. Using hay fever as a model illness, Multimod has already started clinical studies,

which have resulted in the identification of possible diagnostic markers.

The project results, announced through publications and conferences, have received favourable reviews from the research community and are inspiring similar studies for different diseases. In short, the challenge of defining diagnostic markers for personalised medication has been successfully overcome. The methods used are likely to apply to complex diseases, a target that now seems well within reach.

(1) 'Multi-layer network modules to identify markers for personalized medication in complex diseases'.

Funded under the FP7 specific programme Cooperation under the theme Health.

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Watch this space!

Coming up in issue 32 of *research*eu results supplement* a special dossier on 'Robots and us: advances in robotics, from industry to society,' how better sensors and robotic intelligence are making robots more common.

Setting the standard for handling medical samples

We need to do a better job of collecting, storing and transporting human blood, plasma, tissue and other samples before they are analysed in the laboratory. Discoveries made during the Spidia ⁽¹⁾ project are making sure we do just that.

In vitro research has contributed significantly to the fields of cellular and molecular biology, and consequently to many advances in medicine. However, progress is not as fast as it could be since many of the samples are not handled correctly prior to their analysis in the laboratory.

Considerable funding from the Health research programme of FP7 has been earmarked to address this problem. Both private and public research organisations have committed to developing new standards and tools for *in vitro* diagnostics in the context of the Spidia project. Over 250 laboratories have been enlisted to participate in ring trials addressing DNA and RNA in blood and plasma samples. The results are expected to drive the devel-

opment of guidance documentation on key issues such as quality assurance.

In parallel, a new method of collecting and stabilising tissue samples has been created. Analysis of 3 000 samples has demonstrated superior preservation in comparison to conventional techniques such as snap freezing, where the temperature is reduced as quickly as possible, and formalin fixation. Remarkably, the new technology allows both histopathological and molecular analyses to be performed on the same sample.

Samples may travel great distances or be stored for long periods prior to their analysis. The advent of a tracking system, including both hardware and software, during Spidia will help organisations follow samples from the point of

collection all the way until they are put under the microscope. A new container for storing and transporting tissue samples completes the picture.

Finally, a search has been initiated for biomarkers that reveal whether or not the quality of a sample has been impaired during processing. Both RNA and metabolic profiles show promise in this area. No stone remains unturned as new sampling techniques and stabilisation solutions are also being sought.

Fast adoption of the new technologies and standards is assured since the Spidia consortium includes a prominent pan-European standards body. The hope is that debilitating diseases, such as Alzheimer's, will be diagnosed earlier and with greater reliability.

(1) 'Standardisation and improvement of generic pre-analytical tools and procedures for *in vitro* diagnostics.'

Funded under the FP7 specific programme Cooperation under the theme Health

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Comfortable homes with near-zero energy costs

The cold air that enters through cracks in walls or underneath doors drives up utility costs. Coupled with the lack of high-quality insulation and energy-efficient windows, people's homes can become expensive to heat. But 'passive housing' offers a much-needed solution, say the experts.

For the past decade, architects, designers, and engineers have been working on how to best minimise energy use in the home and drive down costs. The European Commission is also promoting energy performance of buildings by encouraging Member States to endorse national plans and targets of very low and close to zero energy buildings by 2020. This includes heating water, air conditioning, as well as the everyday consumption of electricity.

But the implications of new sustainable technologies in passive housing are not entirely understood. Are people aware of passive housing and how can they benefit from existing technologies? The EU-funded 'Create acceptance' ⁽¹⁾ project, for instance, attempted to answer those questions. They developed a tool that measures, promotes and improves the social acceptance of these technologies. Another EU-funded project, 'Changing behaviour' ⁽²⁾, also created a toolkit that looks at how people use energy. Results will help determine how Europe can best suit the energy needs of its citizens.

Typically, an averaged-sized one-family house will spend almost EUR 240 000 over a 40-year period to heat their home, provided that heating costs do not exceed 5%. Only around 12 000 homes in Europe — mostly located in Germany, Austria and Scandinavia — were reported in 2009 as 'passive'. But the number of passive houses and buildings throughout the EU has since more than doubled.

Passive housing is sometimes described as obtaining the minimum performance requirements of all types of energy in a house or an apartment. Thermal comfort in one's home without the use of a conventional heating system can be achieved by using novel passive housing technologies and deceptively simple strategies. For instance, a house can have passive credentials just by designing and building it to maximise how much sunlight enters through windows, keeping homes warmer in winter and cooler in summer.

Numerous other EU-funded projects are also working on driving down energy-associated costs in homes and buildings. These projects are working towards making future energy more decentralised, renewable, efficient, technologically varied and intelligent. Researchers at the 'Green solar cities' ⁽³⁾ project, for instance, are developing solar thermal collectors on rooftops. They are also experimenting with using biomass



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to help offset conventional heating methods. And the EU-backed FENIX ⁽⁴⁾ project worked out a method to boost distributed energy resources by maximising their contribution to the electric power system. These initiatives not only help reduce energy consumption — some actually make houses and buildings net contributors to the energy grid.

Passive housing continues to excite and is gaining a foothold among small- and medium-sized enterprises and large industry alike. In Germany, trade fairs like the Clean Energy and Passive House (CEP) in Stuttgart have been bringing together interested parties for the past four years. The next CEP is scheduled to run from 10 to 12 February 2011 and includes exhibitions, presentations by industry, and guided tours.

For more information on the CEP event, please visit:
www.cep-expo.de/messe+M52087573ab0.html

(1) 'Cultural influences on renewable energy acceptance and tools for the development of communication strategies to promote acceptance among key actor groups'.
Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).

(2) 'Contextualising behavioural change in energy programmes involving intermediaries and policymaking organizations working towards changing behaviour'.
Funded under the FP7 specific programme Cooperation under the theme Energy.

(3) 'Global renewable energy and environmental neighbourhoods as solar cities'.
Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).

(4) 'Flexible electricity networks to integrate the expected "energy evolution"'.
Funded under the FP6 programme Sustdev (Sustainable development, global change and ecosystems).

Europeans driving electrical power

Researchers in Germany are developing new electronic components that will help energy infrastructures adapt to the growing use of renewable energy sources and cut energy losses during transmission. As things stand now, power is lost during its journey along the electricity wires to users. The team from the Fraunhofer Institute for Integrated Systems and Device Technology (IISB) in Germany discovered that a reliable power supply is the critical component behind the infrastructure.

The cable infrastructure consists of various switching points that reduce the voltage, helping equipment tap into the power at low voltage. 'A reliable power supply is the key to all this, and major changes will take place in the coming years to safeguard this reliability,' explains IISB head Professor Lothar Frey.

'The transport and power networks will grow together more strongly as a result of electromobility, because electric vehicles will not only tank up on electricity but will also make their batteries available to the power grid as storage devices. Renewable energy sources will become available on a wider scale, with individual households also contributing electricity they have generated.'

A case in point is the global Desertec project, which targets harnessing solar and wind energy in deserts worldwide. Locations that are currently in Desertec's spotlight are North Africa and the Middle East. Consumers will receive the generated electricity via long high-voltage power lines or undersea cables.

The researchers added that cables, systems and components already in use will have to be adapted to the future energy mix. Doing so will ensure that consumers receive electricity reliably and with as few losses as possible.

The IISB team is mulling over solutions and developing components to convert electrical energy efficiently. According to the team, more and more direct current is being used to transmit energy for distances that are over 500 kilometres or for cables located under the sea. This system ensures constant voltage and keeps consumption low; 7% maximum of power is lost over long distances compared with a 40% loss for alternating current. The researchers said more converter stations are needed to convert the high voltage of the direct current into the alternating current required by the consumer.

'In cooperation with Siemens Energy [Germany] we are developing high-power switches,' IISB's Markus Billmann pointed out. 'These are necessary for transmitting the direct voltage in the power grid and are crucial for projects like Desertec. The switches have to be more reliable, more scalable and more versatile than previous solutions in order to meet the requirements of future energy supply networks.'

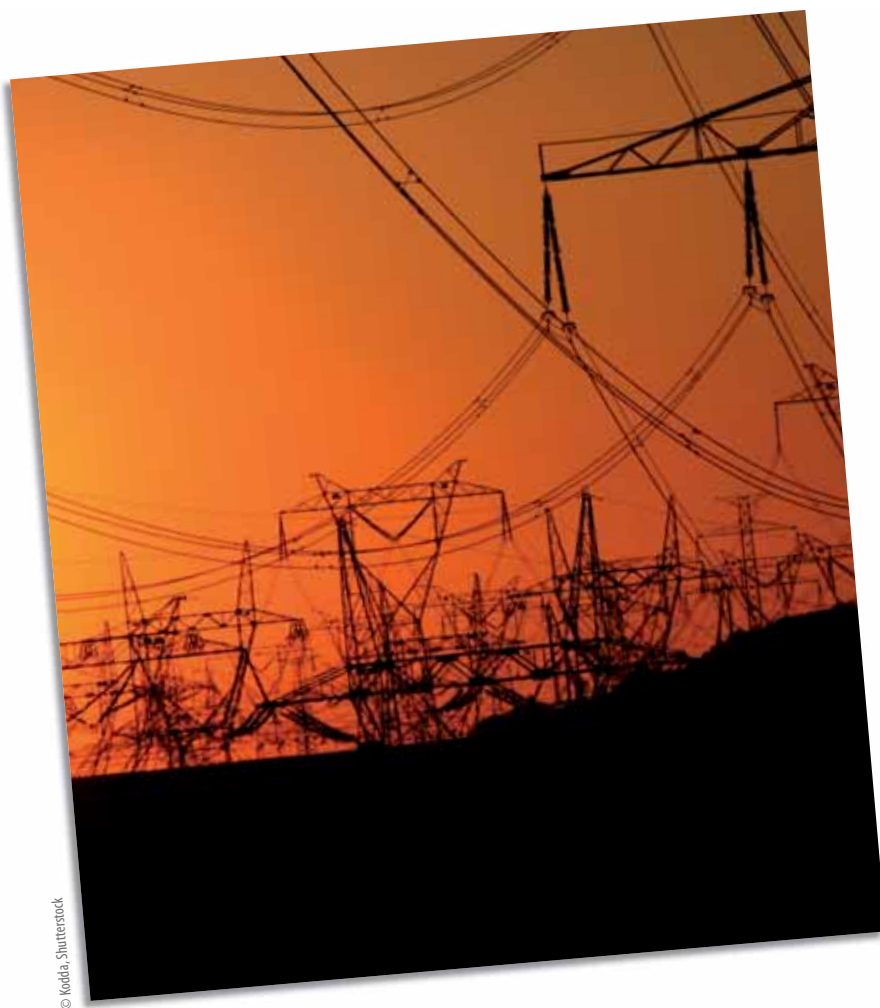
In order to achieve this goal, the team is using inexpensive semi-conductor cells which with previous switching techniques could not be used for high-voltage direct-current transmission (HVDCT).

'At each end of a HVDCT system there is a converter station,' Mr Billmann said. 'For the converters we use interruptible devices which can be operated at higher switching frequencies, resulting in smaller systems that are easier to control.'

The researchers are determined to protect cells from damage. Some 5 000 modules will be contained in each converter station. Normally, failure of these modules, which will be connected in series, would result in a chain reaction and damage the entire station. The IISB has changed this.

'We have now solved this problem. With our cooperation partners we are working on tailor-made materials and components so that in future the equipment will need less energy,' Mr Billmann pointed out.

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Cheaper and more efficient solar cells

Cheap and efficient solar cells can make an important contribution to combating climate change. Europe's leading research institutes in the field of heterojunction solar cells are joining forces through the 'Heterojunction solar cells based on a-Si c-Si' (HETSI) project to investigate new ways of making solar cells even more competitive.

Crystalline silicon (c-Si) wafer-based technology has genuine potential for significantly reducing the cost of solar cells. However, a number of critical issues must first be addressed. They include a reduction in the amount of silicon material consumed (for example using thinner wafers) and an increase in solar cell efficiency.

One of the most promising avenues of research is silicon heterojunction cells, which depends on a low temperature growth of ultra-thin silicon layers on both sides of a crystalline silicon wafer substrate. The role of the EU-funded HETSI project is to design, develop and test more efficient heterojunction solar cells that are compatible with high-throughput mass production. The cell design is based on an emitter and back surface field produced by a low temperature growth of ultra-thin layers of silicon.

Modelling new concepts is crucial to effective design and development. Simu-

lation results obtained with two different softwares have shown excellent correlation. The software has now been upgraded to take into account additional factors. Project partners have also developed wet-chemical processes and dry cleaning processes that have resulted in higher cell efficiencies.

Different deposition methods for doped metal oxides used in photovoltaics, called transparent conductive oxides (TCO) and include indium tin oxide (ITO), have been compared. The sensitivity of ITO in damp-heat tests on solar cells shows that aluminium foil is required on the back to prevent the penetration of water. Metallisation conducted with low-temperature screen printed pastes from a number of different suppliers reveals that resistivity is too high for a single print process

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and a multiple print process should be investigated. Metallisation was finally applied to actual large area solar cells.

The HETSI project shows that a new approach can be applied to the development of a competitive solar cell using c-Si wafer-based technology to reduce costs and increase efficiency. The results will also help boost the European solar cell industry and create more jobs in the renewable energy sector of the new green economy.

Funded under the FP7 specific programme Cooperation under the theme Energy.

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Enhanced oilseed crops lead to cleaner biofuels

New developments in genetic manipulation of oilseed crops are yielding plants that will lessen industry's dependence on fossil oils.

In the drive to replace crude oil with more renewable resources, scientists under an EU-funded initiative have been experimenting in producing added-value oils and lubricants for industrial use. Made from simple crops, these oils must be produced in large enough quantities to satisfy the needs of oil-hungry industries.

The challenge has been tricky since it involves genetic modification (GM) of existing oilseed crops in order to create more robust and efficient varieties that yield the maximum amount of oil. Beyond scepticism of the general public concerning GM products, there are also technical difficulties involved.

In dealing with the public's concern about GM, the 'Industrial crops producing added value oils for novel chemicals' (ICON) project has pledged to maintain a transparent and ongoing communication ethic in order to inform the public about progress and developments, keeping all aspects open for debate. In this light, ICON has overcome two major obstacles in mass-producing plant-based industrial oil and related chemicals.

The first challenge is the development of an efficient 'transformation protocol' for a common leafy crop called Crambe, which until recently had not responded well to genetic engineering technology.

Today, a promising new variety of the Crambe plant has been developed to yield seeds with a much higher content of esters.

Intense scientific research and progress have also given way to new GM applications using Jojoba wax esters to produce similar esters in *Camelina sativa*, another oilseed crop. Such esters resist pressure and temperature more efficiently than the triglycerides that the plants produce naturally, giving way to a much wider array of industrial applications.

Both these accomplishments will avoid or considerably shorten previous delays expected in the technology. Permission for field tests using the new crop — a variety of *Camelina sativa* which now boasts 15 to 20 % of wax esters — will be submitted in 2011 to the Animal



and Plant Health Inspection Service (APHIS) in the US, marking a milestone of achievement.

