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Creative and talented: nurturing Europe's next generation of scientists and building an inclusive, innovative society for the future ■

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Creative and talented: nurturing Europe's next generation of scientists

In these days of 'geek chic', when being a nerd is no longer seen as the insult it once was, it might seem that studying science is more popular than ever. But Europe cannot afford to sit back and hope young people choose to enter the sciences — our future prosperity depends on the competitiveness that only research and innovation can deliver.

It is therefore more vital than ever that young scientists continue to be supported, so that Europe does not lose its best research minds of the future. That is why the special feature in this issue of *research*eu results magazine* is entitled 'Creative and talented: nurturing Europe's next generation of scientists and building an inclusive, innovative society for the future.'

The feature articles cover several projects funded by the European Research Council (ERC) under the 'Ideas' programme of FP7, which supports fundamental research by some of Europe's most outstanding scientists and includes a budget line specifically for younger researchers — the ERC Starting Grant. In particular, in our interview in this issue we talk to Dr Davide Iannuzzi who has been 'Diving into the world of the very small' with the help of an ERC Starting Grant.

The Marie Curie Actions, funded under FP7's 'People' programme, also support young researchers as part of their effort to break down barriers to free movement of knowledge in Europe and to help build a true European Research Area. Feature articles throughout this issue highlight some of the results from such actions, especially those which have sought to encourage young people to take up scientific careers.

As for the rest of the issue, our regular 'biology and medicine' section's top story, on page 6, entitled 'Study investigates aquatic parasites on fish', looks at how European researchers have increased our knowledge of some of the pathogens that can cause significant losses on fish farms.

The regular 'energy and transport' section lifts off with the article 'New motor can cut space exploration costs' on page 13. This 'Micro electro mechanical system' (MEMS), developed by an FP7-funded project, will help smaller satellites adjust their orbits cost effectively.

The 'environment and society' section starts on page 18 with 'Innovative pellets to benefit organic farmers', the story of the development of new fertilisers based on the by-products of bio-gas facilities.

The opening article of the 'IT and telecommunications' section is 'Open access: EU project results go public' on page 26. This explains how the OpenAIRE project is making sure that the results from all EU-funded research are made accessible, and not lost to other scientists or the wider public.

The 'industrial technologies' section starts with 'Invisibility field cloak a reality' on page 33 — the story of Slovak and Spanish electrical engineers' success in developing a prototype 'invisibility cloak' that uses superconductors and ferromagnetic materials to hide objects from the prying eyes of electromagnetic fields.

The issue ends, as usual, with a list of events and upcoming conferences.

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

The editorial team



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Watch this space!

Coming up in issue 15 of *research*eu results magazine* — a special dossier on 'Opening the doors towards Africa: international cooperation, research for development and the digital divide'.

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BIOLOGY AND MEDICINE



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Study investigates aquatic parasites on fish

Researchers in the Czech Republic, Spain and the United Kingdom have successfully identified the cellular components and mechanisms that play a role in the proliferation of myxozoa, tiny aquatic parasites responsible for diseases in commercially valuable fish. Presented in the journal PLoS ONE, the study's findings shed light on the motility of myxozoa's proliferative states and their reproductive process.

Produced through spores and without insemination, *myxozoa* are related to cnidarians — primitive marine species of great diversity. Examples of *myxozoa* include anemones, corals and jellyfish. Fish quickly fall victim to these parasites because of the latter's fast proliferation.

Led by the Cavanilles Institute of Biodiversity and Evolutionary Biology at the University of Valencia in Spain, the researchers used 'Confocal laser-scanning microscopy' (CLSM) to probe the anatomy and reproductive biology of the pathogens.

For their part of the study, the Spanish team investigated the morphology, structure and composition of the *myxozoa Ceratomyxa puntazzi*, found in the bile of the bream *Diplodus puntazzo*. This bream is one of the species experts are using in their attempt to diversify fish farming in the Mediterranean.

Specifically, the team identified two different developmental cycles of the parasite: 'Pre-sporogonic proliferative development' and 'sporogony'. According to the researchers, both developmental cycles occurred in parallel, but the fish were observed to have stages either lacking mature spores, or stages with mature spores, predominating.

'The application of *in vivo* techniques has enabled the analysis of the proliferation mechanisms and the movement of this kind of pathogen, which affects the fish's digestive system and might cause important losses to fish farms,' says lead author Gema Alama-Bermejo from the Cavanilles Institute, who is currently carrying out postdoctoral research at the Institute of Parasitology of the Academy of Science of the Czech Republic.

In the paper, the authors write: 'As the present study shows, the combination of light

microscopy, scanning and transmission electron microscopy and three-dimensional confocal laser microscopy, successfully contributed novel information on the structure and morphology of ceratomyxid parasite stages in the bile, and provided unique insights into parasite composition, cell motility and cytokinesis in *myxozoans*, which had not previously been studied.'

The researchers point out that although confocal CLSM may be a poorly used tool, it is extremely useful for investigating the three-dimensional morphology of the parasites, as well as for determining the presence and location of certain cellular components.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 24653

Improving detection of drug-resistant tuberculosis

*European researchers are developing new assays to detect drug-resistant strains of *Mycobacterium tuberculosis*.*

Early detection of drug resistance is one of the priorities of tuberculosis (TB) control programmes. It allows initiation of the appropriate treatment in patients and also surveillance of drug resistance. Associated with this problem is the emergence of 'Multi-drug-resistant' (MDR) and 'Extensive drug-resistant' (XDR) strains of *M. tuberculosis*.

Detection of drug resistance has been performed in the past by so-called conventional methods based on the detection of growth of *M. tuberculosis* in the presence of antibiotics. Such methods are, however, time consuming and thus necessitate the development of easier, more reliable and rapid assays. The main objective of the EU-funded FAST-XDR-Detect¹ project was to develop an assay for the

rapid detection of drug-resistant *M. tuberculosis*. Project partners used a method known as 'rifologotyping' which involves amplification of the genomic sequence of the bacteria found in TB patients, followed by hybridisation against the wild-type sequence. This molecular assay was optimised for detection of resistance to rifampicin and isoniazid, two of the most common anti-tuberculosis antibiotics.

At the same time, efforts were made to optimise an assay that can detect antibiotic-resistant strains directly from patient sputum for the simultaneous detection of MDR- and XDR-resistant strains. This assay is expected to reduce processing time and enable the identification of drug-resistant strains based on phenotypic criteria.

In addition, new mutations responsible for drug resistance were sequenced and entered into an existing database with all gene mutations associated with drug resistance in TB. Researchers also sought to explore the possibility that other candidate genes could be contributing to the emergence of new forms of drug resistance.

The FAST-XDR-Detect project developed assays for the rapid and sensitive detection of MDR and XDR *M. tuberculosis*. More effective screening methods for TB will improve the surveillance of drug resistance, prompting health authorities to initiate appropriate correction measures.

The project was coordinated by the Prins Leopold Instituut voor Tropische Geneeskunde in Belgium.



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- 1 'Development of a two-approach plate system for the fast and simultaneous detection of MDR and XDR *M. tuberculosis*'

Funded under the FP7 specific programme Cooperation under the theme 'Health'.
<http://cordis.europa.eu/marketplace> >
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Lombardy becomes a bastion of biomedicine

A vigorous mobility scheme and fellowship programme is attracting an elite class of young men and women researchers. This initiative supports the EU in its efforts to become a leader in biomedicine.



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The Lombardy region in Italy has undertaken valiant efforts to strengthen itself as a centre of excellence in biomedicine, seeking to attract experts in the field from around the globe. One major effort in this direction is the EU-funded SIPOD¹ project.

Grouping together three major biomedicine research centres in Lombardy, the initiative has launched a sophisticated post-doctoral programme in conjunction with the Scuola Europea di Medicina Molecolare (SEMM). The programme has already attracted

expert postdoctoral scientists, offering equal opportunities for both genders and a higher education training programme involving tech transfer, management, team leading and applications for grants. Such a mobility scheme will ultimately help develop these researchers as independent group leaders.

After a series of calls for participation in the scheme and a rigorous selection process, SIPOD received 82 applications and finally enrolled 15 women and men of 10 different nationalities. Demonstrating the truly global nature of the project, the finalists hailed from France, Germany, India, Italy, Japan, Malaysia, the Netherlands, Russia, Serbia, Spain and Turkey. Prior to joining, all the applicants had previously published on average two publications as first-time authors, a prerequisite that helped sustain the calibre of applications.

The project's launch of other calls, to recruit more fellowships, should help to promote Lombardy as a powerhouse in biomedicine on a global scale. This mobility scheme also contributes to positioning Europe as a continent whose economy is differentiated based on research and knowledge.

The project was coordinated by the Scuola Superiore Europea di Medicina Molecolare, Italy.

- 1 'A coordinated and structured international post-doctoral program to foster trans-national mobility and independent career of scientists in biomedicine'.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> >
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BIOLOGY AND MEDICINE



Europe awakens to life sciences

A vigorous initiative to attract young researchers from different corners of the globe to Europe is giving an unprecedented boost to disciplines related to life sciences.

Molecular biology has become a hot topic in European research, prompting the European Molecular Biology Organization (EMBO) to launch another of its successful mobility initiatives for young scientists. Awarding funds to postdoctoral scientists, EMBO organised its resources through the EmbocoFUNDFP7¹ project for research and training.

With the demand for EMBO fellowships rising dramatically in the last decade, the project has attracted more talented young scientists to benefit from European infrastructure and contribute to the European Research Area (ERA). It has so far conducted two calls through a vigorous online media and marketing campaign to draw quality long-term fellowships from around

the world. The drive has attracted over 1 000 applications which were screened by a panel of global experts in life sciences, resulting in 215 fellowships being awarded to ideal candidates.

The project is scheduled to end in late 2012, and all involved fellows are expected to have completed their fellowship by then. The full positive implications of such expertise on the health of the knowledge economy within Europe and on the ERA should be felt over the next few years.

The project was coordinated by the European Molecular Biology Organization (EMBO), based in Switzerland.

1 'Fostering trans-national mobility in the life sciences - co-funding of the EMBO long-term Fellowship Programme'.

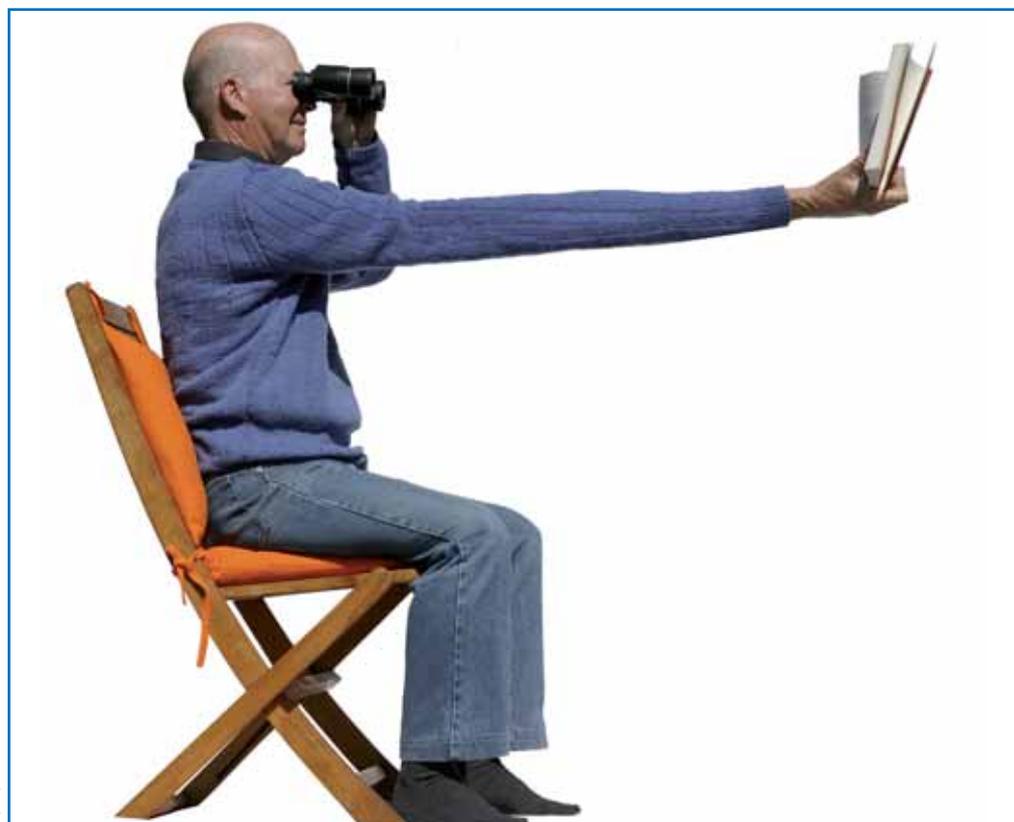
Funded under the FP7 specific programme People (Marie-Curie actions).
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Better nutrition for better eyesight

Parents have long tried to persuade children to eat their greens by promising it will give them better eyesight. Dr John Nolan is using his Starting Grant from the ERC to develop a targeted approach that could optimise the nutrition of the eye.



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We all know that our vision deteriorates as we get older. This research will lead to improvements in eyesight for many sufferers of impaired vision, and potentially be beneficial even for those who are considered to have 'normal' vision.

'Age-related macular degeneration' (AMD) causes more than half of the cases of blindness in the developed world. This condition does not only have physical consequences but it also has profound social and psychological consequences for sufferers, such as loneliness and depression. Today, around 15 million Europeans have AMD, and this number is projected to double over the next decade as Europe's population ages.

The problem largely stems from deterioration in the central part of the retina, called the macula. As we age, our eyes' cells accumulate damage from the

effects of oxidising chemicals, such as free radicals, and from blue light. There is now growing evidence that a lack of macular pigment (MP) in this part of the eye is associated with more retinal damage from these sources, and a correspondingly increased risk of AMD.

'The question we are asking is how to optimise this pigment at the back of the eye,' explained Dr Nolan, Principal Investigator at the Waterford Institute of Technology's Macular Pigment Research Group in Ireland, who is leading the CREST¹ project. 'Our approach is to optimise nutrition for the eyes, which we hope will protect the retina through the ageing process — and even produce improved "super-vision" for those with normal eyesight.'

Sunscreen for the eye

Chemicals called carotenoids are key, 60 of which are found

in the typical Western diet. Only three of them, however, occur in MP in the retina — lutein (L), zeaxanthin (Z) and meso-zeaxanthin (meso-Z) — and the concentrations of these pigments vary from individual to individual.

As well as contributing to retinal damage, blue light is also the part of the spectrum most subject to scattering — which causes glare. To combat this, the yellow pigments, which absorb blue light, act 'like sunscreen for the eye', according to Dr Nolan.

'Our study will enrich MP through diet and supplements, and then measure the impact on improving vision. These pigments are also antioxidants — so increasing them could potentially have a double protective effect.'

Part of the challenge is to measure any improvements in eyesight: 'We know the way vision is measured today is limited.'

ERC funding has already helped Dr Nolan to assemble a specialist team and the advanced equipment needed for new tests. 'These will go beyond familiar opticians' tests designed to assess the need for corrective lenses.' Dr Nolan explained that the standard tests use white backgrounds and black letters, which are not sensitive enough to measure improvements in young people's eyesight and for those with normal vision 'but we will look into effects from colour and contrasts.'

There could be significant economic benefits: not only from a reduction in the incidence of impaired vision in older people, but also from improvements for all those who depend on good eyesight for their work, and better testing techniques for other vision problems.

ERC support has also attracted the funds needed for a new Vision Research Centre at the Waterford Institute of Technology, which was opened earlier this year by Ireland's Prime Minister, Mr Enda Kenny.

Dr Nolan expects to have established the initial baseline comparisons by the end of summer 2012, with the project's first publications following soon afterwards. Full results should start to become available in around three years' time.

This Starting Grant project was hosted by the Waterford Institute of Technology, Ireland.

1 'Enrichment of macular pigment and its impact on vision and blindness.'

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories?search>'eyesight'>

BIOLOGY AND MEDICINE



What can zebrafish larvae tell us about the function of the brain

With their transparent skin and a known genome, the zebrafish larvae are emerging as a model for neuroscientists. They enable researchers to monitor large portions of the brain in an intact behaving vertebrate. Dr German Sumbre, an ERC grantee from Argentina, uses zebrafish to achieve a better understanding of the neural mechanisms of sensory perception, and as a means of providing new insights into neurological disorders.



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Perception is the process by which organisms sense, organise and interpret the sensory information around them. With his ERC Starting Grant, Dr German Sumbre is trying to uncover the neural processes underlying sensory perception. He is focusing in particular on the 'ongoing spontaneous activity' of the brain and its role in visual perception.

'Sensory brain regions remain active even in a complete absence of sensory stimulation, such as visual stimuli. These ongoing spontaneous internal activities are not random: they have a structure,' explains Dr Sumbre. 'We are looking at the biological meaning of these ongoing activities — i.e. what they represent (for example, past sensory experience) — and how it may modulate sensory perception.'

At the Institut de Biologie de l'École Normale Supérieure (ENS) in Paris, France, the Zebrafish Perception¹ project team is using two-photon calcium imaging to monitor the activity of neural networks in genetically modified zebrafish. This innovative method enables them to monitor virtually all neurons in the brain in an intact, non-anaesthetised and hence moving vertebrate.

'Zebrafish are vertebrates whose small size, transparent skin and suitability for transgenic manipulations allow us to measure their neural activity. We can trace this activity in thousands of cells which represent a large portion of the nervous system.'

Dr Sumbre does not expect direct applications from his research at this point of time. Although his main focus is on the basic

neurosciences, he is convinced that his results will one day open the door to new research lines: in the study of mental syndromes such as Parkinson's, Alzheimer's, or autism. Some zebrafish models already exist for several of these neurodevelopmental or neurodegenerative syndromes. By studying the differences in ongoing spontaneous activities in healthy and pathological brains, the research team may shed light on the neural basis of these diseases.