With laboratory success in for content of esters and related fatty acids, in Crambe and a similar crop called *Brassica carinata*, the plants' seeds may be screened for wax ester content as early as the end of the year. The positive implications on cleaner energy, novel chemicals and more efficient industry are enormous.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy.'
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Harnessing the energy potential of rivers

Harnessing power from water is an energy form that is centuries old. However, creating an energy converter for rivers or streams with low head differences is something new. This is what one European project is aiming to achieve.

A consortium of researchers in the 'Hydropower converters with very low head differences' (HYLOW) project looked to exploit even small (as low as 2.5m) water head differences — the level between the upper section of a river weir and the section below it. The consortium of 11 partners, 7 universities and 4 SMEs from 5 European countries believes this is a

major untapped energy resource in the hydropower sector.

It is estimated that in Germany alone, hydropower potential of 500 MW with head differences below 2 m exists, which cannot be exploited due to the lack of a cost-effective and ecologically acceptable converter technology. The project is developing three different energy converters. The first will be for low head differences producing power ranging from 50 kW to 750 kW. The second is designed to be a free stream energy converter for river and tidal currents with speeds of between 1 m and 2 m a second, producing power of up to 500 kW. The last energy converter will look to make use of low pressure differences in pipe systems.

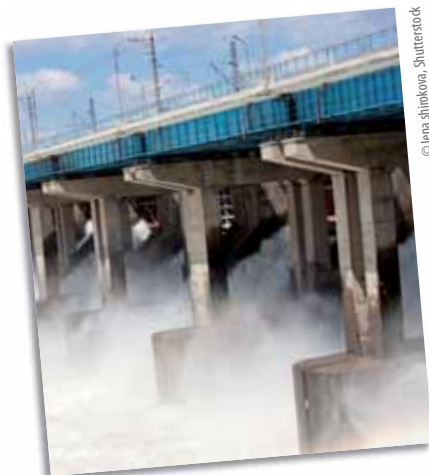
The consortium has identified three issues it has to take into account: fish compatibility, sediment transport, and compatibility with the EU's Water Framework Directive. In order to get around the rather low water levels

associated with the project, traditional turbines and energy converters were not deemed suitable. Therefore, the consortium had to come up with its own model: the 'hydrostatic pressure converter'. It consists of a big radius wheel with vertical blades which will be placed at a weir.

Model tests of this energy converter gave initial energy efficiency of 83 %. Medium and large scale models of the converter are due to be built and tested. Models for the 'free stream energy converter' have already been built and tested, with positive results. A full-scale model for micro-turbines for small pressure differences of less than 200 kPa in pipelines was scheduled to end in 2010.

It is hoped that because of the simplicity of the energy converters, they will be picked up by local businesses and produced on a large scale. It is believed that the energy potential of these converters can reach 3 GW to 6 GW and contribute to the Union's aim of increasing its share of renewable energy.

Funded under the FP7 specific programme Cooperation under the theme Energy.
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Taking airport safety systems off the radar

European researchers have developed a new system to improve security and management at airports. Based on magnetic sensors, the new detector will improve control systems at major airports and replace costly radar at smaller airfields.

When it comes to safety and security, airports need an economic and above

all, reliable point sensor to detect the nature and behaviour of objects on the

runway. Most current systems present safety problems and can be costly.

The gains for smaller airports would be more crucial as they depend solely on radar systems. Expensive to buy, they are subject to distortion from buildings. Moreover, they rely on the presence of

a transponder that aircraft use for anti-collision systems which may not always be fully operational.

For larger airports, an improvement in technology would boost efficiency. The new detector can be combined with other data like flight and radar in sophisticated systems such as the 'Advanced surface movement guidance and control systems' (A-SMGCS).

The EU-funded project Ismael ⁽¹⁾ investigated whether improvements in magnetic sensor technology would fit the bill to provide better surface movement surveillance at airports. The aim was to not only provide appropriate hardware for laboratory and field trials but also to develop software to trace the exact direction, identity and velocity of objects on the runway.

The ingenious detector operates by sensing the ferromagnetic parts of cars and aircraft, motors, engines or gears

and can therefore distinguish between them. As the information is based on interaction between the Earth's magnetic field, a single or an array of detectors can be put into action.

The system's technological superiority is in no doubt. As magnetic sensors are used, they are not influenced by weather, temperature or light. It is cost-effective with low power consumption, no radiation output and importantly, has no effect on airport communication.

To test the real-life effectiveness, the system was tested at a provincial airport in Thessaloniki, Greece and the major international airport Frankfurt. In Germany, the A-SMGCS was tested for how it coped with runway incursions and gate management, notoriously complex issues.

Ismael has made a significant contribution to overcome operational limits at small airports by improving safety

and therefore capacity. Passengers flying out of major airports will not have a stressful start and finish to their holiday or business trip.

(1) 'Intelligent surveillance and management functions for airfield applications based on low cost magnetic field detectors'.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
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New multifunctional layer for aircraft structures

New composite structures that are stronger, safer, and more cost-effective are being developed by European researchers for the aircraft industry.

Over the past 35 years the use of composite materials in aeronautics has increased, reflecting their versatility and strength. However, the organic basis of the matrix means that composite materials are poor conductors of electricity and heat, and can emit toxic fumes when burnt.

Researchers from the 'Multifunctional layers for safer aircraft composites structures' (LAYSA) project are investigating the scientific and technological basis of a new multifunctional layer for improved aircraft composite structures. The multifunctional layer needs to include an ice/fire protection and health monitoring capacity integrated into the structure. Project partners are working on new layer types based on commercial nano-materials.

A nano-composite that can conduct heat and electricity, resist fire and possess a sensing capability are now being developed. These three functions were initially studied separately to focus on pre-treatment and the dispersion of the

nano-material into the resin in order to achieve the desired function. The developed nano-composite can now be integrated into the traditional composite manufacturing process.

Improvements resulting from the LAYSA project include simplification of manufacturing processes and maintenance operations resulting in time and cost savings. Temperature sensors are not needed because of the self-sensing ability of the layer. The elimination of heavy heating elements results in important weight reduction and therefore fuel savings. A reduction in fuel use will result in fewer emissions from aircraft, thereby reducing their impact on the environment.

The LAYSA project will help to produce cheaper multifunctional layers for safer aircraft composite structures, thereby helping to make the European aircraft industry more competitive. Furthermore, a reduction in fuel use will result in fewer emissions from aircraft, reducing their impact on the environment

and helping the air travel industry to become more sustainable.

These barriers are exacerbated by legal hindrances, such as outdated inter-governmental agreements on management of international rail traffic. In addition, market barriers are produced by inconsistent infrastructure changes or the lack of willingness to invest in its upgrading.

There are however clear signs of progress. Effective competition has emerged on the international freight corridors stretching from Scandinavia to Greece. Competition in this railway pipeline has encouraged innovation of undertakings and operational efficiency to reach business objectives.

It appears likely that the efficiency and quality of service of rail freight will improve over the coming years under the impact of greater competition. More importantly, it is possible that the scene has been set for very major changes over the next few years.

Funded under the FP7 specific programme Cooperation
under the theme Transport.

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Technology drives road safety

Technology can and has made Europe's roads safer. The challenge is getting drivers to embrace new technologies, which is exactly what the Safety-Technopro ⁽¹⁾ training tool hopes to accomplish.

Unfortunately, tens of thousands of Europeans lose their lives on the road every year. Technology can play an important role in bringing this number down. This is the idea behind the eSafety initiative backed by the European Commission and a range of relevant stakeholders.

The goal of the EU-funded project Safety-Technopro is to accelerate the adoption of new road safety technologies. Research shows that vehicle owners trust the opinion of their car salesperson, mechanics and vehicle inspectors. With this in mind, Safety-Technopro sought to reach out to these industry professionals with a flexible training tool.

Feedback from the professional bodies themselves was used to drive the tool's development. An internet-based questionnaire made it easy to gather feedback from across Europe, ensuring that geographically differing perspectives

would be taken into account. The most promising new technologies targeting road safety were also identified, with a focus on those mature enough for deployment.

These two elements were combined to create a training system with individual modules tailored specifically for car dealers, mechanics and other industry professionals. A series of user-based trials is expected to help optimise the tool's effectiveness.

Looking to the future, it is easy to keep the tool current thanks to a special module that can be updated on a regular basis with the latest road safety technologies.

(1) 'Training system on new safety technologies for road transport addressed to professional bodies of the automotive sector'.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
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Intelligent road restraint systems

As more drivers take to the road, the number of traffic accidents is expected to continue to rise and further burden our health care system. A fresh approach to roadside infrastructure may hold the key to meeting this challenge.

Increased mobility is an indicator of a better quality of life, but it can come at a cost when lives are lost on the road. Motorcyclists and cyclists are particularly vulnerable to injury, especially when accidents involve roadside barriers.

Significant European funding is being directed towards improving these so-called road restraint systems (RRS). The Smart RRS ⁽¹⁾ project looked at how technology can be employed to increase road safety.

The first step involved analysing data from accidents involving RRS, examining what body parts are most often affected, the role that speed and angle of impact play, and so on. This was complemented by an investigation of the current standards governing RRS as well as the latest advances in motorist safety technologies.

Armed with this knowledge, the Smart RRS participants have begun designing and constructing different prototypes. Computer-based models are helping identify which materials and profiles deliver the best performance. Primary and tertiary sensors are also being developed that will, in addition to other functions, alert emergency services to the exact location of accidents in order to reduce response time.

Care is being taken to ensure that the Smart RRS can be easily integrated into existing road infrastructure, that production and maintenance costs are minimised and, above all, that the system is robust and reliable. Its abil-

ity to better safeguard road users will be evaluated through on-road tests.

(1) 'Innovative concepts for smart road restraint systems to provide greater safety for vulnerable road users'.

Funded under the FP7 specific programme Cooperation
under the theme Transport.
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When does harvesting become mining?

A lengthy, wide-ranging and detailed study of palm forest ecosystems promises to reveal the impact of economics on diversity. It will also teach valuable lessons in sustainability.

European researchers at the 'Palm harvest impacts in tropical forests' (PALMS) project pose an urgent question: when does harvesting become mining in natural ecosystems? At what point do we begin to deplete an ecosystem faster than it can renew itself?

The question is vital because humanity depends directly on obvious natural goods like food, fuel and building materials, and people are even more dependent on less obvious ecosystem services like species diversity, climate moderation or soil stabilisation.

The PALMS project is a concerted five-year effort to understand the ecosystem impacts of economic activity focusing on Palm trees, specifically those of the forests of north-western South America in Bolivia, Colombia, Ecuador and Peru. This is the most biologically rich region in the world; here flowering plants, birds, and other biological groups reach their maximum global diversity. All of this diversity also offers thousands of useful products and natural resources for people, including rattan and other weaving fibres, building materials, food, fuel, oil, dyes, resins, paints and traditional medicines.

'Tropical forests harbour thousands of useful plants which are harvested and used in subsistence economies or traded in local, regional or international markets,' explains Dr Henrik Balslev, coordinator of the PALMS project and professor of botany at Aarhus University, Denmark.

'The effect on the ecosystem is little known, and forest resilience is badly understood. Many species are restricted to small areas and threatened by expanding human populations, particularly in the mountain and foothill forests. It is urgent to define and implement more sustainable uses of the region's ecosystems,' he stresses.

PALMS studies harvest impacts on tropical ecosystems and it focuses on palm trees because they are the most useful group of plants in tropical South American forests. They are well represented in different regions. But they also stand in as a good proxy for the wider diversity of these forest ecosystems.

'Palms are well suited for this purpose because local people and scientists alike know them well, and they are diverse and abundant,' Dr Balslev notes. If the palms of a particular region are under stress, it is indicative of a wider problem.

The project is a hugely ambitious and highly detailed attempt to understand impacts on a very wide scale. It includes a range of institutions in nine countries cooperating to complete field-work in four countries and three climatic zones, with forests



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spread over thousands of hectares that are exploited by millions of people. And PALMS is looking to address this extremely broad area at every level, from educational materials for tribal children to academic papers and policy briefs for governments. The project is ongoing but it has already achieved some significant results.

Thousands of purposes

EU-funded PALMS has identified 194 palm species that are used for 2395 different purposes. 'The results of the project so far confirm the substantial diversity and abundance of palms in the tropical forests of north-western South America,' remarks Dr Balslev.

'But we also spotted some patterns that have so far gone unnoticed. For instance, we have noticed great regional differences in the diversity patterns and we have started to disentangle some of the drivers of such differences, like climatic seasonality and variation in soil fertility.'

The researchers undertook genetic and molecular characterisation of palm species, vital to assess species resilience in different regions. A palm that physically seems like another might have some subtle genetic variation which is unique to a particular forest, making it less resilient because a tree from another forest cannot replace it.

That work is underway, but preliminary field studies suggest that destructive harvest of palms is widespread and that more sustainable methods are essential. Harvest studies show that controlling the number of leaves taken per stem can easily



make harvesting sustainable without compromising the total harvest. Other research shows that only adult palms can be harvested sustainably, and juveniles must be left alone.

This is vital, hard, practical data that has immediate application and can offer substantial benefit to the many communities that depend on these forests. 'In fact, one of the most striking results so far is that our local organising committees want this information transmitted immediately, so it can be put into action as soon as possible,' reveals Dr Balslev.

Harvest policy and regulation applied by local, regional and national governments is another research strand pursued by PALMS. So far the team has looked at 336 legal documents from Bolivia, Colombia, Ecuador and Peru, and almost half deal with the use of non-timber forest products, 10% deal with trade and the rest are divided between documents dealing with indigenous rights, access to genetic resources, intellectual property rights and land use.

'The most striking preliminary result is that, although there are many legal instruments and regulations, the local communities know very little or nothing about rules and regulations. And, really, they cannot imagine why anyone from the outside would care what they are doing,' stresses Dr Balslev. 'They are almost puzzled about why we would care!'

So far the project has held three major workshops with local organising committees in Bolivia, Ecuador and Peru. 'These meetings helped refine our communication strategy, making it more relevant to different stakeholders,' Dr Balslev reveals. And that work will progress apace over the coming years.

Of course, while PALMS' work will significantly advance our understanding of one of the most important ecosystems in the world, the impact of its work will probably go far beyond that. PALMS is one of the most ambitious systematic ecosystem studies undertaken, involving 10 world-class laboratories and dozens of field researchers examining the economic realities on local, regional, national and international levels, but also the ecosystem impacts in three climatically distinct regions

As such its methods will be as important as its results and the project's insights into large-scale ecosystem research will provide both the inspiration and the model for others.

The PALMS project received funding from the Environment theme of the EU's Seventh Framework Programme (FP7) for research.

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Environmentally-friendly economic indicators

For decades, we have taken the environment for granted in the name of progress. Now more than ever, a new generation of economic indicators, which embraces rather than ignores the environmental challenges associated with growth, is needed.

Models of economic development that do not take environmental impacts into consideration are outdated in today's environmentally-aware society. As such, the traditional economic indicators that are used to drive decision-making are no longer valid.