Speaking about his ERC grant, Dr Sumbre, who previously was based in the US, emphasised that: 'One of the reasons I moved to Europe was that the situation was getting very complex in terms of funding in the US. Despite the economic crisis, the ERC remains one of the research agencies which offer competitive funding opportunities, which are crucial

for researchers.' He added that 'The ERC grant has had a great impact on my research career and it was key to the setting up of my laboratory.' Dr Sumbre has nine PhD students and postdocs working under his supervision. He is convinced that 'an ERC grant will always provide a forum for better ideas and for collaborations between researchers from different continents.'

This Starting Grant project was hosted by the Institut de Biologie de l'École Normale Supérieure, France.

1 'Sensory Perception: neural representation and modulation'

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories?search=>'zebrafish'>



Investigating signalling molecules in breast cancer

Significant progress has been made in understanding breast tumour biology. However, statistics indicate that the number of breast cancer patients and victims will continue to increase.

Dr Bentires-Alj, ERC Starting Grantee at the Friedrich Miescher Institute for Biomedical Research in Basel, and his team are studying the roles of the still under-explored family of protein-tyrosine phosphatases (PTPs) in both normal breast development and cancers. In a recent study, published in *Nature Medicine* in March 2012, Dr Bentires-Alj's team have revealed the fundamental role of the protein phosphatase SHP2 in breast cancer proliferation, invasion and metastasis.

The team's goal is to better understand cancer so as to better treat it. An estimated 1.1 million new cases of breast cancer are diagnosed in women worldwide each year. There are as many as 400 000 deaths from breast cancer each year.

The results of the research could lead to the definition of the role of protein-tyrosine

phosphatases (PTP) in normal breast development and differentiation, and in the maintenance and progression of breast cancer. The acquired knowledge from this basic research could contribute to the design of targeted therapies which would improve clinical treatment of patients affected by breast cancer.

These studies use state-of-the-art *ex vivo* and *in vivo* models for studying breast pathophysiology. This research is innovative in the sense that it crosses the boundaries between developmental and cancer research fields and between basic science and clinical applications.

Although progress has been made in understanding breast tumour biology, most of the relevant molecules and pathways remain undefined. Their delineation is however critical to a rational approach to breast cancer therapy. Bentires-Alj's PTPSBCD¹ project focuses

on the role of the under-explored family of 'Protein-tyrosine phosphatases' (PTPs) in the normal and neoplastic breast.

Virtually all cell-signalling pathways are modulated by reversible protein tyrosine phosphorylation, which has an important role in breast development and cancer. It is regulated by two classes of enzymes: 'Protein-tyrosine kinases' (PTKs) and PTPs. Whereas the role of specific PTKs in breast cancer is well studied (e.g. the oncogene ErbB2/HER2), little is known about the function of specific PTPs in this disease.

The chief goals of the Bentires-Alj lab are: to delineate the roles of PTP1B and other PTPs in normal breast development and differentiation; and to address the roles of PTPs in the maintenance of breast cancer and metastasis and to assess their merits as drug targets.

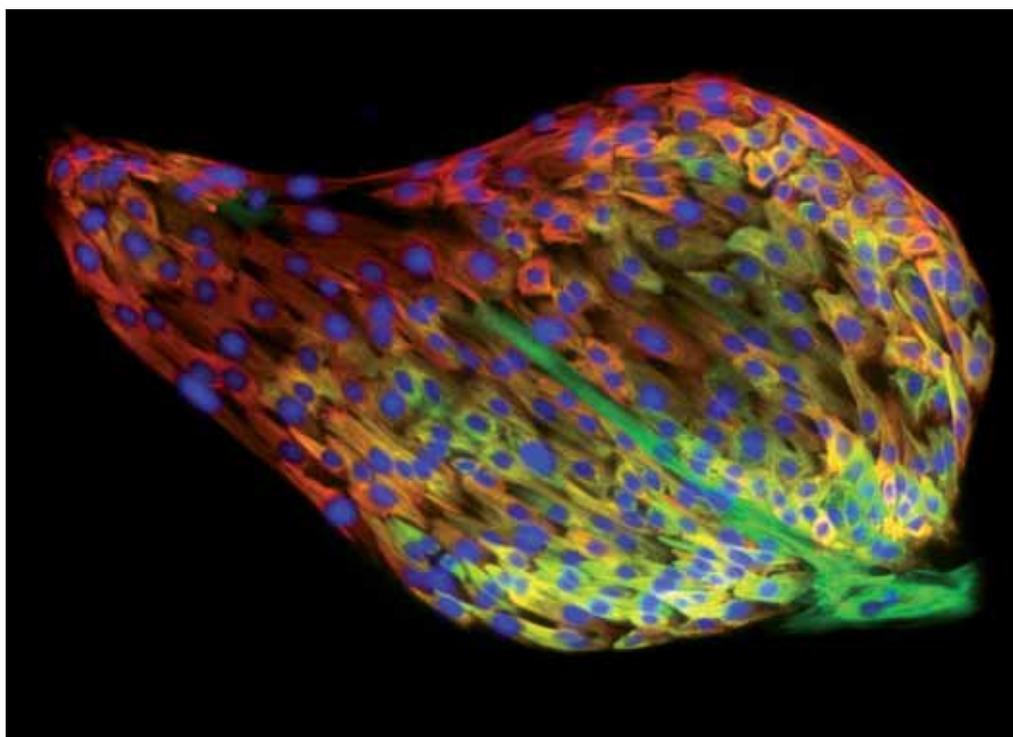
Leading journal publishes research results

In March 2012, Dr Mohammed Bentires-Alj and his team revealed in *Nature Medicine* the fundamental role of the protein phosphatase SHP2 in breast cancer proliferation, invasion and metastasis.

SHP2 is necessary for the maintenance of the tumour-initiating cells, called TICs, in a breast tumour. TICs seem to be the reason why patients affected with some cancers do not react to therapy or relapse quickly after remission. They seem to be more abundant in aggressive and refractory cancers. The scientists depleted SHP2 from breast cancer cells with a small hairpin RNA; proliferation and invasiveness in 3D cultures thus decreased while blocking the tumour growth and reducing metastasis. In some cases, their experiments even showed that SHP2 depletion could eradicate tumour-initiating cells.

Knowledge about the signalling pathways controlling the functions of TICs is improving and could translate into effective therapies. 'It is thus important that basic scientists, industry and clinicians work together to help these to bear fruit,' said Mohammed Bentires-Alj.

This Starting Grant project was hosted by the Friedrich Miescher Institute for Biomedical Research (FMI), Switzerland.



1 'The role of protein-tyrosine phosphatases in breast development and cancer'.

BIOLOGY AND MEDICINE

Diamond implants are forever

An EU-funded project has developed artificial retina implants for treating neurodegenerative diseases and blindness.



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Electrical stimulation of the specialised cells that conduct nerve impulses, known as neurones, is a well-known therapy for treating Parkinson's disease and other degenerative disorders of the 'Central nervous system' (CNS). This approach could also

have a significant impact on the treatment of blindness.

However, available commercial devices based on metal-impregnated electrodes break down in the body, causing cells to react by forming a glial scar.

Therefore, a new approach was needed for creating implants that could activate the neurones and not degrade over time.

The Dreams¹ project investigated new types of nanotransducers based on artificial 'Nanocrystalline diamond' (NCD), which does not break down in the body, and took advantage of NCD semiconducting properties. The consortium's aim was to create biocompatible implants that were capable of restoring patients' vision to a useable level.

Project partners used NCD films to create new structures on which neural cells could be grown to create implants that were compatible with the human body. The scientists then assessed the survival rate and stability of the cells, which were taken from the lining of the inner eye of laboratory rats. The ability of the

implants to successfully activate neurones was also examined.

Results showed good biocompatibility for diamond in contact with retinal tissue and supported the potential use of diamond in neural and retinal prostheses. The project's success therefore provides a ray of hope for sufferers of degenerative disease and blindness.

The project was coordinated by CEA/DEN/DANS/I-TÉSÉ, based in France.

- 1 'Diamond to retina artificial micro-interface structures'

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace> > search > offers > 8451

Stem cells repair stroke damage

Stem-cell therapy has the potential to change the face of human disease. Recent EU-funded research has applied the technology to the treatment of stroke patients by replacing damaged brain tissue.

Stroke caused by blockage of a brain artery is the second most common cause of death worldwide. The resulting brain damage due to oxygen shortage in brain tissue is also a source of disability in patients, particularly the elderly.