An EU-funded project called In-stream ⁽¹⁾ has been charged with developing a new set of indicators that incorporate both economic and environmental criteria with a focus on sustainability. A range of indicators is to be proposed

for use with different audiences, such as policy-makers, economists, the media and the general public.

Accounting methods that adjust for the effects of pollution and overexploitation of natural resources are being analysed alongside conventional indicators such as gross domestic product (GDP). One of the challenges the In-stream team faces is finding the right balance between qualitative and quantitative approaches.

Economic models are being set up to test the appropriateness of the recommended indicators under different conditions. It is also expected that specific sustainability targets may be established based on feedback from the models.

The hope is that use of the new indicators will help Europe continue to grow its economy without compromising the environment.

(1) 'Integrating mainstream economic indicators with those of sustainable development.'

Funded under the FP7 specific programme Cooperation under the theme Environment.
<http://cordis.europa.eu/marketplace> > search > offers > 5852



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Satellites improve African environmental decision-making

Many developing countries face serious environmental problems that require the use of earth observation (EO) data and derived environmental information to help solve them.

The EU-funded project 'Distribution of vegetation data in Africa through EUMetcast' (Vgt4Africa) provides data on vegetation cover for analyses by EO experts in Africa, which is then used by local policy-makers to make better-informed decisions. The user community includes all of the continent's meteorological services and regional institutions conducting environmental monitoring.

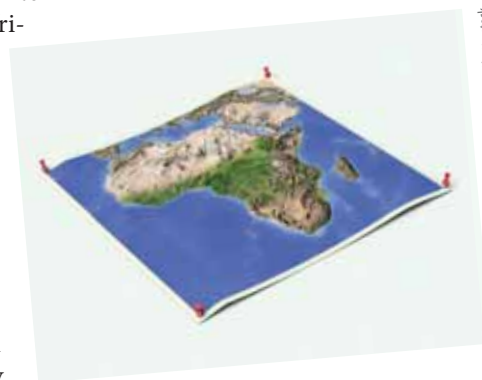
The EUMetcast telecommunications system disseminates free EO data from the European Organisation for the Exploitation of Meteorological Satellites

(EUMetsat) to all African countries. The Vgt4Africa project has also been helping to train EO experts to use the different available products in order to build capacity. This has helped African authorities to fulfil their environmental monitoring and reporting obligations. The work can also help countries improve the management of their natural resources.

The Vgt4Africa project has therefore made a significant contribution to sustainable development in Africa by building on local capacity

through the dissemination of data and training. The project has also built scientific cooperation and understanding between Europe and Africa who can work together to protect our common environment.

Funded under the FP6 programme 'Aeronautics and space'.
Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5832



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Long-term observation of greenhouse gases

A clearer picture of the state of greenhouse gases across Europe and the adjacent key regions of Africa and Siberia is now possible thanks to the efforts of European researchers.

Data from the EU-funded 'Integrated carbon observation system' (ICOS) project can be used to validate remote sensing tools, support scientific studies and contribute to improved environmental models.

Long-term observations are conducted to improve understanding of the global carbon cycle and greenhouse gas emissions and the factors which affect the composition of these gases in the atmosphere. Carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO) and carbon-14 (14C), also known as radiocarbon, are monitored by project partners to determine the fossil fuel component.

Monitoring and assessment of the impact of carbon sequestration and greenhouse gas reduction activities on the global atmosphere are also carried out. This includes attributing sources and sinks according to region, industrial sector and ecosystem type. The information can be integrated into a single dataset. In order to fulfil its objectives, the consortium has established the ICOS centre to carry out co-ordination, calibration and data handling.

The ICOS project has also set about establishing a central analytical laboratory for conducting calibration, quality control and atmospheric analyses for the whole network. An atmospheric thematic centre will be responsible for air sampling, data processing and instrument development and servicing.

The ecosystem thematic centre will help monitor changes in ecosystems and carbon pools as well as data processing and instrument development. Free access to ICOS data services is provided to scientists around the world by the carbon portal. The portal enables the production of web-based tools for studying greenhouse gas sources and sinks in near real time.

Europe can become a key global actor in greenhouse gas observations, data processing and user friendly online tools as a result of the work of the ICOS consortium. The project should make a significant contribution in the fight to reduce greenhouse gases and prevent the harmful effects of climate change.

Funded under the FP7 specific programme Capacities under the theme Infrastructures.
<http://cordis.europa.eu/marketplace> > search > offers > 5851



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Measuring changes to Europe's glaciers

The effect of climate change on glaciers was investigated by European researchers using interferometry technology to determine movement and other changes to these masses of land-based ice.

Precise measurement of Europe's glaciers is possible thanks to the advanced observation technology developed by the EU-funded project 'Interferometric evaluation of glacier rheology and alterations' (Integral).

The project employed a radar interferometer and interferometer altimetry to analyse changes to glaciers. This detailed information, which included data regarding water runoff and the movement of ice, was applied to computer models. Operational users of synthetic aperture radar (SAR) were also familiarised with new interferometry technology.

Interferometry is the technique of superimposing two waves and studying differences in their pattern. The instrument used is called an interferometer, which detects wavelength using an algorithm. Project part-

ners designed an enhanced algorithm and program tools for processing and combining SAR data with altimetry data for updating models of glacier movement.

Data from Integral have been used to study glacier activity and assess the state of land-ice resources in response to climate change. A series of interferometric 'snapshots' were taken showing ice-surface velocity structure, glacier strain rate and changes to the glacier's mass balance and runoff. These results were checked on the ground by field surveys carried out in several European arctic and alpine test areas.

Results from the Integral project will give scientists and policy-makers a clearer picture of the effect of climate change on the Europe's glaciers



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and enable the best course of action to be taken.

Funded under the FP6 programme 'Aeronautics and space.'
Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5830

Getting the bigger picture for better migration policy

Migration from Africa to Europe is a major concern for policy-makers with new policies currently underway. Thanks to a European research initiative, the quality of migration policies can now be improved.

Globalisation trends have led to increased international migration. Among other things, migrants seek bet-

ter economic and educational opportunities for themselves and their family members. A case in point is migration from sub-Saharan Africa to Europe.

This influx has heightened the need for new policy measures framed around more reliable data on the causes of migration and circulation between Africa and Europe.

The 'Migration between Africa and Europe' (MAFE) project intends to fill this gap by gathering data on the characteristics and behaviours of this particular

intercontinental migration. This means better understanding of two-way migration flows, not just the one-way movement from Africa to Europe, according to the project.

MAFE's holistic approach spans migration flows between Europe (Belgium, Spain, France, Italy, the Netherlands and the UK) and the Democratic Republic of Congo, Ghana and Senegal. Key areas involve examining what the patterns of migration are, what it is that determines migration and also how it intertwines with economic integration and the family unit.

The fieldwork, involving questionnaires and surveys, has been completed and the creation of a new dataset has been successful. The questionnaire and collection methodology are accessible on MAFE's website: www.mafeproject.com

Funded under the FP7 specific programme Cooperation under the theme 'Socio-economic sciences and the humanities.'
<http://cordis.europa.eu/marketplace> > search > offers > 5843



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Living with volcanoes

The huge ash cloud that erupted from one of Iceland's volcanoes last year underlines the havoc — and danger — that they pose. Anticipating and measuring volcanic risk relies on the latest scientific knowledge and monitoring techniques, while lives can be saved if effective mitigation strategies are in place.

An EU-funded project was launched in 2008 to integrate cost-effective approaches to mitigate risks from volcanic hazards. The project builds on the UN's 'International strategy for disaster reduction' recommendations and covers such issues as prevention, crisis management and recovery.

The project, called 'Mitigate and assess risk from volcanic impact on terrain and human activities' (Miavita), pools the expertise of civil defence agencies, national geological and volcanological surveys, scientific teams and an IT company. Local scientists and stakeholders in Africa (Mount Cameroon, Fogo in Cape Verde) and in Asia (Merapi in Indonesia, Kanlaon in Philippines) are also involved.

Together, the team has studied risk assessment methodologies (focusing on Mount Cameroon) and cost-efficient monitoring tools for under-monitored volcanoes. The tools include satellite and ground monitoring, gas analysis and volcano-seismology.

The project team has also identified the need to improve vulnerability assessments to cover people, buildings and the biosphere. Socio-economic surveys

to enhance community resilience were also felt to be important. Finally, the team agreed on the need for an integrated information system to help deal with disasters in an orderly and timely fashion.

Ahead of its completion in 2012, Miavita aims to deliver methods and guidelines for multi-hazard risk mapping on active volcanoes in different countries. New methods to monitor volcanoes and integrate remote-sensing techniques and geophysics — gas, seismicity and ground deformation — are also expected to come out of the project.

The team will also put together management plans and guidelines for boosting community resilience to volcanic hazards. The impact of active volcanoes on soil and agriculture will also be examined and documented.

The results of the project will be validated on a Caribbean volcano (Montserrat), and then finally presented at an international workshop. The results will also be summarised in a final handbook, providing stakeholders with comprehensive information on how best to manage risks associated with active volcanoes.

Funded under the FP7 specific programme Cooperation under the theme Environment (including climate change).
<http://cordis.europa.eu/marketplace> > search > offers > 5827



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ESF report: Europe can be marine biotech leader

The Marine Board of the European Science Foundation (ESF) says in its latest report that Europe can take the leading role in marine biotechnology by 2020. Latest data show that the marine biotechnology market is valued at EUR 2.8 billion, and has the potential to grow up to 12% each year if industry and academia cooperate.

The ESF experts say Europe's four seas and two oceans offer diverse conditions of temperature, pressure, light and chemistry, from shallow coastal waters to the deep ocean. The changes that allowed myriad marine organisms to thrive in these conditions led to a living library of diversity that is both unexplored and underexploited, the ESF's Marine Board says.

Marine biotechnologists can use these resources to develop new products and services, and in turn help bring solutions to the table as regards challenges that affect our planet, including offering a sustainable supply of food and energy and new industrial materials and processes, and developing new drugs and health treatments.

'Marine biotechnology not only creates jobs and wealth, it can also contribute to the development of greener, smarter economies,' explains Lars Horn of the Research Council of Norway and Chair of the Marine Board. 'Japan, China and the US are already investing heavily in marine biotechnology. If we fail to act, Europe will lose out.'

One of the ways that Europeans can help meet the Europe 2020 strategy is to bring biofuels to the forefront. For example, cultivation of microalgae for fuel could result in a 20% cut in greenhouse gas emissions. The ESF's Marine Board believes this technology is probably the best way to harness the ocean's



bioenergy, but more in-depth research is needed to boost output and cut costs.

The experts also point out that Europe's waters offer a potential source of drugs, biomaterials and industry products including biopolymers (biodegradable polymers). European researchers have already started developing over 13 marine-derived treatments, some of which are to fight cancer. Marine biotechnology can also give a big boost to aquaculture capacity, thus helping Europe meet its growing demand for sustainable, healthy seafood.

The Marine Biotechnology: a new vision and strategy for Europe report offers a roadmap for European research in this area and targets challenging, yet achievable, science and policy agenda for the next 10 years. If the right actions are taken now, Europe could take the helm of marine biotechnology, the Marine Board underlines.

Some actions the board refers to include: creating a stronger identity and communicating to raise awareness of European marine biotechnology research; improving the technology transfer pathways to stimulate cooperation between indus-

try and research; and developing new research strategies and programmes for marine biotechnology.

Founded in 1995, the Marine Board has helped foster cooperation between European marine science organisations towards the development of a common vision on the research priorities and strategies for marine science in Europe. A total of 31 organisations from 19 countries are represented by the board. By adopting a strategic role, the Marine Board offers its members a forum within which marine research policy advice to national agencies and to Europe's policymakers is developed. The main objective is to promote the creation of the European Marine Research Area.

Commenting on the board's 2020 vision for Europe, Maive Rute, Director of Biotechnologies, Agriculture and Food at the European Commission



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Directorate-General for Research and Innovation said: 'The recent developments in the area of marine biotechnology promise to be very important for example for applications in the medical sector, by developing new drugs and diagnostic devices.'

Researchers from Germany and Spain contributed to this study.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 19313

The big picture of Europe's marine ecosystem

Finding the right balance between economic and environmental goals is a difficult task. Better monitoring of Europe's marine ecosystems is a good place to start. And with the latest space technology at their disposal, European researchers can better assess the state of marine ecosystems.



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Europe's fish stocks are under pressure from pollution and in many cases over-fishing. Coastal waters along the Caspian Sea and the Black Sea, for example, are under threat from uncontrolled urban and industrial development.

The risk of losing valuable habitats and biodiversity is serious. A critical step in preserving marine ecosystems is to take stock of their condition. But it is notoriously difficult to produce a comprehensive picture of the state of Europe's seas.

The EU-funded Monruk ⁽¹⁾ project looked to change that. It monitored the marine environment in Kazakhstan, Russia and Ukraine using satellite synthetic aperture radar (SAR) images which capture larger sea areas.

High-resolution images collected by the Envisat satellite were analysed along with optical and infrared images, as well as in-situ observations from offshore platforms, to get a better picture of what is happening to seas in the region.

Interpreting radar images to identify, for example, patterns linked to surface winds, currents and waves is complex. So the team fed the SAR data into a numerical radar imaging model (RIM) which provided a clearer reading on real events, such as an oil spill in the Caspian Sea. The researchers used the radar measurements to determine patterns of oil dispersion and movements of pollution.

With the EU-funded part of the project now over, the team is eager to follow up their initial findings with further research. Existing algorithms need to be made more robust, and future satellite sensors will require

new methods and tools to be developed. And further effort will be needed to validate information products that provide a reliable picture of Europe's marine ecosystem to decision-makers.

(1) 'Monitoring the marine environment in Russia, Ukraine and Kazakhstan using satellite synthetic aperture radar'.

Funded under the FP6 programme 'Aeronautics and space'.
Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5831

Effect of climate change on alien fish species

Ichthyologists have studied the environmental biology and reproductive behaviour of the pumpkinseed sunfish, a non-native species from North America. The investigation has been conducted to determine the effect of global warming on the biodiversity of European freshwater systems.

Freshwater environments are extremely sensitive to changes in meteorological conditions and the organisms they contain may be vulnerable to predicted future climate change. Aquatic ecosystems and biodiversity can also be threatened by non-native species introduced into Europe either by accident or design.

An increase in extreme weather events such as flash floods due to global warming raises the risk of non-native species reproducing and dispersing into the freshwater environment. A changing climate will put additional stress on native organisms, which are already under duress from alien species due to predation, competition for food and the introduction of new diseases.

The European-funded 'Modelling of non-native fish species responses to climate change' (Alienfish&climchange) project determines the risks and impacts presented by non-native fish under conditions of climate change. A scientist funded by the Marie Curie Intra-European Fellowship has assessed the risk posed by the pumpkinseed (*Lepomis gibbosus*) and estimated spawning frequency, growth and dispersal rates as a result of flood events. Drift nets were used to sample populations in the wild and study their reproductive strategy.

Pumpkinseed reproduction and the corresponding increase in the species' invasiveness were investigated under

controlled conditions. For six months fish were held in artificial ponds; three ponds were heated by 2 to 3 °C and three were at ambient temperature. Fish kept in the heated ponds spawned earlier and for longer, leading to a higher number of larger young fish and better survival rates over winter. The findings suggest that *L. gibbosus* will become more invasive under warmer climatic conditions.

It is crucial to understand the environmental biology of alien species if an eradication programme is to be developed to help conserve native fish. Data from Alienfish&climchange will help environmental managers and government bodies make informed decisions regarding non-native species such as pumpkinseed fish.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> > search > offers > 5829





Long-distance learning for remote areas

Cutting-edge space technologies have huge potential to facilitate distance learning in Europe. But scientists first need to find cost-effective ways of integrating satellite telecommunications infrastructure with broadband terrestrial systems, in order to reach as many people as possible.

An EU-funded project set out to develop an integrated system for tele-education applications that integrate broadband terrestrial networks with satellite broadband technologies. The 'Broadband access satellite enabled education' (BASE2) project, completed in 2008, aimed to deliver educational services to remote areas in Cyprus and Greece. It also sought to underline the importance of space technology in supporting key EU policies such as distance learning.

A comprehensive system was developed through converging and making compatible different networks and broadband terrestrial networks. This created a backbone of satellite systems to which terrestrial networks can connect, in order to create seamless network infrastructure. Although the project focused on delivering educational services, the infrastructure can also potentially be used for other purposes, such as tele-medicine or access to knowledge databases for isolated areas.

This integrated end-to-end system was then implemented to provide tele-education services to remote rural areas and maritime users. For example, European farmers in remote areas often produce specialised products of designated origin, but could benefit from more knowledge of how to market them to other European regions.



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This project is therefore playing a crucial role in spreading e-learning and promoting computer literacy in remote and sea-borne communities, such as those employed on long voyages.

BASE2's platform was tested and validated. The quality of the content was evaluated and users' opinions were taken into account. Many who were unfamiliar with technology reported that the system was easy to use.

It is expected that the project's results will be adopted and exploited in order to provide a wider range of services to a larger number of remote regions.

Funded under the FP6 programme 'Aeronautics and space.'

Collaboration sought: venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 5804

Bridging the digital divide in Africa and beyond

The number of people with access to the internet continues to rise, yet many countries and communities have been left behind. Ironically, technology could be the key to bridging the digital divide between the haves and the have-nots.

The 'New technologies to avoid digital division in e-divided areas' (Netadded) project combined satellite and wireless technologies to deliver broadband communications solutions to a new generation of users. With the aid of European funding, 14 test sites were established in Africa, Asia, Europe, and the Middle East. A flexible network architecture made it possible to develop several different user applications addressing education, health care, tourism and agriculture.

The system was built from readily available components and equipment

in an effort to maintain simplicity. Instructional videos were produced to ensure that people without a technical background could install the system, including the difficult task of aligning the dish with the satellite. A special portable unit was also created that can withstand the harsh environmental conditions found in Africa and other parts of the world.

A prototype was constructed that allows the system operator to monitor operations remotely. Once again, the emphasis was on enabling people with little to no ICT expertise to be able to work

with the system. This and other tools helped the team evaluate the system in terms of availability, reliability, quality of service and other benchmarks. Feedback gathered directly from users at the 14 test sites will be used to optimise system deployment in the future.

The viability of the hybrid satellite-wireless solution was successfully demonstrated and the Netadded participants have been getting the message out at conferences and other events, through articles as well as via a dedicated website. The hybrid technology will continue to be exploited to deliver tangible benefits to users in need.

Funded under the FP6 programme 'Aeronautics and space.'

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5846

Interview

Blackboards to computer generated imagery: *research*eu results supplement* talks with Salero

As technology advances, our perceptions of the real and virtual begin to blur. Entire communities and relations flourish uniquely online. People interact, exchange ideas, and communicate in novel public spheres. The way we learn and the tools we use to educate are also changing. The blackboard and chalk is being complemented and sometimes replaced by computers, smart-phone technology, and devices that immerse students in a more interactive and many would say exciting learning environment.

EU-funded projects, like Salero (www.salero.eu), are making tools that allow developers to create these types of environment. The project aims to make cross-media production of games, movies and broadcast faster, better and more cost efficient by combining computer graphics, language technology, semantic web technologies as well as content-based search and retrieval. These elements and media are being harnessed to both entertain and educate.

This is why *research*eu results supplement* decided to talk to Georg Thallinger, Salero's project coordinator. Mr Thallinger has extensive experience in the implementation of innovative solutions for such areas as film restoration, content-based analysis and retrieval of audiovisual media, as well as media monitoring and security issues. As the head of the Audiovisual Media Group at JOANNEUM RESEARCH, DIGITAL — Institute of Information and Communication Technologies, Mr Thallinger is keen to see that such solutions are not only sleekly designed but also implemented. It's a position he has held since 2002.

He has also successfully managed numerous national and international projects in the field including Diamant, Detect, and Prestospace. Aside from Salero, he also coordinates the EU-supported project FascinatE, which is creating standards for future immersive and interactive TV services. He obtained his Diploma of Engineering in Telematics from the University of Technology in Graz, Austria.

We asked Mr Thallinger how Salero's research is helping developers generate games that both entertain and educate.

Such games are commonly referred to as 'serious games' (see box) and are designed for more serious purposes than mere entertainment. Examples include games that help train cadets for urban combat, prepare medical students for surgery, help the elderly keep alert and connected with friends and carers, and applications that instruct children about a range of often complex subjects like the solar system or chemistry.

Get serious!

The notion of serious games first made its appearance in 1970 in the book, *Serious Games*, published by Viking Press. Battlezone by Atari, used to train US military, is widely considered to be the first serious game. It was developed in 1980. In the 1990s, serious games began to take shape as computer power increased. Then in 2002, the Woodrow Wilson International Center for Scholars in Washington D.C. launched the serious games initiative. Since then, numerous groups and communities for serious games have appeared including Games for Change and Games for Health.

• Technology and software is enabling game developers to produce stunning visual graphics. The realism in computer-generated (CG) animation, for instance, is even sometimes unsettling. Can you explain how the advances in CG enhance the learning experience?

The advent of methods to produce not only a static image with a photorealistic visual impression but more important the possibility to also animate three-dimensional (3D) models in a way that they seem to behave like real



Georg Thallinger

persons, animals or objects has a major impact; especially in the field of serious games. Serious games are used to train people in a game-like environment for situations that are hard to reproduce like medicine and space. These kinds of games often involve hardware which is too expensive to provide real experience, such as pilot training. Flight simulators are one of the earliest examples of a serious game — although at the time this technology was developed the notion of serious games was not used.

The models as described above could be further combined with physical and or physiological models and so could act or react in the same fashion as real objects. In the EU-funded project Salero, one experimental production implemented by BLITZ Games Studios, UK was Triage Simulator which is a high-fidelity serious game designed to teach and reinforce the process of the triage sieve that should be used as a primary assessment in any mass casualty situation.

The purpose of the triage sieve is to quickly assess the priority of each casualty involved so that those with the most life-threatening injuries are treated first and those that are less serious have their treatment delayed until sufficient resources are available.

Using features like ultra-realistic 3D human models designed to fully



immerse the player (injuries are shown in full detail, casualties may sweat, their skin pallor may change over time and a full range of emotions will be shown), it depicts an underlying physiological system which allows casualties to change and deteriorate over time, depending on the injuries. This is combined with functionality typical of the gaming world, like the intuitive control system, multiple game environments depicting scenes from typical major incidents, ability to set up and save customised scenarios, range of game modes, player profiles.

Evaluation has shown that people trained with Triage Simulator consistently reached better scores than those trained using a table top method.

But enhancements are not only coming from the CG side. Also the interface between the user and the machine is constantly evolving. One example is Microsoft's Kinect. It's a sensing device that enables new forms of interaction by providing depth information for the scene in front of the sensor, like a game console. The availability of very cheap sensor devices like these is a game-changer, sparking interest in the programming community, with new applications in domains like medicine or surveillance being investigated.

• ***How has European research funding/policy helped in your field? What challenges has it tackled? What improvements could be made?***

EU research funding helped and helps to orient researchers' work on the needs and requirements of the industry, as most of the programmes are collaborative in nature. But this is also a two-way process. Industry details what problems they want to solve for their customers and so pose new research problems to researchers. On the other hand, researchers present solutions they have developed or are currently working on, and so industry might identify solutions to problems they didn't even know existed. It's a unique feedback loop.

The funding regime/policy should be defined in a manner that makes project administration as easy as possible. Industry, especially SMEs, needs lightweight processes and should be oriented to short-term milestones and financial targets. Research roadmaps should be defined in a way that, on the one hand, enable good planning for the future, but also present an opportunity to quickly react to new developments. Furthermore, the administration should be kept consistent over time.

• ***Did you think you would be working in this branch of science and technology when you were still at school?***

When attending school (technical college from 1980-85, university 1985-92), this field was quite in its infancy. Operating systems were mostly text based with graphical user interfaces emerging slowly during that time. The x-Windows System was defined and implemented in the ensuing years, building the base for the windowing system of the different Linux distributions. Apple and then later Microsoft provided the first versions of their graphical operating system. These were unbearably slow due to insufficient processing resources, and graphic support was only very limited and needed special skills both on the software development and user side. All that gave no hint to the possibilities of today's hardware and software and so was hard to envisage.

I was always interested in computer graphics and what is now called 'computer vision' so I focused my time while at the university on these topics and also selected a job in this field. I guess you could say my timing was right.

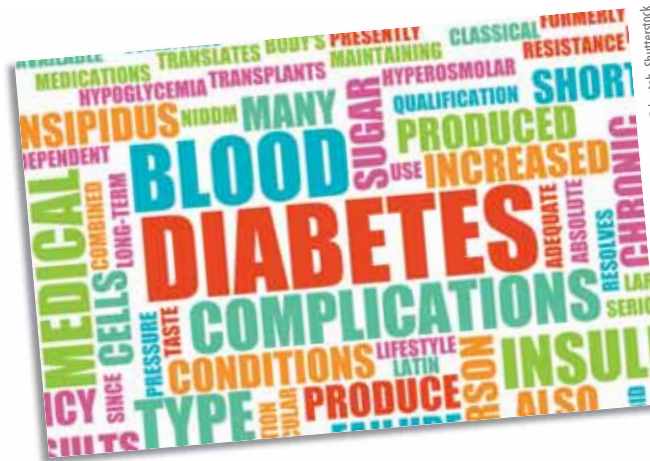
Editor's note: for more information on Triage Simulator please visit: www.salero.eu/en/showcase/triage_simulator.html



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EU project develops 'in-office' health test system

One of the most nerve-racking things about being tested for some medical condition is the long wait you endure while you wait for your results to come in. It could take anywhere from a few days to a couple of weeks to know your results. But EU-funded researchers are changing all this. The 'Automatic detection of disease related molecular cell activity' (Microactive) project has developed a microchip that allows physicians to diagnose a patient's condition right in their office. Microactive received EUR 1.6 million under the EU's Sixth Framework Programme (FP6).



The advanced integrated system, which is based on microtechnology and biotechnology, helps keep your medical testing information at the doctor's office instead of being sent to a laboratory. This tiny chip gives the doctor your test results then and there.

For instance, a blood sample whose protein content and genes, among other things, are to be read must be submitted to a series of complex processes, including heat treatment, mixing with enzymes, centrifugation and concentration of disease markers. What this means is that central laboratories receive the samples and perform analyses. This is a time-consuming process. Another case in point is tests for cervical cancer. The sample of cells that are scraped from a woman's cervix are analysed under the microscope. Experts say diagnostic error rates can be high when abnormal cell appearance is determined by even experienced eyes.

According to the Microactive team, the new health chip contains a complete laboratory and resembles a credit card. While the partners used cells taken to diagnose cervical cancer as a case study,

the chip can actually assess various diseases triggered by bacteria or viruses, as well as different types of cancer.

Several narrow channels containing chemicals and enzymes in the correct proportions for single analyses are engraved in the chip. When the patient's sample has been drawn into the channels, these reagents are mixed.

'The health chip can analyse your blood or cells for eight different diseases,' explained Liv Furuberg and Michal Mielnik of the Norwegian-based group Sintef, the coordinating body of Microactive. 'What these diseases have in common is that they are identified by means of special biomarkers that are found in the blood sample. These "labels" may be proteins that either ought or ought not to be there, deoxyribonucleic acid (DNA) fragments or enzymes. This little chip is capable of carrying out the same processes as a large laboratory, and not only does it perform them faster, but the results are also far more accurate. The doctor simply inserts the card into a little machine, adds a few drops of the sample taken from the patient via a tube in the cardholder, and out come the results.'

A group of researchers from Minalab at Sintef has developed several techniques for interpreting the results when the biomarkers have been found. The results, for instance, can be read off in an optical instrument in which the ribonucleic acid (RNA) molecules in various markets emit specific fluorescent signals.

'Sintef's lab-on-a-chip projects have shown that it is possible to perform rapid, straightforward diagnostic analyses with the aid of microchips, and we are now working on several different types of chip, including a protein analysis chip for acute inflammations,' Dr Furuberg said.

Keen to commercialise the results of their study, the researchers are working with a hospital acting as end user to validate system usability and clinical accuracy.

Researchers from Germany and Ireland contributed to this study.

Promoted through the Research Information Centre.

<http://ec.europa.eu/research/infocentre> > search > 19293

Telemedicine is looking up

Europe's healthcare initiatives can benefit from the use of satellite technology in addition, or as an alternative, to conventional systems connecting healthcare providers. Researchers in the Healthware (1) project have come up with new options for connecting professionals to patients.

Telemedicine uses communications technology to provide medical care to people remotely. It can be a lifeline for people in inaccessible locations or the housebound. It can provide patients

with chronic diseases the care they need without frequent visits to the hospital. Beyond the advantages for patients and the medical profession, the public healthcare savings are significant.

E-health services like this are traditionally delivered over terrestrial internet and sometimes via expensive dedicated equipment. Too often, they are not intuitive enough for untrained people or those unfamiliar with computers. Younger people can manage but are not usually the most in need of such services.

The 19 Healthware partners, from the worlds of telecommunications and



engineering as well as university hospitals, came together to demonstrate how satellite technology could be used to provide cost-effective home services for patients and medical training throughout Europe. According to the team, the cost of satellite-based telemedicine would only be a small part of the total cost for healthcare and the return on investment for medical providers high.

The researchers looked at five areas in which telemedicine can play a crucial role: disaster response, rural healthcare, patient monitoring, e-learning, and medicine for mobile or offshore users. They identified e-learning and healthcare as the areas most likely to provide immediate return on investment.

Pilot studies revealed several advantages in using satellite for telemedicine, especially for remote places out of reach

of terrestrial broadband networks. Via satellite, important diagnostic images can be transmitted in real time for consultations between physicians. Satellite can also be useful in tackling interoperability issues between wireless networks, among other benefits.