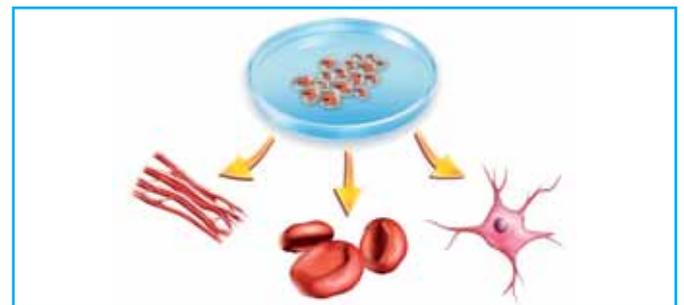
The Strokemap¹ project aimed to develop new multidisciplinary strategies to restore blood flow to the region of the brain that has been deprived of oxygen. This would involve repair of neurones and vascular tissue that died due to 'cerebral ischaemia', or lack of oxygen.

Project researchers aimed to use 'Multi-potent adult progenitor cells' (MAPCs), first discovered in

2002. As a novel population of marrow stem cells, MAPCs can generate the necessary tissue for vascular repair. Furthermore, in rodents, MAPCs have been shown to cause the regeneration of neuro-progenitor cells that can develop into neurones and other nervous-system cells.

To achieve this ambitious objective, Strokemap devised a work programme that incorporated stem-cell transplantation in the ischaemic brain and non-invasive imaging of stem-cell grafts and their effects in the damaged brain.

Strokemap gained an in-depth understanding of human MAPCs and their effect on the immune



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system. Using ischaemic limb and 'Middle cerebral artery occlusion' (MCAO) models, the researchers demonstrated and investigated superior vascular and tissue repair. The team also successfully produced clinical grade MultiStem[®], a stem-cell platform, for stem-cell grafts and vascular stroke.

The Strokemap study has laid the foundations for clinical trials involving MAPCs for research into therapies for strokes. Research in stem-cell technology can be applied to regenerative medicine

in general and is applicable in many areas of biomedicine.

The project was coordinated by the Katholieke Universiteit Leuven, Belgium.

- 1 'Multi-potent adult progenitor cells to treat stroke'

Funded under the FP6 specific programme 'Life sciences and health'.
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New motor can cut space exploration costs

A European team of researchers led by the Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland has developed a prototype of a new, ultra-compact motor that will enable small satellites to journey beyond Earth's orbit. The objective of this new motor is to make space exploration less expensive.

The result is an outcome of the Microthrust¹ project, which is supported under the 'Space' theme of the EU's Seventh Framework Programme (FP7), to the tune of EUR 1.9 million. The compact motor weighs only a few hundred grams and is specifically designed to propel small satellites, weighing from 1 to 100 kilograms.

Conventional thrusters can change orbit around our planet and travel to more distant destinations, but they are usually used for large and expensive spacecraft. The new prototype only weighs around 200 grams, with the fuel and control electronics included. It is also very efficient.

The researchers say their prototype motor will probably be used on CleanSpace One, a satellite currently being developed at EPFL that will clean up space debris, as well as on OLFAR, a swarm of Dutch nano-satellites able to record ultra-low radio-frequency signals on the far side of the Moon.

'At the moment, nano-satellites are stuck in their orbits. Our goal is to set them free,' said Herbert Shea, the head of EPFL's Microsystems for Space Technologies Laboratory and the coordinator of the Microthrust project.

Research into the development of small satellites has intensified in recent times, mainly due to the low cost of production and launch. The price tag for small satellites is around USD 500 million, while the price for larger ones runs into the hundreds of millions. The problem with nano-satellites was the lack of an efficient propulsion system ... until now.

The new mini-motor does not run on combustible fuel but rather on an 'ionic' liquid — a liquid chemical compound, EMI-BF₄, used as both a solvent and an electrolyte. Ions, electrically charged molecules, are extracted from the liquid and then ejected to produce thrust. The fuel is expelled, not burnt.

'We calculated that in order to reach lunar orbit, a 1-kilogram nano-satellite with our motor would travel for about six months and consume 100 millilitres of fuel,' said Muriel Richard, a scientist in EPFL's Swiss Space Centre. 'Our prototype still has a few flow problems at the nozzle extremities, which could cause short circuits,' Dr Shea concluded.

The project was coordinated by the Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. Researchers from the Netherlands, Sweden and the United Kingdom, members of the Microthrust consortium, also contributed to this study.

1 'Micro-electromechanical systems (MEMS)-based electric micro-propulsion for small spacecraft to enable robotic space exploration and space science'.

ENERGY AND TRANSPORT

Getting a better sense of Europe's traffic

An EU-funded project has made headway in developing a communications, analysis and user-interface system to enhance traffic-infrastructure efficiency and road-user safety.



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The REACT¹ project has made its own contribution towards Europe's long-term vision of improved transport-infrastructure efficiency and significant reductions in traffic deaths.

Work focused on developing and integrating state-of-the-art technologies to introduce mobile vehicles' sensors to sense natural and infrastructure conditions, and transmit real-time data to a central server for analysis and communication to affected areas. The primary aim was to be able to generate safety alerts, speed and route recommendations, and relevant information for road and law enforcement authorities.

A system architecture and communication system were developed, with the latter involving the design of a communication system with vehicles and traffic-management centres. A prototype and pilot in-vehicle telematics system was also designed for communicating with sensors and collecting information sent from distributed sensors.

Project partners developed real-time mobile sensors for measuring natural and infrastructure conditions. These included a visibility sensor for installation on board a test vehicle, a traffic sensor and

a first version of a friction monitor. Other developments included a decision model for generating in-car recommendations to the driver, and prediction and decision-making models for the central server.

With regard to the decision-making simulations, the REACT team was able to realise an accident-risk prediction model, develop traffic and route-quality prediction models, and carry out software design of a graphical user interface for monitoring traffic states, traffic predictions and travel times.

Outcomes of the REACT project have the potential to favourably impact road transport efficiency and safety. Contributing to greater standardisation and harmonisation throughout Europe, results stand to greatly reduce traffic fatalities, especially outside urban areas where most traffic deaths occur.

The project was coordinated by Motorola Israel Ltd., based in Israel.

1 'Realizing enhanced safety and efficiency in European road transport'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8546



The dream for the vehicle of the future

A documentary film is presenting science in a novel way to inspire our young scientists. The theme is the vehicle of the future and successfully combines the hopes, aspirations and scientific ability of three eminent scientists.

The issue of transport in society has many facets. First and foremost there are the matters of demographic growth and sustainable urban development. There are also concerns around city transport, including safety, pollution and health, and town planning. A third issue concerns the future of city transport, incorporating the dreams and ambitions of stakeholders

and the possibilities of scientific technology.

To ensure sustainable progress in the technological development of urban transport, the pursuit of science has to be encouraged in society, but because technology has an impact on society, science must also be reconciled with the social needs of its citizens. To this end, the EU-funded VIA¹ project

produced a fictionalised documentary on transport of the future, the target audience being mainly young people.

The production titled *Move along, there is everything to see* presents a vision of the future for urban transport and involves European scientists actually working on the development of new sustainable forms of transport for our cities. The documentary features three forward thinkers who explore visions of urban transport for the future — a scientist inspired by science fiction, an urban planner who likes playing with toy cars and

an artist inventing new utopias. The documentary also represents the hopes and fears of scientists and citizens alike, and questions the part a utopian dream plays in the development of such technologies.

The film was broadcast on a terrestrial channel and is also available to view on the Internet in three versions. (For French, see <http://www.si-nos-villes-avaient-des-ailes.com>, and for English, see <http://if-cities-could-fly.com/>.)

VIA managed to show another side to scientific research, replacing the traditional image of the

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scientist confined to the laboratory. The human aspect of science was merged with a very real scientific and social problem — urban transport. This novel approach helps to fuel the dreams of young scientists and promote the image of science as a technical subject that includes the element of adventure.

The project was coordinated by the Université Nancy 2 in France.

1 'Véhicule Innovants d'Avenir'.

Funded under the FP6 programme
'Science and society'.
[http://cordis.europa.eu/marketplace > search > offers > 7608](http://cordis.europa.eu/marketplace/search)



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Staying ahead of the waves

The dangers of the sea for maritime vessels are being tackled by innovative high-tech systems that can warn of impending disasters and alert crews so that they can successfully preempt them.

Ships out at sea can often run into emergency situations such as rough seas, but new safety systems can help avoid mishaps. The EU-funded ADOPT¹ project aimed to minimise accidents through a new real-time, risk-based 'Decision-support system' (DSS).

The novel system integrated and functioned in three modes — design or office mode, training mode and operation mode. In other words, it was developed to assist ships during the design phase, train staff to respond more appropriately and ensure optimal decisions are taken during

operation in high-risk situations. To achieve this, the system interfaced with several different data sources, and hardware and software platforms.

The system exploited high-tech information input to produce valid warnings that assist the crew in responding. It calculated parameters such as wave height, ship speed, encounter angle, rolling motion and others to produce recommendations based on high-tech responses.

The different components of the project included numerical simulation, ship data-gathering, man-machine interface, component integration and validation of the system. The ultimate goal was to provide expert decision-support capabilities that offer the crew crucial information they would not normally have access to. The emerging prototype system goes far beyond a pure software-hardware package for onboard use to implement a procedural process for the three modes of use (design, training and operation).