Satellite-based telemedicine, the partners concluded, is capable to meet the dual challenge facing modern

healthcare systems — better healthcare without having to spend more for it.

(1) 'Standard and interoperable satellite solution to deploy healthcare services over wide areas'.

Funded under the FP6 programme 'Aeronautics and space'.
Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5819



Network initiative for latest grid technologies

An EU-funded initiative brings together scientists and industrialists from across Europe to boost research and development into the next generation of grid technologies.

The 'Networked European software and services initiative' (NESSI) is a European technology platform (ETP) that brings together industry, researchers and other stakeholders to promote grid technologies. The ETP works with stakeholders to define a Strategic Research Agenda (SRA) and contribute to its implementation. The goal of NESSI has been to address major changes taking place in the fast moving IT services environment.

This includes increased access to less expensive yet more reliable services to help drive industrial growth.

NESSI can help Europe to play a leading role in the evolution of a new services-orientated economy. It combines the efforts of industry and academia to define a common strategy known as the NESSI Open Service Framework. The Nessi-grid project has enhanced

the NESSI initiative by defining a vision and strategic research agenda for grid infrastructures used in business environments and NESSI scenarios. The project's main focus has been on next generation grid technologies to encourage the provision of IT services as utilities.

Although the main objective of Nessi-grid was to define the SRA it also addressed other important issues such as standards, research infrastructure, training and dissemination. The project is also successfully supporting development of research into grid computing and service-orientated architecture (SOA). This was used to develop business processes packaged as services. Nessi-grid has also helped forge links with other R&D communities outside the EU.

The Nessi-grid project will help maintain Europe's position as a global player in developing the next generation of grid technologies. This in turn will help contribute to the EU's growing knowledge economy.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5815



European research reshapes grid landscape

Grids offer huge number-crunching power by combining distributed (different locations) computing resources towards common goals. Once the preserve of big organisations, grid technology is finding new converts thanks to efforts by a European research network.

As science evolves and the problems it seeks to solve get more complex, it calls for more powerful computing, or supercomputing. Few organisations in Europe have that sort of power on hand, but if the unused resources of many organisations could be brought together, then the sky is the limit.

This is the basic idea behind grid computing, which uses some clever technologies, such as middleware which connects relevant software and applications, to harness the power of many computers distributed across different locations. It underwrites the revolution taking place with virtual science, or e-science, and makes new discoveries in data-heavy research, such as particle physics and genomics, all the more possible.

The EU-funded Coregrid ⁽¹⁾ network has paved the way for much wider access to grid-computing technology and its application in untapped markets, from better climate change modelling to the way cars behave in collisions. As a network of excellence under the Sixth Framework Programme (FP6) for research, Coregrid assembled a critical mass of expertise and promoted scientific and technological excellence within the grid research community and beyond. The idea being to take grids out of research labs and into industry.

To do this, Coregrid first had to build solid foundations for grid and peer-to-peer (P2P) technologies by coordinating European R&D among experts in parallel and distributed systems, middleware, programming models, algorithms, tools and environments. In just four years Coregrid has become one of the largest research entities — 161 permanent researchers and 164 PhD students from 46 research centres and universities — in grid computing. Their work has covered diverse research topics, including data management, programming models, resource management and scheduling, service infrastructures and P2P systems, to name a few.

Leading teams from all over Europe have organised nearly 80 meetings and workshops, set up knowledge repositories, published or presented hundreds of peer-reviewed papers, including several professional books, laid the groundwork for several spin-off projects, courses and initiatives, and more. The teams also actively encouraged new ideas to anticipate technological trends and promote commercially relevant and promising research.

Coregrid reshaped the research landscape in grid computing. Its goal of establishing a highly visible and sustainable research lab in grid computing has been achieved. The team also understood several years back that computing technologies would evolve and that grids would change with it. Today terms like internet services and cloud computing — supercomputing potential over the internet

— are discussed freely alongside grid computing.

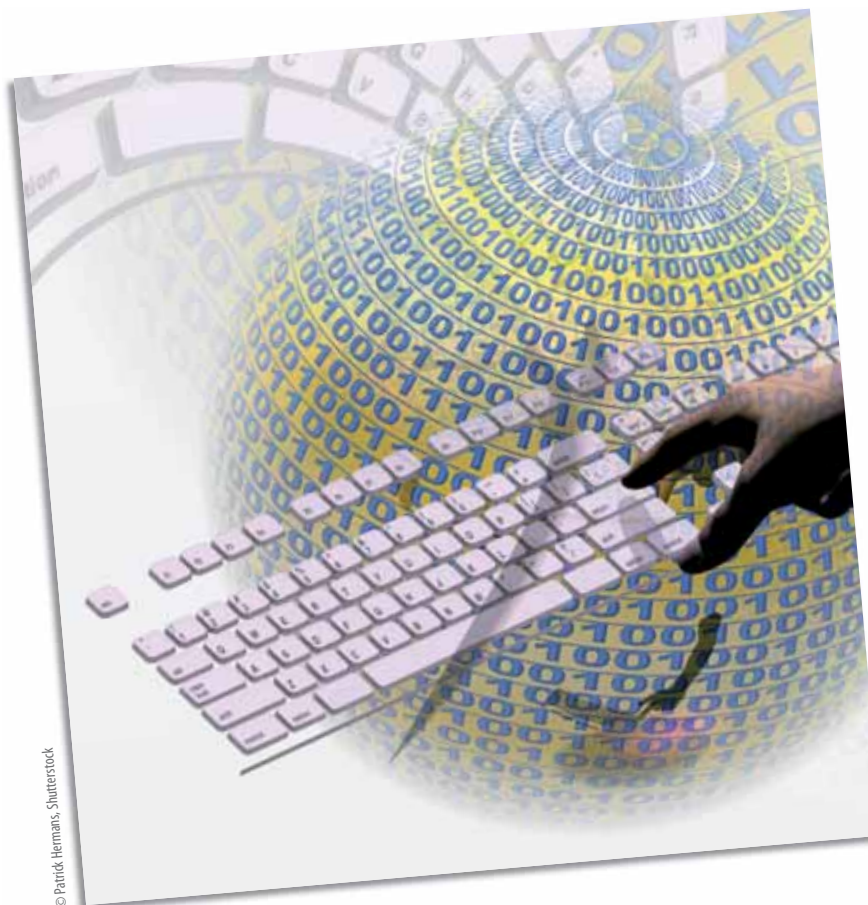
Coregrid has developed theoretical foundations and software infrastructures for large-scale, distributed grid and P2P applications. With co-hosts, the network continues to organise workshops, including a recent one in Italy, and it has extended its interests to include the emerging field of (service-based) cloud computing — a trend to watch according to Europe's software experts.

'The grid research community can be proud of what it has achieved over the last ten years,' noted the Coregrid team. It has also shown that the internet can carry out large-scale distributed computing applications to help researchers perform even the heaviest of computing tasks.

(1) 'European research network on foundations, software infrastructures and applications for large scale distributed, grid and peer-to-peer technologies.'

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: Information exchange/training.
<http://cordis.europa.eu/marketplace> > search > offers > 5858



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Powering up for broadband

Europe is striving to deliver broadband internet to the far reaches of its territory. With faster, wider bandwidth it opens the way for new services and greater opportunities for business, health care, e-services and entertainment.

Broadband 'ultra-fast' internet connection goes hand in hand with progress in achieving Europe's Digital Agenda. For many Europeans it is already a standard feature of daily life online, and essential to benefit from features of Web 2.0. But delivering the broadband dividend to Europe's remote mountain villages and regions is not that easy.

Typically, the higher data transfer rates achieved with broadband come from fibre-optic cables and some special tools that harness satellite communications for this purpose. But cheaper, easier ways of turning on the broadband tap across Europe are needed. This is where projects like Powernet ⁽¹⁾ come in.

The main goal of Powernet was to develop what it calls 'Cognitive broadband over power lines' (CBPL), no doubt taking advantage of the widespread power line infrastructure already in place throughout the continent. The project set out to create demonstrators that not only deliver the high data rates expected of broadband, but to do it more efficiently — using low transmit power spectral density (PSD) and working at low signal-to-noise ratio. The demos had to also meet the regulatory requirements concerning electro-magnetic (EM) radiation. And to be ready for initial field trials, the project had to do all this in just one year using off-the-shelf components. Not a simple task.

The first field trials were to confirm the design validation and, among other things, to help guide development of an application-specific integrated circuit (ASIC) — a microchip for a special application — for the analogue front end (AFE), which is one of the complex parts of the planned CBPL system.

The digital circuits were designed to be configured by the customer or designer after manufacturing using field-programmable gate array (FPGA). The benefit of the FPGA approach is it can be commercially developed later as a digital ASIC to complement the analogue ASIC, according to the project partners.

Based on the first set of trials the analogue ASIC was developed in the second year of the project. This chip was tested for its performance and integrated into digital circuit boards needed for the new CBPL demonstrator units. Also in the second phase of the 29-month Powernet project, software algorithms were applied to correct errors in the system, working towards the so-called 'cognitive algorithms' that can learn from the data they are dealing with. The final step was to integrate the parts — the analogue ASIC into the CBPL demo — and test and make any necessary adjustments. In field trials, the demonstrator units performed better than current technology on the market,

reaching the desired PSD and EM radiation goals, the team reported.

The five partners — three SMEs, one research institute and one public utility — were eager to get word out in conferences and meetings with peers that the technology is validated. This dissemination and awareness campaign included standardisation efforts. Powernet has played an active part in IEEE 1901 standards in this field and its work has been viewed positively by Homeplug/Panasonic, the electronics group.

Since ending the EU-funded part of the work in 2008, the project has received a number of enquiries for possible field trials on their electricity distribution networks. Other groups have expressed interest in helping to exploit the results of the Powernet project.

(1) 'Broadband over powerlines that works and meets the standards and users expectations'.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: Information exchange/training.
<http://cordis.europa.eu/marketplace> > search > offers > 5860



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Broadening business horizons

Businesses and individuals are only beginning to tap the potential of ultra high-speed online technologies, which can provide data, voice and video services along the same access lines. Using these technologies over existing infrastructure means that consumers can access the benefits of higher bandwidth with minimal cost.

An EU-funded project set out to quadruple the total bandwidth available to internet end-users, increase access through the use of network technologies and architecture, and develop low cost access network equipment for

new operating services. To achieve all this, the U-broad ⁽¹⁾ project developed and integrated technologies capable of delivering broadband content over ethernet-based networks directly into customer premises.

First of all, the project team developed technology capable of providing fast ethernet (100 Mbps) over existing telephone network copper cabling. To facilitate this, new techniques and state-of-the-art signal processing and communications algorithms were developed. These techniques were specifically designed to cope with the copper infrastructure.

The U-broad project, the first publicly available extensive study of multi-channel techniques using real-life measured data, delivered a number

of results. At the theoretical level, the team was able to put actual numbers on the capacity that can be expected from short broadband copper loops, for both single-line and vectored transmission. This is the first time that the capacity of very short-twisted copper channels has been assessed based on measured data. Furthermore, the team was able to prove that downstream rates of 200 Mbps per pair are achievable on a coordinated binder up to a distance of 250 metres.

At the practical level, the prototype transceiver they developed is capable of up to 100 Mbps at a distance of up to one kilometre. Novel noise cancellation and vectoring techniques for single carrier modulation were established and tested, along with advanced coding — including space-time codes over copper. Advanced spectrum management techniques for dynamic bandwidth allocation to the different

users supporting high throughput and quality of service constraints were also developed.

The U-broad project represents a significant step forward in enabling existing lines of communication to deliver the internet services of the future.

(1) 'Ultra high bit rate over copper technologies for broadband multi-service access'.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5817



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All-optical computing on its way?

Cutting-edge optical computers may one day replace the electronic computer technology of today. As a first stage, optical technology may blend with today's systems.

Computers have come a long way in the past decade, and the way digital computations are performed may also be changing as technology progresses.

Optical computer systems, for example, use photons of visual light or infrared beams instead of traditional electrons used in most computers today.

The project involved a variety of tests to develop optical technology matching different applications. Indeed, Mufins ensured that the developed multi-gate elements will have an adequate market to support high-tech applications in products upon completion of the project. This was made possible thanks to the several different types of devices and chips that were developed.



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There have already been solid efforts to develop optical components that can replace traditional components in creating a hybrid optical/electronic system. Ideally, a completely optical system, known as all-optical computing, would be a much more efficient solution and the epitome of advancement in this field.

The EU-funded 'Multi-functional integrated arrays of interferometric switched' (Mufins) project combined eight European research groups to create optical switching systems — or all-optical gates — for this purpose.

These advances have made the dream of all-optical processing much more tangible than before. They have also offered improvements to existing specialised applications in high data-rate telecommunications and networking, particularly those that can benefit from high-speed, low-complexity all-optical circuits.

In short, Mufins is a robust demonstration of how Europe is rethinking computers and how digital technology can become much more efficient. One day, all our computers may feature this novel technology.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5856

Europe advanced embedded systems design

Europe is emerging as a serious player in dedicated micro-computing, thanks in part to advances in embedded systems made by the 'Embedded systems design' (Artist2) and the ArtistDesign networks.

Technology today relies heavily on what is known as embedded systems — computer systems that perform dedicated functions grouped into one device. On the ground these systems drive anything from an iPod to nuclear power plants.

The Artist2 initiative set out to create a European research by integrating the topics, teams and competencies across Europe. These topics include modelling, real-time computing, timing analysis, control systems, testing and verification to name a few. The initiative has been set up to develop a virtual centre of excellence with several clusters — or virtual teams — each dealing with a specific topic.

Artist2 succeeded in gathering together the best European teams under dif-

ferent topics and helped to overcome fragmentation in their fields. It has also managed to integrate the different clusters or topics into a multidisciplinary community which now plays a major role in designing embedded systems. Both these achievements have built on the past efforts and experience from Artist1 on 'Advanced real-time systems', under the Fifth European Framework Programme (FP5) for research.

Today the partners' international standing and global presence in scientific events underlines their excellence and the success of Artist2. Increased research initiatives, strong researcher exchanges and teaching programmes in were a major feature of its success.

Building the embedded systems design scientific community is continuing into the future through the ArtistDesign network of excellence. The critical mass needed for embedded systems design in Europe has finally been created.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5847



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Laying down the law with meta-rules

Pioneering research into the way laws are made is helping to raise awareness about the potential traps that bureaucracy poses with respect to preserving constitutional integrity.

Legislation, whether it addresses economic, social or environmental objectives, is an integral part of modern society. While social scientists and legal scholars have contributed significantly to the legal dialogue, many of the processes that drive law-making today remain a mystery.

European funding was put towards gaining a better understanding of these so-called meta-rules by focusing on what goes into law-making rather than on what comes out of it. The study, called 'Meta-rules and constitutional law: "co-regulating" legislative

processes in Europe?' (Metarules), complements the European Commission's Better Regulation strategy.

The face of law-making is changing, especially in Europe. A growing number of actors are involved in the process, many of whom do not possess formal legal training. Unfortunately, this can and does lead to potential distortions when socially acceptable norms are applied without regard to their constitutionality.