ADOPT's feasibility was successfully demonstrated by testing its

prototype in a simulated environment, although more improvements are needed with respect to response time before onboard integration can happen. Upcoming computer advances and ongoing research are expected to bring the concept closer to fruition, signifying a completely different and more efficient way of dealing with maritime hazards. Such promising technology is important not only for securing vessels and economic goods in transport, but also for saving lives.

The project was coordinated by Flensburger Schiffbau-Gesellschaft, based in Germany.

1 'Advanced decision support system for ship design, operation and training'.

Funded under the FP6 programme
'Sustainable development, global change and ecosystems'.
[http://cordis.europa.eu/marketplace > search > offers > 8605](http://cordis.europa.eu/marketplace/search)



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ENERGY AND TRANSPORT

More efficient use of solar energy

EU-funded researchers have developed technology to increase the efficiency of solar cells connected to mains utility grids.

Minimising dependence on fossil fuels by exploiting clean and renewable forms of energy has become a key EU priority for reducing greenhouse gas (GHG) emissions while ensuring a stable and reliable supply of energy at a reasonable cost.

Solar energy is one of the main players in the renewable energy field and photovoltaic (PV) power systems are becoming increasingly common. In particular,

grid-connected PV systems that are connected to the mains utility grid supply it with excess power when a surplus exists and draw electricity when demand exceeds supply.

European researchers sought to enhance current PV technology through the Optisun¹ project. Specifically, they set out to develop technology for producing subdivided solar cells, a solar-cell integrated micro-inverter, and

a backlight reflector to maximise efficiency of energy capture and usage.

Solar cells subdivided into eight parts with equal current output were achieved by laser dicing, with inkjet-printed conductive paste used for the interconnections. To achieve compatibility with the mains grid, researchers bonded a micro-inverter to the subdivided solar cells to convert the DC current to AC and 'step up' the small voltage of the solar cells (3 V) to the high voltage of the electricity grid (220 V).

The backlight module was designed to utilise empty space between solar cells by transferring light to the rear side of the solar panel, generating additional solar power. Extensive research was required to select optimal materials for transmission of those wavelengths of light most critical for power production and for coating material to reflect light from the transmissive material on to the PV cell.

Researchers created a fully functioning prototype PV module that demonstrated increased efficiency of the solar cell by using the backlight module.

Optisun technologies have the potential to increase the competitiveness of the European PV industry which is currently lagging behind American and Asian counterparts. With increased energy efficiency and cost-effectiveness, commercialisation could provide important benefits to consumers as well.

The project was coordinated by Allsun A/S, based in Denmark.

¹ 'The development of a new more efficient grid connected PV module'.

Funded under the FP6 programme 'SME activities'.
<http://cordis.europa.eu/marketplace> >
 search > offers > 8580



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Nanotechnology for solar energy conversion systems

EU-funded researchers have extensively characterised the self-organisation of nanotubes and developed novel compositions particularly appropriate to solar energy conversion applications.

Self-organised one-dimensional (1D) oxide nanotube systems are a hot research topic of late, given that their inherently high surface-area-to-volume ratio produces interesting and useful properties.

In particular, over the last 20 years, ordered arrays of porous titanium oxide (TiO₂), or TiO₂ nanotubes, achieved via electrochemical anodisation have been studied extensively. To date, TiO₂ is the only material suitable

for use as a photocatalyst (substance using light energy to enhance chemical reactions) due to its high efficiency and stability, low cost and safety profile toward humans and the environment.

European researchers set out to prepare and characterise self-organised TiO₂ nanotubes with an ordered structure similar to that of porous aluminium oxide (Al₂O₃)

and silicon (Si) nanotubes via the Ti-Nanotubes¹ project.

In particular, investigators sought to understand key parameters governing self-organisation of TiO₂ nanotubes, specifically those affecting tube dimensions, orientation and morphology. The ultimate goal was to develop novel functional and structural materials with superior performance

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characteristics to be used in solar energy conversion systems such as dye-sensitised solar cells.

Self-ordering mechanisms of TiO₂ nanotubes were investigated via a plethora of surface analysis technologies, including 'Rutherford backscattering spectrometry' (RBS) and 'Nuclear reaction analysis' (NRA) for depth profiling.

The TI-Nanotubes consortium successfully produced TiO₂ nanotube arrays doped with silver (Ag) or iron (Fe) that exhibited enhanced photocatalytic activity important for solar energy conversion applications.

Commercial exploitation of TI-Nanotubes project results has

the potential to enhance solar energy efficiency and use — with important benefits for the EU economy, EU citizens and the planet.

The project was coordinated by the Friedrich-Alexander Universität, Erlangen-Nürnberg in Germany.

1 'Preparation, characterisation and application of self-organised titanium-oxide nanotubes'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace> > search > offers > 8641

Next-generation lithium batteries

While tremendously promising, the development of lithium batteries with thin-film solid electrolytes such as glass has been technologically problematic. EU-funded researchers have developed powerful computational tools leading to the production of an electrolyte for micro-batteries.

Lithium-based batteries have become extremely common and attractive due to their high capacity, low weight and long shelf life. In an effort to enhance performance while ensuring safety, lithium-based solid-state electrolytes (the charge-carrying medium) made of various materials, in particular glass, have attracted interest. However, preparation of thin films with the desired characteristics via a technique called sputtering has been problematic.

European researchers supported by EU funding of the HI-Condelec¹ project set out to develop solid electrolytes (glass and crystalline materials) together with the necessary thin-film technology enabling very high conductivity with enhanced chemical and mechanical stability.

Powerful computational tools were developed to fully investigate and

characterise materials behaviour from the atomic to the glass-structure scale, as properties of bulk materials have been shown to be quite different from those of thin films of the same compounds.

In addition, researchers developed similar tools for investigating stability of thin-film electrolytes produced by sputtering as well as the stack integration process itself.

Experimental studies enabled determination of sputtering process parameters and investigation of ionic conductances in prepared materials.

The HI-Condelec project team was therefore able to identify basic structure-property relationships, process parameters and conditions leading to development of novel optimal compositions and an exploitable electrolyte for micro-batteries.



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HI-Condelec has significantly advanced understanding of properties and process parameters for producing solid-state thin-film electrolytes via sputtering, and produced a micro-battery electrolyte ready for upscaling.

Solid thin-film electrolytes hold promise for miniature energy-storage devices, as well as smart windows or displays, among other things. Exploitation of the results could have an important impact on electronics and other industries, with benefits for manufacturers and consumers alike.

The project was coordinated by Hef R&D, based in France.

1 'Design of highly conductive solid thin-film electrolyte for stack integration within optical and energy storage applications'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace> > search > offers > 8582

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Innovative pellets to benefit organic farmers

Researchers in Germany and Hungary have engineered novel pellets that are able to repel pests in a way that does not harm the environment but could fertilise the plants. These pellets are made of cyanobacteria and fermentation residues from biogas facilities.

The purchase and consumption of organic vegetables continues to grow, with many people acknowledging that they prefer to buy and eat products that are neither treated with pesticides nor laden with chemicals. But organic farmers must deal with the challenge of keeping their plants safe from pests, a task that is next to impossible. So when cabbage root flies, for instance, lay their eggs in spring and autumn on freshly planted greens, an entire harvest can be lost. Farmers claim they can help protect their plants by planting seeds after the fly's flying time is over.

Now there is some good news for these farmers, thanks to scientists from the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB), working in collaboration with researchers from the University of West Hungary in Mosonmagyaróvár and on behalf of several organic agriculture associations.

The organic farming industry should benefit from this novel development since organic farmers stand to lose entire crops when pests, such as cabbage root flies, lay their eggs on freshly planted vegetables.

'The pellets primarily consist of fermentation residues from biogas production, but they also contain 0.1% cyanobacteria,' says Dr Ulrike Schmid-Staiger, group manager at IGB. Soil flora degrade the cyanobacteria, which release a scent that repels cabbage root flies, after the pellets are placed around the vegetable plants. The fermentation residues, which are rich in nutrients, also fertilise the plants.

The team employed a flat-panel airlift reactor, originally developed for microalgae, to cultivate cyanobacteria. They used only light, carbon dioxide (CO₂) and mineral nutrients to cultivate the bacteria. The task was not easy, especially because the bacteria had to be mixed thoroughly and allowed to rise to the surface. Both air and CO₂ had to flow into the reactor. It should be noted that the cyanobacteria are very sensitive. Their structure looks like a long string of pearls, which can be damaged if too much pressure is placed on it. The researchers regulated the air inflow to allow the mass to be thoroughly mixed without damaging the bacteria.

They later used super-heated steam to dry the cyanobacteria, which was then mixed with

the fermentation residues and pressed into pellets. The team acquired the fertilising fermentation residues from eco-certified farms in which liquid manure is decomposed into biogas. Within two weeks, they generated 300 litres of biogas per kilogram of organic dry mass. Any remnants that cannot be further fermented are dried.

The pellets were tested in open-field studies in Spain and Hungary, where the researchers found that the cabbage root flies did not attack any of the growing cabbage or kohlrabi.

The study was coordinated by the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB) in collaboration with researchers from the University of West Hungary.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 24493



A new reality for Europe's youth, by Europe's youth

An EU-funded initiative delved into the changing reality of how youth affect social change. It also studied how changes in forms of expression should be reflected in policies for integration.

The Up2Youth¹ project sought to gain a better understanding of the factors at play in young people's role in social change. A network of project partners in various countries worked to integrate existing research and document young people's choices for actions or non-actions in the social realm. The intention was to arrive at a new understanding of youth as social actors and, based on this, to offer relevant policy recommendations.

Up2Youth developed their approach based on two objectives. The first was to improve on the theoretical understanding of young people's agency, and the second to explore policies aimed at empowering their actions in the social context. Critical questions included 'How do young people's decisions and coping strategies relate to changing social structures?' and 'What policies enable young people to actively influence social change?'

Such questions were examined across three thematic areas chosen as crucial and representative of the status of youth in European societies. These were young parenthood, transitions to work, and civic participation. Working groups collected studies and empirical findings from countries across Europe, drafted a thematic report and, based on that, chose a series of key issues for more in-depth analysis.

The project analysis uncovered plenty of evidence for the contributions of young people's agency to social change. Coping strategies change the meanings of key assets of social integration — family, work, citizenship — as youth strive to overcome the growing distance from societal institutions. The project found that in interpreting young people's choices, it is necessary to recognise the changing meaning of citizenship and participation with



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respect to content and manner of expression.

Another point of focus was how work as a central mode of social integration has changed considerably. There is the new reality against which protracted transitions to adulthood and ethnic social integration need to be viewed and approached in terms of policy.

Up2Youth highlighted the mismatch between how institutions expect young people to participate, and young people's actual priorities and activities. This indicates a need to design relevant policies that recognise a new set of subjective interests, needs and priorities.

Project findings thus offered a new approach for old institutions: to be flexible and responsive to new forms of social action and the processes of integration.

The project was coordinated by the Institut für Regionale Innovation und Sozialforschung (IRIS) in Germany.

1 "Youth — actor of social change".

Funded under the FP6 programme 'Citizens and governance in a knowledge-based society'.
[http://cordis.europa.eu/marketplace > search > offers > 8330](http://cordis.europa.eu/marketplace/search)



Biodiversity to minimise the effects of climate change in global drylands

Both tropical forests and areas with extensive forest coverage are fundamental in tackling the effects of climate change on Earth. However, the environmental importance of arid, semi-arid and dry-sub-humid ecosystems — called drylands — is less well known.



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Drylands cover about 40% of the Earth's land surface and support 38 % of the human population. With his BIOCOM¹ project, Dr Fernando T. Maestre, an ERC Starting Grantee 2009 from the Universidad Rey Juan Carlos in Madrid (Spain), is investigating the role of biodiversity in enhancing the ability of drylands to maintain essential functions. These processes have the capacity to combat the consequences of climate change and desertification in drylands worldwide. Some significant research results were published in the journal *Science* on 13 January 2012.

Experiments suggest that biodiversity is essential in enhancing the ability of ecosystems to

maintain multiple functions simultaneously — such as carbon storage, productivity, litter decomposition, water infiltration and the build-up of nutrient pools. This is known as 'multi-functionality'. These functions can help, for instance, in controlling soil erosion or regulating CO₂ exchanges between the soil and the atmosphere.

Until now, most of the work on the relationship between the diversity of plants and multi-functionality has been carried out in highly controlled laboratory conditions or small-scale field experiments. By conducting their study in 224 dryland ecosystems from 17 countries across all continents (except Antarctica), Dr Maestre and >

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his team assessed this relationship at the global level for the first time. He emphasised that: 'The financial support provided by my ERC grant has been essential in allowing me to successfully carry out the field surveys and conduct the laboratory analysis of more than 2600 soil samples gathered during the global survey. Without funding of this magnitude, it would have been very difficult, if not impossible, to conduct this large-scale research.'

Some past research had revealed that the loss of biodiversity may impair the functioning of natural ecosystems, and thus diminish both the number and the quality of services they provide to the environment. This new study reveals

that drylands, which host many endemic plants and animal species and include about 20% of the major centres of global plant diversity and over 30% of the birds native to dryland areas, are not an exception to the rule. The research also indicates that in drylands worldwide, multi-functionality is enhanced by an increased number of plant species and is reduced by a rise in the average annual temperature.

Dr Maestre explained that 'The results of this extensive fieldwork provide empirical evidence of the importance of biodiversity in maintaining and improving ecosystem multifunctionality in drylands. Our findings also suggest that plant species' richness may be particularly

important for maintaining ecosystem functions linked to carbon and nitrogen cycling, which sustain carbon sequestration and soil fertility.'

An important result of this research is that the increase in average annual temperatures predicted by climate change models will reduce the ability of dryland ecosystems to perform multiple functions related to carbon, nitrogen and phosphorous cycling, which are crucial to supporting life on Earth. Commenting on these findings, Dr Maestre said: 'Although it is sometimes difficult to agree on limiting the emission of greenhouse gases responsible for global warming, we can contribute to minimising their negative consequences if we

take clear actions to both preserve and restore plant biodiversity.' This would not only preserve the wealth of species but, as land degradation is often accompanied by the loss of soil fertility, also limit the number of areas affected by desertification.

This Starting Grant project was hosted by the Universidad Rey Juan Carlos, Spain.

- 1 'Biotic community attributes and ecosystem functioning: Implications for predicting and mitigating global change impacts'.

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories> > search > 'biodiversity'



Marie Curie fellowships to boost research in Ireland

In collaboration with the Irish Health Research Board (HRB), the EU is recruiting Irish scientists in a three-year research scheme. The EU-funded HRBCOFUND2008¹ project is expected to improve the competitiveness of the Irish scientific community and research potential on a global scale.

The 'Marie-Curie actions' have long been among the most popular funding schemes for research and technological development (RTD), meeting the needs of Europe's scientific community in terms of training, mobility and career development. They were originally designed as pure mobility fellowships but have now progressed

to early-career support grants tailored for scientists wishing to become independent researchers.

Falling under the Seventh Framework Programme (FP7), the Irish HRB and the EU are offering a Marie-Curie postdoctoral mobility fellowship scheme of three year-long fellowships. They are

applicable for postdoctoral research training in a leading research institute abroad for two years followed by a one-year reintegration phase in Ireland.

Fellowships are open through international peer review, on the basis of the scientific merit of the research proposal. In addition, an

applicant's research background, commitment to research and potential to develop as an independent researcher are also being considered. Furthermore, priority will be given to scientists who will benefit from such a transnational mobility fellowship.

Upon completion of the fellowship, the fellow will be expected to have successfully completed the research project and to be able to present evidence of independent research, publications, improved research and management skills, and potential for establishing collaborations.

So far, eight researchers have been recruited as Marie-Curie fellows and their progress will be monitored by annual reports.

The project was coordinated by the Health Research Board of Ireland.

- 1 'HRB/Marie Curie post-doctoral mobility fellowship scheme'.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> > search > offers > 8480





Training scientists, advancing agriculture

A network of experts is implementing a plant-growth-focused training programme for young scientists. Efforts aim to cover educational and research needs for advancing competitive European scientific output in the field of plant signalling.

A major challenge for European agriculture is finding a way to satisfy increasing demands for food in a sustainable way. A better understanding of the basic mechanics of plant growth can help in these efforts, and promises to increase crop yields while reducing the need for pesticides and fertilisers.

Developmental programmes that can be modified by environmental cues act through plant hormones to regulate plant growth. Brassinosteroids (BRs) are one class of steroid hormones that promote plant growth and therefore play an instrumental role in biomass, crop yield, and adaptation to stress and pathogens. Despite significant progress in understanding the BR biosynthetic pathway and identifying multiple BR signalling components,

there are still key questions that need to be answered. These involve better understanding of the role of BRs in controlling growth and how their levels change throughout development and in response to the environment.

The Bravissimo¹ project is a training network employing a variety of approaches, imaging technology and other techniques to study BRs in *Arabidopsis thaliana*. The EU-funded consortium aims to translate knowledge generated into model crop plants as well as provide full training of young scientists. The latter will help ensure scientists develop an informed appreciation of how various techniques can be effectively utilised in an integrated research programme.

To this end, Bravissimo has recruited early-stage researchers



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(ESRs) and, with industry participation, is employing novel technologies for research on BR signalling. This approach will enhance understanding of, among others, hormonal plant growth control, innate immunity and hormonal crosstalk in plants. Project partners have already provided scientific and technological platforms for work to advance in these areas.

All ESRs have been introduced to concepts of personal career development and action plans, and have taken part in various network activities: training courses, workshops,

network meetings, external conferences and training outside the network. Research progress is being achieved in line with the original plan and has already realised various successes.