Meta-rules are also thought to contribute to the trend towards increasing consultation and inclusiveness in the law-making process. This study has highlighted that only careful identification and assessment of meta-rules can ensure that our legal system is not being compromised by bureaucracy.

Funded under the FP7 specific programme People
(Marie-Curie actions).

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offers > 5841



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EU innovation to stimulate science studies for youth

EU-funded researchers have developed a new software tool that uses semantic resources to help students form conceptual models of the scientific subjects they are studying, regardless if they are working alone or with others. This innovative workbench is an outcome of the 'Engaging and informed tools for learning conceptual system knowledge' (Dynalearn) project, which has clinched EUR 2.45 million under the 'Information and communication technologies' ICT theme of the EU's Seventh Framework Programme (FP7).

The device allows students to store and compare these models with other standard models, according to the researchers. The main objective is to give students the support they need to define concepts relating to a field of knowledge.

Students will use this information to enhance their models, which in turn will fuel their understanding of the represented domain. They will also be able to learn independently without losing any rigour and make considerable progress in the study of a subject.

The University of Amsterdam in the Netherlands is coordinating the Dynalearn project. The other seven partners are from Austria, Brazil, Bulgaria, Germany, Israel, Spain and the UK. Kicked off in 2009, Dynalearn is stimulating the integration of well-established technological developments and bolstering European youth's interest in studying scientific disciplines.

According to the consortium, Dynalearn uses external semantic resources as a source of information. DBpedia is one such source, and it extracts infor-

mation from Wikipedia to construct a semantic version of the Web-based encyclopaedia. The researchers said DBpedia 'is a community effort at extracting structured information from Wikipedia', effectively making it accessible from the web.

The compiled knowledge can be used computationally, they said, adding that existing applications already connect with DBpedia. The outcome is better interoperability and establishment of common vocabularies.

Thanks to DBpedia, Dynalearn can also find equivalences between the terms entered by students and stored in this source. The partners said students can verify during the modelling whether or not the definitions extracted from DBpedia for the terms they entered are what they think they should be. Not only does this give terminology a boost, but it also fixes any potential errors.

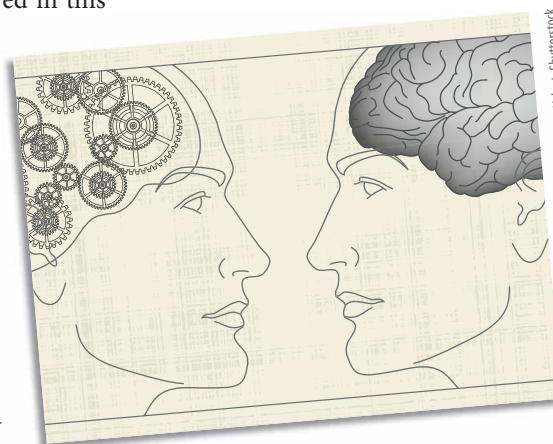
Models set up by students, instructors and others for a

model repository are saved because of this application. The researchers said future students could use these models to enhance their own modelling. A student model is compared with another model that belongs to the same domain and is used as a standard.

When the comparison is completed, users can identify similarities and differences between the models. The tool could also be used to recommend possible improvements by the students, the team pointed out. At the end of the day, the students will use the information to improve their models and understand the domain much better.

Dynalearn is both easy to use and very interactive. It stimulates interest and accelerates the assimilation of new knowledge. This innovative software provides insight to students who wish to expand their knowledge on the behaviour of scientific systems.

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The benefits of storytelling

Europe has undergone many changes during the past few decades. These changes can also be understood through the personal experiences of people who have witnessed them. Getting their stories and passing them on to the youth is an endeavour that spans both generations and borders.

Before the European integration process, aspects of daily life were not that simple. Travelling abroad, for example, involved visas and changing currency.

A consortium of universities decided, therefore, to show younger generations

what Europe was like during the second half of the 20th century in order to help them appreciate the progress that has been achieved. The major events, however, are left for history books. The partners were mostly interested in conveying the social history, the way people felt and lived.

Thanks to the EU-funded 'European life experiences' (E-VITA) project, the cross-border knowledge of dozens of people has been collected, documented, and incorporated into 'serious games' that are available online. In this process, the partners studied the best way to share knowledge and emotional intelligence through problem-based and contextualised learning. As a result, four prototypes of interactive games were designed to bring generations closer and increase cultural awareness.

In the initial stages of the project, groups of volunteers worked in 'communities of





practice' guided by a gerontologist. They explained what it was like for them to live and travel in other countries, especially in areas such as integration and communication, cultural differences, the work and political environment, etc. Anyone can take part in the project by uploading a story (and photographs, music or videos) on the website. This information has been collected in all participant countries and has been the basis for creating the protagonists' profiles and producing the scripts for the games.

'As a result of this project, we have obtained a methodological guide on how to transform knowledge from an ageing population into educational games to achieve specific pedagogic aims,' explain researchers from the Universitat Jaume I de Castellón (Spain).

This has been possible through the integration of game-based learning (GBL) with intergenerational learning concepts. The outcome is appealing to all educational levels, from children to adults, and promotes the use of new technologies in a serious and useful way.

The advantage of serious games is that they allow people to immerse themselves in a simulated real situation. The player adopts the role of a character who must achieve a certain goal. The learning process goes beyond retaining dates or events, as the player lives and feels a past reality — and so the knowledge is more

meaningful and is assimilated more quickly. Experiences in the E-VITA games include immigration regulations, different economic and monetary systems or cultural issues, for example. Indirectly, therefore, the players learn about history, anthropology and sociology.

The E-VITA games

Each of the four prototypes available on the project website (www.evita-project.eu) is deliberately designed following different types of interaction: experiential, narrative, problem-based, and exploratory. The games also comprise different areas of expertise: East / West bloc, tourism, work and leisure.

Each game has different strategies to increase the motivation of the player. Furthermore, because of the different level of interaction in each one, they are suitable for different learning environments. This facilitates adaptation to the most appropriate educational setting: individual or group learning, assisted by an adult or in class.

The first of these games is experiential and relates to travelling in a Europe divided between the East and the West. The player is a reporter or a student who has to choose between different options in each scenario and has to make decisions. The second, however, is narrative-centric game and the player reads the experience of older people who travelled in their youth to another

country on a business or tourist trip. Here, the player must ask and answer questions in order to continue the story.

The third game is related to work experiences abroad, and the user has to answer questions about the country visited as the experience is narrated. In this problem-based game, the player can help the protagonist integrate by finding out more about the customs and traditions of other countries. The fourth game is exploratory and raises questions about culture and recreation in a world without the internet and mobile phones. Here the player must respond by seeking information externally.

Seven research institutions and companies from Germany, Greece, Spain, Italy, Poland, Portugal, and United Kingdom worked on the two-year initiative. The project has been co-funded by the European Commission's 'Lifelong learning programme'.

Promoted through the Network of Valencian Universities for the promotion of Research, Development and Innovation (RUVI).



Satellites boost oceanographic research

Operational oceanographic centres have incorporated earth observation data from European Space Agency (ESA) into new computer models of the world's oceans.

The 'GOCE in ocean modelling' (Gocino) project has enhanced existing oceanographic research by promoting and exploiting data from the 'Gravity and ocean circulation experiment' (GOCE) satellite mission. GOCE is a new type of earth observation satellite that can measure the planet's gravity field. The collection of accurate data enables sea surface height information to be fully exploited when used in the analysis and modelling of ocean circulation. This includes determining the mean dynamic topography (MDT).

MDT is the difference between the mean sea surface and the hypothetical

surface of the Earth that coincides with mean sea level, known as the 'geoid'. The MDT provides the reference surface for investigating ocean circulation and for satellite altimeter data. Information regarding mean sea surfaces was supplied by a number of institutes working with satellite altimetry.

Data from the GOCE satellite was integrated by the Gocino project into four oceanography systems and a seasonal forecasting system. The dissemination of knowledge to national and regional operational centres was conducted in conferences organised by the consor-

tium. The project's website was also used for dissemination of information, enabling knowledge and expertise to be developed throughout the consortium as well as being fully accessible to operational GOCE data users.

Results from the Gocino project have helped to develop more accurate computer models, giving scientists a better understanding of the oceans. This information is particularly relevant at a time when the planet is subject to climate change and its effects on ocean circulation.

Funded under the FP6 programme 'Aeronautics and space.'
Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5835

Stretchy circuits for fashion and more

Smart clothes that can communicate your feelings or keep tabs on your health where ever you are have shown much promise but faced a major hurdle... they often look and feel like you're wearing tiny computers. But what if you could have stretchable, breathable, even washable tiny electronic circuit boards? European researchers set out to prove you could.

Repellent jackets that really hate water. Pants made of recycled plastic bottles. Moody garments that emote your feelings in colour. These sound pretty weird but science and technology have a way of making everyday things like dressing yourself or lighting your house an ambient adventure.

And so it is with the 'Stretchable electronics for large area applications' (Stella) project, co-funded by the European Commission. Stella has developed new processes, technologies and whole new applications for electronic circuit boards. But the first thing they did was throw out the notion that electronic circuits have to be built onto or into a 'board' — implying something rigid.

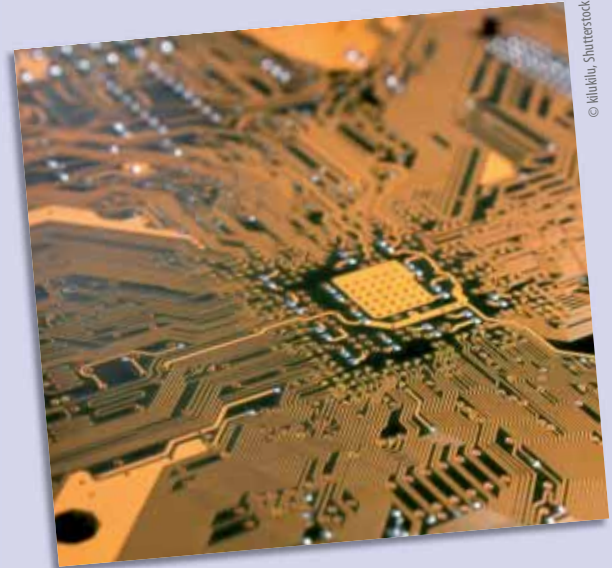
The project partners developed stretchable copper boards (SCB) with meandering copper tracks laminated by a soft plastic (thermoplastic polyurethane). This means complex electronic systems can be applied to textiles as simple as a sticker to a T-shirt. What makes it special is a SCB can be used as both a substrate for micro-electronics and integrated in textiles.

To prove it, the Stella partner TU Berlin developed a so-called 'interactive dress', called KLight, using SCB technology which makes integrated lights switch on and off according to body movement. The dress won the avantex innovative product prize at the 2009 Techtextile exhibition. Commenting on the win, Stella coordinator Dr Christopher Klatt, head of the Physics and Simulation Department at Freudenberg Research said: 'Nowadays, it's not enough to develop fantastic new technologies or to prove their viability in demonstrators. You need to combine an element of glamour and publicity together with professional work on reliability to achieve widespread market acceptance.'

More than glamour

That may be so, but Stella was definitely not all about glamour. It worked primarily on practical and critical applications in the medical and automotive sectors. Here, the developed technologies really tackled today's challenges. For example, the patented Urgo band aid uses Stella's SCBs to monitor the pressure applied in a compression bandage. It is important to get the pressure just right to maximise pain relief and healing, especially for chronic cases and to prevent venous and lymphatic disease. The flexible, comfortable design of Urgo means it can fit neatly together with the bandage to monitor the pressure being applied. It's a groundbreaking little design with high commercial potential. Currently, it is under internal evaluation for new Urgo-like products.

Industry partner Philips Applied Technologies has also put the SCB technology to good use. Together with partners TU-Berlin and Quality Products Int (QPI), it created a stretchable wireless



body activity monitor which goes with an adjustable Velcro® strap for ease of fitting. With applications in sports, health care and wellness there is a potentially large market for the product.

'The combination of sensors integrated in a body area network, embedded in stretchable soft-touch materials provides options for enhanced ... monitoring and early warning/detection combined with improved wearing comfort,' notes the project on this new development.

Stella has also ventured into new health care areas with a tiny insole device designed with diabetics in mind, a major and growing disease in Europe. Uncontrolled diabetes can cause nerve damage and blood flow problems which can mean the patient no longer feels heat, cold or pain. The muscles in the foot area may also be affected which can lead to walking difficulties, ulcers, gangrene and potential limb loss — about 40 000 foot amputations still occur in Europe each year.

The Stella partners Freudenberg and rubber specialists Nora systems developed a three-point foot pressure sensor that fits unobtrusively into the shoe. Because diabetic patients cannot feel the onset of foot problems or pain, Stella's insole monitor detects minute changes for them, including the ageing of the insole itself. Testing has also shown that the SCB can cope with the harsh and sweaty conditions inside shoes.

Babies and cars, too

Stella researchers at IMEC and Verhaert also delved into infant health concerns. An infant respiratory monitor, which is built into light cloth that can be clipped onto pyjamas, measures the baby's chest and abdominal movement more effectively than current technology.

Stella's integrated sensor using the SCB technology looks set to be cheaper, more robust and more sensitive to babies' breathing patterns (recording chest/abdominal elongation) than current state-of-the-art technology.

Stella has also eyed off the huge potential market in intelligent solutions for vehicles. It set up a special demonstrator to prove that it is possible to create bendable electronic circuits



sued to car-makers' growing needs for lightweight, energy efficient 'embedded surface heatings'. The team worked on making 2D stretchable polymer circuit boards (SPB) and then forming them into 3D shapes — an action that could destroy traditional circuitry — which fit in, on or under diverse car components.

In their proof-of-concept, the team showed their 3D-shaped circuits were suitable for interior lighting in vehicles; for example, white light-emitting diodes (LED) for reading lights and a blue version as an alarm signal. The technology they developed stood up to harsh testing designed to reflect the real conditions inside vehicles.

'Manufacturing 3D-shaped circuits using well-established 2D processes for flat circuit boards is very attractive for many applications, not only cars,' explains Dr Klatt. 'Inquiries coming from the market give us hope that SPB technology will be used in a lot of marketable products.'

Spin-off and follow-up

So confident that this work has strong market potential, several team members from Fraunhofer IZM have created a spin-off company, called Stretchable Circuits, to 'realise innovative product concepts using stretchable and textile circuit technologies'.

Several Stella partners will also be taking part in a follow-up project called 'Platform for large area conformable electronics by integration' (Place-it). This project planned to establish an industry platform for thin, lightweight and flexible optoelectronics to be used in diverse product designs and on-body applications.

Imagine a lamp that can be designed into any shape or even blended into the surroundings, or curtains that emit light to mimic natural daylight. These sorts of lighting solutions, using energy efficient LEDs and organic LEDs, may soon be possible thanks to flexible substrate technologies developed by European researchers.

'This is a success story and we can be proud of it,' stresses Dr Klatt. 'The demonstrators are ready and the first products are already visible on the horizon.'