The project was coordinated by VIB, Belgium.

1 'Brassinosteroid venture increasing students' international mobility'.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> >
 search > offers > 7320



Voters' behaviour under scrutiny in French elections

Over 44 million French citizens had the right to vote in the second round of France's recent presidential elections. One ERC grantee showed a particular interest in these voters: Dr Michael Bruter, a political scientist working at the London School of Economics (UK).



His research focuses on the deep mystery that surrounds the act of voting, and especially what happens in voters' minds as they stand in the polling booth, ready to place their ballot paper in the box. In the first round of the French election on 22 April, 30% of voters claimed to have either made up or changed their mind on the actual election day, many in the polling booth itself. The logic of these voters' choices remains very mysterious. Dr Michael Bruter's INMIVO¹ project aims to fill this gap in the literature. More broadly, his research

examines the emotions, memories and images associated with the moment of voting — an 'exceptional minute' which has been neglected by academia. Dr Bruter's research places voters' psychology under a virtual microscope in 15 countries — including Australia, Sweden and the UK in 2010, and France and the US in 2012.

A particularly innovative aspect of this project is its methodological approach, which combines surveys, interviews (including spot interviews), experiments, and direct observation. Dr Bruter's surveys of 2 000 nationally representative respondents are designed as panel studies, involving re-interviewing the same >

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people multiple times over several months or years to track the evolution of citizens' electoral psychology over time.

For the French presidential elections, Dr Bruter and Dr Sarah Harrison introduced two new and unconventional fieldwork elements to complement the project's methodology: 'election diaries' and 'polling station observers'. The ambition is to gain unprecedented insight into the coherence of voters' behaviour. Around 100 French families were selected to keep an 'election diary': each day they write down any thoughts and feelings connected with the election, and record any discussions about the campaign. 'In surveys, many people rationalise or feel constrained about their answers, whilst direct observation in people's homes would be too intrusive. So we had the idea of using personal diaries to act like 'flies' in people's houses. This will allow us to figure out what their state of mind is throughout the election period. We ask them questions like 'have you

thought or talked about the elections today?' or 'what were your reactions and discussions during election night?' In addition, Dr Bruter works with 50 official polling station observers who collect impressions and anecdotes for the project, recording whether voters come to the station alone, in couples or with children or neighbours; what they say or ask; and whether they seem happy, sad or nervous.

'By superimposing various methodologies, we get truly exciting results about voters' experiences. Some of our work has already shown that memories of first elections matter a great deal to voters: nearly 70% remember going to the polling stations as children with their parents, over 80% recollect their first election, and 30% of French voters claim to have cried during or because of an election.' One of his latest results is a confirmation of the legendary 'cynicism of French voters': 70% of French respondents said that

they regularly had to settle for the 'least bad' candidate in recent years.

The research team have added a number of 'funky' questions to their work — asking people what animal, colour or drink they prefer or how they would rank the seven 'deadly sins' — in an attempt to understand more about the role of personality and emotions in electoral choice. The expectation is that the project will have a significant impact on our understanding of electoral decisions. Moreover, Dr Bruter and Dr Harrison are conducting special research modules on the psychology of extremism, voters' identity, and young people's participation — all of which have proved uncannily topical in the context of the 2012 French election.

Dr Bruter emphasised that: 'The ERC grant is fabulous and opens new doors for scientists, but central to its merit is the fact that it supports innovative research with the potential to produce unexpected results.'

The EUR 1.2 million ERC funding should help the team to establish a research structure, based in the UK and dedicated to electoral psychology. The focus will be on these crucial electoral moments, which Dr Bruter described as the 'civic communion' of citizens with their political system.

This Starting Grant project was hosted by the London School of Economics in the United Kingdom.

- 1 'Inside the Mind of a Voter — Memory, Identity and Electoral Psychology'.

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories> >
 search > 'voters'





More strong, hip women in TV science dramas

An EU-funded initiative delved into the changing reality of how youth effect social change. It also studied how changes in forms of expression should be reflected in policies for integration.



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Television plays a major role in influencing public opinion, particularly the opinions of young people. To date, programming demonstrates a lack of strong, hip female scientists and engineers.

The Eurowistdom¹ project set out to use popular entertainment formats on television to address the issue of under-representation of women in science, engineering and technology (SET).

The Eurowistdom project was designed to select and award grants for scripts with SET content and strong female role models, and to provide technical support via

scientific advice to writers. Team members also worked to support marketing activities carried out by the production companies and broadcasters.

The results were quite encouraging. The investigators facilitated productive information exchange among authors, producers and television executives, on the one hand, and scientists, researchers and engineers on the other. The support provided by the investigators through the EU grant fostered confidence in the writers related to factual content and inspired enthusiasm on the part of all team players for this genre in TV drama.

SET television shows with female role models have the potential to positively influence the career decisions of numerous young women, decreasing the gender gap

and increasing EU competitiveness in the fields of science, technology and engineering.

The Eurowistdom project paved the way for fruitful collaborations among technical experts and TV drama producers. The investigators thus made a major contribution to positively changing the face of women in science and engineering and to making this change highly visible.

The project was coordinated by Femtec Hochschul Karrierezentrum für Frauen, Germany.

1 'European women in science TV Drama on Message'.

Funded under the FP6 programme 'Science and society'.
<http://cordis.europa.eu/marketplace>search>offers>7450>



Welcome to the wonders of science

Maintaining and encouraging young people's interest in science is crucial for the future of research in Europe. An EU-funded project has organised a circle of festivals to make sure all Europe's students can take the opportunity to pursue a career in science.

To keep young scientific minds fit and enquiring, the EU-funded Wonders07¹ project organised science festivals in cities spanning the whole of Europe.

Organised by Euscea, the European Science Events Association, together with EUSJA, the European Union of Science Journalists' Associations, and EUN, the European Schoolnet, Wonders07 promoted science to students in universities and schools across the continent. Overall, almost 100 festivals took place in cities following a launch in Berlin. Moving on from there, the University of Strasbourg in the west of France, Tartu in Estonia, Ireland and Iceland hosted the festivals, to name but a few venues.

In line with their motto 'look closer', which steers student minds to delve below the surface and think more about the task in question, Wonders07 devised two events to stimulate the minds of the participants. First, a carousel of science provided a platform through which interactive science presentations could be exchanged. A discussion game 'Decide' was the second novel way of encouraging students to actively participate.

The carousel of science lives up to its name: one science festival sends its presentations to the next and so on until the last festival communicates with the first, thereby closing the circle. Basically, it is a lively way of achieving two-way interactive communication.



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The 'Decide' game involved schools in the cities hosting the festivals. A discussion game with rules in a debate format, it also gives the student a chance to upload the results on the Internet.

Wonders07 science communication events were a new form of cooperation between those with a deep and committed interest in science. Inspiring young people to follow scientific thought, project events have created an inspired dialogue between students, which constitutes

a firm foundation for European competitiveness in the future of science.

The project was coordinated by the European Science Events Association, based in Austria.

1 'Welcome to observations, news and demonstrations of European research and science 2007'.

Funded under the FP6 programme 'Science and society'.
<http://cordis.europa.eu/marketplace>search>offers>8318>

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Science TV inspires young people

An innovative television series has created TV characters or 'future detectives' who address global scientific challenges to encourage careers in the field.

Experts in future studies and film producers have come together to produce TV programmes aimed at young people and related to science. The project team set out to raise young people's interest in science and encourage them

to embark on science-related careers.

The EU-funded Future Detectives¹ project employed young characters in the show to tackle many science-related questions. These

included solutions required to make tomorrow's world better than today's and how science can contribute to solving future societal problems. These characters or 'future detectives' aimed to find out if the world was prepared to solve tomorrow's problems.

To achieve its goals, the project aimed to trigger young people's curiosity about science's influence

on their lives. It also tried to encourage dialogue among society, scientists and politicians by depicting different future scenarios and the role of science and technology in solving tomorrow's problems.

The project succeeded in producing the series and airing it across Europe, as well as distributing it to numerous educational institutions. This opened the door to dissemination to different parts of the world through adequate promotion, raising the possibility of achieving the project's objectives on a global scale. By presenting engaging science programming full of challenges and adventures, the world's youth and young adults may be inspired to follow scientific careers, furthering the EU objective of a knowledge-powered economy.

The project was coordinated by the company Bastard Film, based in Denmark.

1 'Co-production on European research and future studies targeted at young people'.

Funded under the FP6 programme 'Science and society'.
<http://cordis.europa.eu/marketplace> >
 search > offers > 7842



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More female applicants for science faculty positions

An EU-funded initiative has increased applications from women scientists in Europe for academic positions in their own and other EU countries. Increased representation of women among university faculty staff should enhance diversity of thought, research and policy-making while providing positive role models for numerous young women in the Union.

The Encouwomsci¹ project was designed to empower women in science to apply for academic professorships, both nationally and within the EU. Specifically, the project targeted female postdocs and encouraged applications in

selected European countries in an effort to enhance mobility in the European Research Area (ERA).