The Stella 'Integrated project' received EUR 7 million in EU funding under the 'Information society technologies' (IST) theme of the Sixth Framework Programme for research. The project ended in 2010 but the partners are continuing to disseminate its findings in such events as the Flex-Stretch-Workshop III scheduled for November 2011.

Promoted through the CORDIS Technology Marketplace.
<http://cordis.europa.eu/marketplace> > search > offers > 5863

New catalysts put nanotechnology in a spin

New catalysts are being developed that can be used to create innovative materials based on a polymer-nanoparticle link. These new materials can be applied to pharmaceuticals and electronics and other uses.

Hierarchically organised metal organic catalysts are being developed by the HICAT (¹) project, which can be recycled during industrial processes without losing their high selectivity, activity and stability. A bottom-up approach is used to create the catalysts from components at the nano-scale. The aim is to link catalysts consisting of metal complexes with nanoparticles, which include microgels, hyperbranched polymers and a hybrid comprising polymers and silicon based silsesquioxanes (POSS).

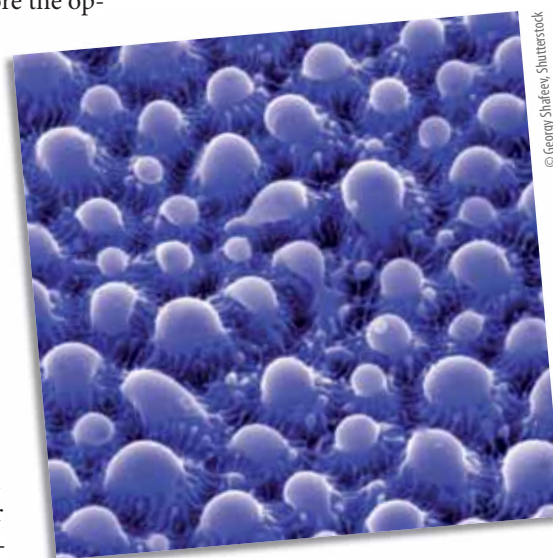
Additional hierarchical organisation of catalysts can be achieved using interconnected frameworks formed from assemblies of catalytic nanoparticles. Specialised polymers act as a binding agent by interacting with the surface of the nanoparticle. Researchers investigated the recycling capability of the catalyst-nanoparticle structures by studying the effect of external factors to changes in solubility of the polymer

supported catalysts. New types of films and membranes based on the polymer-nanoparticle link were also studied by the HICAT consortium. Different grades of porosity can be achieved by varying the size of the nanoparticles and the polymers, which can help improve catalysis and therefore the operation of the reactor.

The HICAT project has developed 40 different POSS entities, as well as synthesising microgels with various surface functional groups and temperature responsive cores. The nanoparticles can be easily dispersed in organic solvents and remain stable for several months without any visible signs of deterioration. Project partners have also begun investigating techniques for creating layers of nanopar-

icles and homogenous nanoparticle size distribution and their effect on permeability. A new spin-coating technique has been highlighted as an effective and relatively simple method for the consecutive coating of nanoparticles, thereby creating a multilayer structure.

Project partners have also studied the production of flat-sheet membranes integrated into spiral-wound modules for applications at the industrial scale. Following a range of performance tests a suitable



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membrane was identified for commercial applications. The HICAT initiative will also establish an innovative catalyst technology that will apply metal-organic catalysts to many industrial fields including production of speciality chemicals, nutrition, pharmaceuticals and polymers. The polymers can be used for coatings, electronics polymers, new active pharma-

ceutical ingredients and health promoting functional foods.

The exciting new technology developed by the HICAT consortium has a large number of different applications and will give a significant boost to Europe's nanotechnology sector and help grow the knowledge economy.

(1) 'Hierarchically organized metal organic catalysts for continuous and multi-batch processes.'

Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies.'

<http://cordis.europa.eu/marketplace> > search > offers > 5848

Ions trapped on a chip

It has been the dream of scientists for the past century to delve into the atomic world and develop technology on the smallest scale. A European project has demonstrated that slowing down and capturing fast-moving atoms shows considerable promise as the basis for a quantum computer.

The Microtrap ⁽¹⁾ project has made an important step towards this goal by developing state-of-the-art techniques for trapping ions — atoms/molecules that lose or gain electrons — on a chip. With ions nearly motionless and lined up neatly along the trap axis, a laser beam can interact with one specific ion, then a different one and control the complex interactions between them.

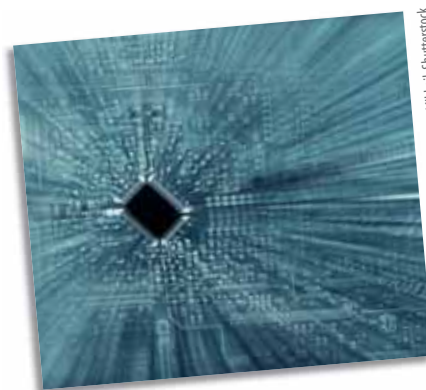
This makes trapped ions promising information carriers in quantum computing. Conventional computers store and process information as bits with one of the two values: 0 and 1. But a quantum computer would exploit the ability of subatomic particles to embody more than one state at a time.

Scientists try to explain the phenomenon using the example of Shrodinger's cat — a thought experiment in which a cat in a box is both alive and dead until someone opens the box to determine it. In a quantum computer, every qubit is simultaneously 0 and 1. With two qubits together, you have a system whose values are simultaneously every value from 0 to 3.

The essential building blocks for quantum computing have been realised over the last decade using linear strings of a few ions. To achieve the full potential of trapped-ion quantum computing, the Microtrap project sought to scale them up to involve many ions interacting with one another in different combinations.

One way of achieving this was through the miniaturisation of trapped ion architectures. To divide traps into segments so ions can be sorted in arbitrary arrangements was another. But the Microtrap researchers went further. They also fabricated microtraps using existing manufacturing techniques from the chip-making industry.

For this purpose, a number of competing technologies were considered, including ceramic wafer three-dimensional (3D) layered traps, two-dimensional (2D) planar surface traps and 3D silica-on-silicon traps. Working on this basis, the researchers were successful in building microtraps suitable for quantum information processing.



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Mounted on standard chip carriers, these microtraps allow ions to be confined under vacuum conditions and their states manipulated using a laser. This has the advantage of generating less noise (interference) because the electrodes keep the particles much further apart than usual.

A quantum computer literally stops working if any interference — even thermal noise — gets in from the outside world. What the Microtrap project has achieved moves the frontier of what scientists can do and gives tantalising insight into the smallest building blocks of our world.

(1) 'Development of a pan-European microtrap technology capability for trapped ion quantum information science.'

Funded under the FP6 programme IST (Information society technologies).

Collaboration sought: further research or development support.
<http://cordis.europa.eu/marketplace> > search > offers > 5845

Elegant technology quenches thirsty industry

Elegant technology developed by European researchers will increase water efficiency by 80 % in Europe's hugely important olive industry. It is vital research for an industry based in dry regions.

The EU is the largest producer of olives in the world, refining 2.2 million tonnes of olive oil from 12 000 olive mills. This is 80 % of world production.

Prospects for the industry are good, with sales increasing across the world as peo-

ple learn about the health benefits of olive oil. But while the olive industry is a vital market to Europe, it faces increasing competition from more competitive neighbours, notably from Syria, Tunisia, and Turkey. Waste control regulations are also becoming more stringent.

But waste management poses a big problem for the olive industry. Olive processing generates large amounts of polluted liquid wastes, primarily from water used to wash the olives prior to processing.

The quantities of water required are astounding, with 50 litres needed for every 100 kilos of olives. 'There is a huge amount of water — about 5 billion litres annually — used in this,' explains Ms Antonia Lorenzo, coordinator of the





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Algatec (¹) project and a researcher from lead partner BioAzul.

Olive fruit washing is the first step in the oil extraction process, removing impurities accumulated during harvest. That water is then mixed with olive mill wastewaters (OMW). Currently these wastes are either run through a costly treatment process or disposed of in adjacent rivers, where it has a serious environmental impact.

Impurities in the wastewater are regarded as having both very high chemical oxygen demand (COD) and biological oxygen demand (BOD), two important water quality indicators. High COD and BOD essentially mean that chemicals and biological material in the water are reacting with oxygen, depleting it rapidly. This can lead to eutrophication in rivers or ground water, with serious consequences for native flora and fauna.

The water also has a large number of suspended solids and phenolic compounds, which are toxic to plants and have an antibacterial effect, which can lead to further negative ecosystem impacts. As such, the wastewater poses a pollution risk for superficial and underground waters. Concentrations of these pollutants in the wastewater can exceed typical domestic water by 200 to 400 times.

It is a big problem, particularly in a highly competitive industry based in more arid regions. A purification system must be found but any solution must effectively deal with the waste at a very low cost. The Algatec project plans to deliver an economic and effective system through an elegant combination of promising biotechnologies which effectively recycle olive mill wastewater using microalgae.

‘It is important to stress that this research comes from the project’s SMEs as well as the research institutes,’ explains Ms Lorenzo. ‘The idea is based on SME knowledge.’

The Algatec concept works in three steps. First, the water is run through a standard filter, removing most of the suspended solids. The water is then routed to a small and affordable photo-bioreactor that uses microalgae to break down the waste. This is the core treatment process. Photosynthesising microalgae feed on nitrogen, phosphorous and other pollutants present in the olive water and release oxygen. Bacteria absorb the oxygen and produce CO₂, a bacterial by-product consumed by the microalgae. Combined, the microalgae and the bacteria work in a symbiotic relationship which, at the same time, dramatically improves the BOD and COD profile of the water.

Next, the water is treated using membrane purification technologies. The water is passed through a membrane module, which uses hydrostatic pressure to filter the water coming from the photo-bioreactor through a microfiltration and a nano-filtration unit.

Innovative and competitive

‘The use of membrane technology will make the system extremely innovative and economically competitive,’ notes Ms Lorenzo. ‘In fact, membrane technology currently represents one of the most useful separation techniques because of its low environmental impact and low energy consumption.’

After this final filtration process all that remains is drinking water and a residue to be sent for disposal. The membrane

filtration stage purifies the wastewater of all suspended solids.

‘By the end of the project we aim to achieve recycled water with no odour, no colour, very low COD and total organic carbon of less than 20ppm, no fatty substances, dry residual material of less than 0.5 %, low conductivity and a turbidity of less than 0.8 NTU,’ remarks Ms Lorenzo.

These are impressively stringent standards. Low conductivity means that there are few dissolved salts in the water, while turbidity is a measure of visual haze or muddiness, and turbidity, or nephelometric turbidity units (NTU), of less than 0.8 qualifies as drinking water.

The upshot of all this filtration is that olive mills can recover about 90 % of used water simultaneously increasing olive mill water efficiency by 80 %.

One of the most elegant aspects of the system is that much of its action is powered by naturally occurring phenomena, such as sunlight to provide energy to the microalgae, which in turn break down pollutants as a happy by-product of their metabolism; the resulting partially treated waters are then passed through a superfine filter using hydrostatic pressure, or gravity. The rest of the system consists of pipes, glass tubes and pumps to route the material through the process.

As such, the Algatec system is powered primarily by ingenuity. That ingenuity is powerful enough to recover and recycle the majority of the drinkable water used in the olive washing process.

The project is well on target to achieve its ambitious goals. Partners are homing in on an appropriate microalgae biotechnology. Eighteen strains of bacteria and two strains of microalgae have been genetically characterised.

‘The most remarkable result is that the consortium has found a combination of algae and bacteria that can grow in polluted water with high phenol concentrations,’ reveals Ms Lorenzo. This is a breakthrough result.

The consortium has also validated the overall approach, with a prototype

photo-bioreactor effectively removing COD and BOD after 30 days, and now experiments are focused on reducing the retention time.

'In addition, we are studying different pre-treatment methods with activated carbon in order to decrease the turbidity of the washing water before it enters

the photo-bioreactor, thus favouring algae growth and treatment efficiency,' Ms Lorenzo explains.

In all, the Algatec system offers an impressive solution to one of the sector's biggest challenges, and undoubtedly it will inspire further research in other water-dependent industries.

The Algatec project receives funding from the SME programme of the Seventh Framework Programme (FP7).

(1) 'Biotechnological recycle of olive mills washing water by microalgae.'

Promoted through the CORDIS Technology Marketplace.
<http://cordis.europa.eu/marketplace> > search > offers > 5865

New lasers for health, safety and more

A new type of cost-effective semiconductor laser based on a modular concept has been developed to provide a wide range of environmental, security and healthcare applications.

The 'Versatile two Micron light source' (Vertigo) project has developed a compact high-performance optically pumped semiconductor disk laser (OPSDL). The laser operates at a wavelength of 2.0-2.5 micrometres, enabling applications in gas detection, free-space optical communication and medical diagnostics. This technology also has a valuable security role to play in detecting dangerous chemicals and explosives and in conducting covert communications.

Project partners include university, industry and government-funded research institutes together with SMEs to ensure the successful commercial exploitation of the technology.

The OPSDL concept is based on a new type of semiconductor laser. It combines the advantages of conventional solid-state lasers, such as outstanding beam quality and high-average output power, with the flexibility of semiconductor diode lasers. The Vertigo consortium has successfully developed long-wavelength gallium antimonide

(GaSb) disk laser technology based on the semiconductor compound. This new class of high-power, high-brightness laser is a major advance over current technology and has been achieved using low-cost components thanks to the flexibility of the OPSDL format.

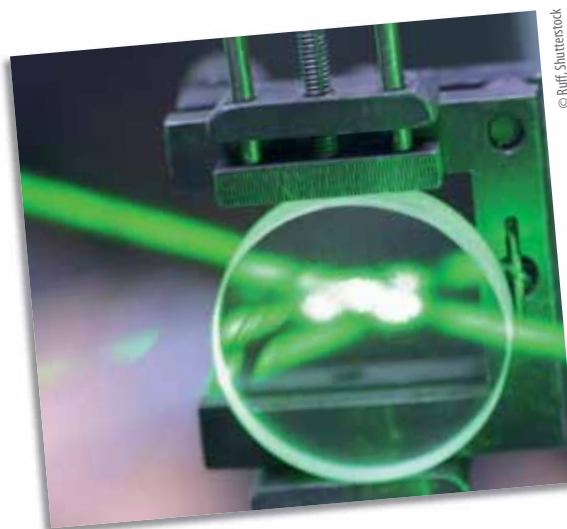
Applications of Vertigo technology include high-speed free space optical (FSO) communication, which uses light to transmit data between two points. This may be employed when it is impractical to use fibre-optic cables. The new laser has highly sensitive gas detection capability and can be used for monitoring gases and chemical compounds in the environment. It can collect precise data for global climatic monitoring or detect hidden chemicals and explosives. An additional benefit is the use of the technology in healthcare as a sensitive,

non-invasive diagnostic device and in high-throughput medical screening.

The Vertigo development has successfully produced flexible, high-performance laser sources as well as addressing important issues of standardisation and cost effectiveness. The new laser technology will help monitor our changing climate, keep us safe from chemicals and explosives, and provide faster and more reliable healthcare.

Funded under the FP6 programme IST
(Information society technologies).

Collaboration sought: information exchange/training.
<http://cordis.europa.eu/marketplace> > search > offers > 5862



Novel materials reinvent medical devices

Sufferers of critical diseases from cancer to AIDS will soon benefit from better, more efficient equipment to purify or separate blood. This may ease suffering, lessen costs, and shorten hospital stays.

Manufacturing devices for serious medical applications can be tricky. They must be made of the right material and interact correctly with biological functions. For example, an external blood purification device must be fast and efficient, without con-

taminating the blood or altering certain properties.

The Monaco-extra ⁽¹⁾ initiative, funded in full by the EU, is looking at ways to manufacture special filtering components that can be used in external

medical devices. Monaco-extra is looking at creating composite 3D column-shaped components that are adsorbent (i.e. porous and with a high-surface material). These can be used innovatively in devices that assist with blood purification and blood separation, common conditions in difficult illnesses.

The project brings together a multidisciplinary consortium of European specialists in different areas of synthetic, chemical, biomedical and biological



sciences. It involves bioengineers, immunologists and medics united in developing new, efficient means to treat patients with currently incurable diseases such as cancer and autoimmune diseases.

In more specific terms, experts are synthesising a range of novel composite adsorbents using natural and synthetic polymers, polymer gels and activated carbon. The material will be used in extracorporeal (i.e. out of the body) devices representing a new generation of medical equipment. The team's objectives are being achieved through knowledge transfer between academic, medical and industrial partners involved in the project. The partners are also working on creating

porous polymer micro-beads suitable for what's known as a microspheres-based detoxification system (MDS). They are also developing novel 3D polymer cryogels for blood cell separation.

Bridging the gap between knowledge production and knowledge use the project is enabling commercialisation of the new developments achieved in the project. The new materials and techniques developed will significantly strengthen the European industry of biomedical materials and medical devices. The project outcomes are expected to help tackle serious health conditions and complications, particularly in elderly patients. By producing novel and more efficient

materials for medical applications and reducing hospital stay of the patients, the project outcomes will reduce the financial burden on national health care providers across Europe.

To this aim, the project consortium has been disseminating its results via scientific presentations and publications in international journals. It has also organised highly successful scientific events.

(1) 'Monolithic adsorbent columns for extracorporeal medical devices and bioseparations'.

Funded under the FP7 specific programme People (Marie-Curie actions).

<http://cordis.europa.eu/marketplace> > search > offers > 5855

100% independent diving robots to come to life

Researchers in Germany are developing a robot able to carry out routine tasks under water, and without any help from humans. Even when equipped with compressed-air bottles and diving regulators, humans reach their limits very quickly. In contrast, unmanned submarine vehicles, connected by cable to a control centre, permit long and deep dives with remote-controlled robots. However, the length of the cable and the instinct of the navigator limit the potential applications of this technology. The current study is about to change all that.

The team is working on creating a new generation of diving robots that will be totally independent and free of the constraints of existing autonomous underwater vehicles (AUVs). The latter can collect data independently or take samples before they return to their starting points, but 'for the time being, the technology is too expensive to carry out routine work, such as inspections of bulkheads, dams or ships' bellies,' explained Dr Thomas Rauschenbach from the Fraunhofer Institute's Application Center System Technology in Germany.

However, he believes that these limitations may soon become a thing of the past as researchers under his leadership are working to create autonomous underwater robots which will be smaller, more robust and cheaper than previous models. They will be able to find their bearings in all types of water, from clear mountain reservoirs to turbid harbour waters, and will be equally at home on the deep sea floor or, for example, inspecting the shallow concrete bases on which offshore wind power stations are mounted, according to the team.

Scientists from various branches of the Fraunhofer Institute are designing different parts of the robot. One group of engineers is working on the 'eyes' — optical perception is based on a special exposure and analysis technology that will even permit the robots to orientate themselves in turbid water, the researchers pointed out.

The 'eye' will first determine the distance to an object, before a camera emits a laser impulse which will be reflected by the object, such as a wall. Then, microseconds before the reflected light flash arrives, the camera will open the aperture and the sensors will capture the incident light pulses.

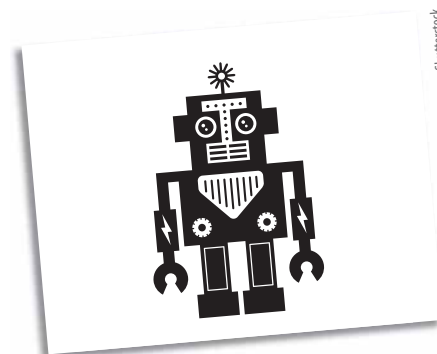
Another group of experts is developing the robot's 'brain'. According to the researchers, this is a control programme that will keep the AUV on course even in strong currents. Meanwhile, a fourth team of engineers is designing the silicone encapsulation for the pressure-tolerant construction of electronic circuits as well as the 'ears' of the new robot. These will be ultrasound sensors that will allow the robot to inspect objects. The researchers

explained that contrary to the previously-used conventional sonar technology, they are now using high-frequency sound waves which are reflected by the obstacles and registered by the sensor.

Scientists from the Fraunhofer Institute for Environmental, Safety and Energy Technology have developed a special energy management system that saves power and ensures that all data are saved in an emergency before the robot runs out of energy and has to surface.

A torpedo-shaped prototype robot 2 metres long that is equipped with eyes, ears, a brain, a motor and batteries will go on its maiden voyage this year in a tank in Germany. The tank is only 3 meters deep, but 'that is enough to test the decisive functions,' said to Dr Rauschenbach. The autonomous diving robot will put to sea in autumn 2011 for the first time from the research vessel Poseidon; several dives up to a depth of 6 000 metres are scheduled to be performed.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 18973



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Composite materials flying high

The 'Integrated monitoring and assessment of cables' (IMAC) project has been developing a process for the high volume and cost-effective production of composite materials for aircraft.

The Imac-pro initiative is funded under the EU's Transport programme and is developing cost-effective integrated production process for carbon fibre-reinforced polymer (CFRP) stiffeners. Stiffeners are the lengths of material to which the skin of the aircraft is fastened. The Imac-pro has developed a process based on textile technology together with advanced injection and curing technologies.

Project partners' focus is on developing stringers for use in the plane's fuselage. The stringers are up to 20 metres in length with a constant cross section and straight alignment. Researchers are also investigating partially curved stringers and heavy moulded products such as frames and beams, which can vary

in cross section and fibre orientation along their length.

Two different methods of stringer production are being studied by the Imac-pro consortium. The first approach is to use hot pressing to form a fabric material; the second is to use specialised tape to produce a highly flexible ribbon suitable for creating curved stringers. Frames and beams can be produced using UD-braiding technology, which gives excellent fibre alignment and little change in dimensions along their length.

Benefits from the Imac-pro initiative include a reduction in development costs for both civil and military aircraft and a more competitive supply chain capable of halving the time to market. Additional



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benefits include significant weight savings leading to savings in fuel, costs and emissions of greenhouse gases.

Work undertaken by project partners will help boost the aerospace industry through the development, manufacture and application of new cost-effective lightweight structural components. The new components will help reduce fuel use and emissions, resulting in a lower costs and a reduced environmental impact.

Funded under the FP7 specific programme Cooperation under the theme Transport.

<http://cordis.europa.eu/marketplace> > search > offers > 5758

Advancing our knowledge of the universe

To fulfil the demands of the large international community using the GANIL facility in France, the Spiral2 (1) project has been initiated. It will extend significantly the possibilities for new rare ion beams (RIBs) and cover several domains of research in nuclear physics.



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A century after the great discoveries of Henri Becquerel, Marie and Pierre Curie, nuclear physics still plays an important role in understanding the formation of matter in the universe. Today, research on the nucleus and the interactions between its constituents progresses using nuclei with unusual neutron-to-proton ratios.

The study of these far from stable nuclei sheds new light on the phenomena at the origin of the cohesion of atomic nuclei. New molecular structures as well as the exploration of the magic numbers of protons and neutrons in very exotic

nuclei are also enticing avenues of discovery at RIB facilities.

Since the first beams delivered 25 years ago, the performance of the GANIL accelerator has constantly improved in terms of intensity and available detection systems. Recently, proposals were put forward to enlarge the range of accelerated ions through the production of RIBs with intensities not yet available with present accelerators.

This idea, after several years of discussions and a preliminary study phase, is being realised in the Seventh Framework Programme with the Spiral2 project. The project is following the European road map for RIB facilities prepared by the Nuclear Physics European Collaboration Committee.

Its main goal is to sign the consortium agreement allowing for the construction and operation of the new facility as a European research institute. The construction of the baseline facility will

be financed by the Region Basse-Normandie, the French National Centre for Scientific Research and Atomic Energy Commission.

The budget for several important extensions of the baseline facility and the new detectors is, however, not ensured today and entirely depends on the success of the Spiral2 project. European and international partners will be sought through direct contacts, official visits, meetings and workshops.

Critical scientific, technical and organisational issues will be addressed in order to attract partners. Finally, the current legal and management structures of GANIL will be adapted to the international character of the new research institute. Spiral2 is creating an extraordinary impetus.

The Spiral2 project is increasing the dynamism of research in nuclear physics and holds great promise for advancing our knowledge of nuclear particles, their role in our universe and applications in industry.

(1) 'Système de production d'ions radioactifs en ligne'.

Funded under the FP7 specific programme Cooperation under the theme Infrastructures.

<http://cordis.europa.eu/marketplace> > search > offers > 5777

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>

Fourteenth International Space University (ISU) symposium

A symposium at the International Space University entitled 'The public face of space' will be held from 16 to 18 February 2011 in Strasbourg, France.

The three-day symposium will explore how to attract more young people to maths and sciences. It will also give presentations on outreach programmes to raise public awareness of space programmes. The aim is to help the industry move towards a more sustainable space programme. This includes exploring the economic benefits behind space-related research initiatives.

For further information, please visit:

<http://www.isunet.edu/index.php/symposium>

Fourth international conference on information systems and economic intelligence

The fourth international conference on information systems and economic intelligence will be held from 17 to 19 February 2011 in Marrakech, Morocco.

Business intelligence is a field which uses technology to find and analyse business data. Common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, business performance management, benchmarking, text mining and predictive analytics. The dynamic of business intelligence depends on the control of knowledge and requires competences to design the best strategies and ensure that decision makers have the right information.

The event will be structured around lectures, tutorials, sessions and experts

panels that will identify new approaches and knowledge in economic intelligence, applied research and feedback.

Specific topics set to be covered include:

- information system and economic intelligence;
- collaborative information retrieval;
- languages and knowledge industries;
- economic intelligence and management;
- cognitive and social dimensions in watch and business intelligence processes;
- information management and knowledge sharing;
- intelligent e-technology;
- information systems governance.

For further information, please visit:

<http://www.siiie.fr/>

Second workshop on context-systems design, evaluation and optimisation

The second workshop on context-systems design, evaluation and optimisation will take place from 22 to 25 February 2011 in Como, Italy.

Systems design is the process or art of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. The field has areas which overlap with systems analysis, systems architecture and systems engineering.

The workshop will focus on context and systems for context computing. At the same time, there will be an emphasis on the impact and processing scheme for uncertain contexts and quality of context, as well as appropriate modelling of context and situations.

Overall topics are set to include:

- design aspects of context aware systems;
- experimental work and field studies on context aware systems;
- architectures and building blocks for context computing systems;
- context recognition in distributed systems;
- architectures and systems for context aware computing;
- architectures and systems for proactive context computing and context prediction;
- optimisation and evaluation of models for context computing;
- systems providing and using quality of context;
- systems providing and using uncertain contexts;
- context reasoning;
- systems to ensure privacy and security in context processing.

For further information, please visit:

<http://www.teco.edu/conf/cosdeo2011>

Second international ICST conference on digital business

The second international ICST conference on digital business will take place from 22 to 23 February 2011 in London, UK. The ICST is the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering.

The internet and information and communication technologies (ICTs) are having a profound and evolving effect on modern life, the behaviour of people and organisations and the way that business is carried out. Many existing business structures and models are being challenged, and many new opportunities and business models are emerging.

Innovation is taking place in parallel in technology and infrastructure, business models and the user experience. The effects often put strains on digital infrastructure and the current legal and regulatory environment.

The event will discuss the future of digital business in a holistic manner, considering the evolution of business models, the impact of open information, the user experience of new services, the regulatory environment and the impact of emerging technology and new infrastructure.

For further information, please visit:
<http://digibiz.org>

Qualitative computing: diverse worlds and research practices

A conference entitled 'Qualitative computing: diverse worlds and research practices' will take place from 24 to 26 February 2011 in Istanbul, Turkey.

The conference is jointly organised by Ankara University and Boğaziçi University of Turkey and Universidad Autónoma Metropolitana of Mexico. It will focus on how research practices from diverse fields have interacted with qualitative computing. Individual research practices will be analysed from methodological perspectives and the epistemological roots of specific national ways of conducting qualitative research will also be on the agenda.

The event will take place across three days, and themes will include:

- research cases from various disciplines utilising qualitative methodology;
- opportunities in and challenges of conducting software assisted qualitative research;

- methodological reflections of using software in qualitative research;
- analysis processes that benefit most from qualitative software;
- innovative and new ways of using software tools;
- transparency on reporting software assisted qualitative research;
- experiences and models on teaching qualitative software;
- new software tools and the future of qualitative research;
- research team possibilities in using software;
- online research, ethics and qualitative software;
- integration of quantitative and qualitative data in mixed methods research and emerging inquiry approaches.

For further information, please visit:
<http://www.qualitativecomputing2011.net>

Fifteenth European conference on software maintenance and reengineering

The Fifteenth European conference on software maintenance and reengineering will take place from 1 to 4 March 2011 in Oldenburg, Germany.

This event will cover the theory and practice of maintenance, reengineering and evolution of software systems.

The conference structure is designed to promote discussion and interaction among researchers and practitioners. It will have up to 10 technical research paper sessions, full-day and half-day workshops, half day tutorials, an industry paper track, a tool demonstration track, a doctoral symposium and a special track on European research projects within the field of software evolution.

This year's edition of the annual event will also feature an industrial forum, enabling companies to present their technologies (tools, methodologies, services) as well as success stories in software maintenance and reengineering. The goal is to promote the work of the reengineering industry and to demonstrate its practical relevance.

For further information, please visit:
<http://se.uni-oldenburg.de/csmr2011>

Pyrotechnics workshop

The European Space Agency (ESA) along with the European Space Research and Technology Centre (ESTEC) are organising a pyrotechnics workshop on 9 March 2011 in Noordwijk, the Netherlands.

The one-day workshop will discuss the latest developments of pyrotechnics devices for use in space. Industry representatives, research centres and universities will present their latest work in the field. The workshop also aims to highlight the advances in new technology and its potential application in pyrotechnics.

For further information, please visit:
<http://www.congrex.nl/11m01a>

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