The principal investigators organised training and seminars covering issues including the interview

and application process, how and where to obtain research funding, and the EU's science policy-making process.

The investigators asked participants to evaluate the project (with a structured questionnaire) initially on completion of training then four months later. Simulation of the interview process, with an appointment committee, and consultation with a personal trainer were rated highest among specific components of

training. Participants experienced enhanced self-confidence and empowerment as a result.

Almost all participants (99%) considered the project worthwhile. In a follow-up phone interview of 10 applicants, seven had applied for professorships since participating in the project training.

In conclusion, the Encouwomsci training project was a great success, empowering women in

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the advancement of women in science.

The project was coordinated by the Gesellschaft Sozial Wissenschaftlicher Infrastruktureinrichtungen (GESIS) in Germany.

science with the knowledge and confidence to apply for academic teaching and research positions

within the ERA. Increased representation of women in science faculty positions, who are

also knowledgeable of policy-making processes, should provide a significant impetus to

1 'Encouragement to advance — training seminars for women scientists'.

Funded under the FP6 programme 'Science and society'.
<http://cordis.europa.eu/marketplace/search/offers/7447>

Young scientists get some air time

An EU-funded project produced a two-part television show focusing on the European Young Scientist Contest. The project should help stimulate interest in science and science careers among young people and the general public.

The EYSCTS¹ project was designed to publicise the creativity, fun and achievement elicited by competition in an international science

contest for young people. In particular, the two-part show highlighted the winners, their projects and their personal stories.

The grant recipients set out to identify four young winners representing four countries and including at least one girl. The winning project

themes were: producing energy from straw left over on maize farms; developing a new motorcycle slipper clutch for Ducati motorbikes; creating a rocket from water and pressurised air in a PET bottle; and developing a new method to remove chromium ions from water.

The documentary highlighted not only the involvement of young people in science projects and the research process in a variety of fields, but also the personal stories and meetings of the competition winners. The innovative EYSCTS project should stimulate science awareness and interest among youth and the general public, and interest in the production of similar programmes among television writers, producers and TV executives.

The project was coordinated by Media and Education Productions, based in the Netherlands.



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1 'European young scientist contest television series'.

Funded under the FP6 programme 'Science and society'.
<http://cordis.europa.eu/marketplace/search/offers/7513>

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Open access: EU project results go public

Publicly funded research should benefit everyone, not bury findings in obscure or expensive journals. The European Commission wants results from Seventh Framework Programme (FP7) and Horizon 2020 projects to produce fully 'open access' publications. A project is now promoting open access and building a portal for all FP7 project publications and datasets.

The stereotypical scientist has unruly Einstein hair, and locks himself away in his laboratory. The caricature is so strong that we tend to forget that landmark scientists like Galileo and Einstein were often excellent communicators — exchanging knowledge with their peers and the wider public — as are today's successful scientists. They speak at conferences, they write books and papers, they interact with people online and mingle at workshops and symposia.

Communication is a fundamental part of the scientific endeavour. Without it, the understanding and knowledge that researchers acquire would remain locked in their brains and never find their way into new products, innovation and real-world applications.

Read all about it

The most traditional and still the most important vehicle for disseminating scientific knowledge is the peer-reviewed paper. These papers are published in specialist journals — from the well-known, high-impact titles like *'Nature'* and *'Science'* to publications which focus on very narrow topics and highly specialised fields of research.

But herein lies an unfortunate irony: when scientists publish in this way, their research sometimes becomes less accessible to the public, as it is hidden away from all but their own research community. Most scientific publishers, running private businesses, charge subscriptions to their journals and fees for access to individual papers. Private

individuals and businesses cannot read papers unless they (or a library) pay a subscription or one-off fee.

For a long time, the European Commission has argued that the results of publicly funded EU research should remain in the public domain. It supports a model of open access scientific publishing which offers free access to published papers.

Out in the open

To make it easier for EU-funded projects to make their findings public and more readily accessible, the Commission is funding, through FP7, the OpenAIRE¹ project. This ambitious project will provide a single access point to all the open access

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publications produced by FP7 projects during the course of the Seventh Framework Programme.

'To try and push more open access publishing, the European Commission has made open access publishing mandatory for around 20 % of FP7 projects,' explains Natalia Manola, the project's manager. 'This is written into the contract, but it is still a soft target — hard to enforce and monitor or really measure the impact. The idea of online open access is still quite new and one of the biggest problems is that projects will publish some results in traditional journals and some in open access publications. Knowledge is fragmented and it is difficult to see the output of a project because it is spread around so much. We want everything to be accessible to everyone.'

OpenAIRE is a repository network and is based on a technology developed in an earlier project called Driver. The Driver engine trawled through existing open access repositories of universities, research institutions and a growing number of open access publishers. It would index all these publications and provide a single point of entry for individuals, businesses or other scientists to search a comprehensive collection of open access resources. Today, Driver boasts an impressive catalogue of almost 6 million taken from 327 open access repositories from across Europe and beyond.

OpenAIRE uses the same underlying technology to index FP7 publications and results. FP7 project participants are encouraged to publish their papers, reports and conference presentations in their institutional open access repositories. The OpenAIRE engine constantly trawls these repositories to identify and index any publications related to FP7-funded projects. Working closely with the European Commission's own databases, OpenAIRE matches publications to their respective FP7 grants and projects, providing a seamless link between these previously separate data sets.

OpenAIRE is also linked to CERN's open access repository for 'orphan' publications. Any FP7 participants who do not have access to an own institutional repository can still submit open access publications by placing them in the CERN repository.

Open to persuasion

'OpenAIRE¹ is not just about developing new technologies,' notes Ms Manola, 'because a significant part of the project focuses on promoting open access in the FP7 community. We are committed to promotional and policy-related activities, advocating open access publishing so projects can fully contribute to Europe's knowledge infrastructure.'

The project is collecting usage statistics of the portal and the volume of open access publications. It will give the Commission this information and use this data to inform European policy in this domain.

OpenAIRE is working closely to integrate its information with the CORDA database, the master database of all EU-funded research projects. Soon it should be possible to click on a project in CORDIS (the EU's portal for research funding), for example, and access all the open access papers published by that project. Project websites will be able to provide links to the project's peer-reviewed publications, too, making dissemination of papers virtually effortless.

The project participants are also working with EU Member States to develop a European-wide 'open access helpdesk' which will answer researchers' questions about open access publishing and coordinate the open access initiatives currently taking place in different countries. The helpdesk will build up relationships and identify additional open access repositories to add to the OpenAIRE network.

Aiming to build the 'knowledge infrastructure' of the European Research Area (ERA), an extension project, OpenAIREplus, is now working in

parallel to OpenAIRE to add open access datasets to the mix and create a so-called 'information space' where publications, data sets and funding information (EC and national) are interlinked. Researchers can make their raw data, benchmark data, or data objects associated to publications available for others to analyse or use.

'The current publication repository networks will be expanded to attract data providers from domain-specific scientific areas. The participatory design of OpenAIREplus will seamlessly guide the researcher to open access research data,' says Professor Dr Norbert Lossau, Scientific Coordinator of OpenAIREplus and Director of Göttingen State and University Library, Germany. 'The experienced consortium will pave the way to support the research work of European scientists and open up the road to multi-disciplinary science.'

'I think more open access publishing, aided by projects like OpenAIRE and OpenAIREplus, could really boost Europe's economy and help boost innovation,' concludes Ms Manola. 'If you are an SME employee or a teacher, say, there is just no way you can read the latest research. With open access, anybody will be able to use it how they want. It is the best way to make the most of publicly funded research.'

The OpenAIRE project received EUR 4.2 million (of its total EUR 5 million project budget) in research funding under the EU's Seventh Framework Programme (FP7), 'Research infrastructures' programme.

The project was coordinated by the University of Athens, Greece..

1 'Open access infrastructure for research in Europe'.

Funded under the FP7 specific programme Capacities under the theme 'Research infrastructures'.
<http://cordis.europa.eu/marketplace> > search > offers > 8519

Intelligent monitoring of the heart

Early disease diagnosis is critical for a successful outcome. A European project made this a reality for cardiovascular disease by providing an innovative solution for continuous monitoring of heart function and real-time prevention.

Cardiovascular disease is one of the leading causes of death in Europe. Medical practice has mainly focused on treatment and therapy of the disease. However, prevention in patients at risk carries equal importance, necessitating the development of efficient monitoring systems.

To this end, the EU-funded Heartronic¹ project aimed to develop an innovative system for prevention and early warning by a continuous monitoring of heart conditions. The system was designed as a light wearable device integrated in some piece of clothing, like a shirt, capable of



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recognising cardiovascular anomalies and alerting doctors and hospitals in real time.

The system comprised a data-acquisition unit that read signals from the chest and correctly interpreted the captured 'electrocardiography' (ECG) signals. These signals were collected on a palmtop computer and were subsequently sent to the host server for accurate diagnosis. Finally, a host server was responsible for collecting all patient information and ECG signals which it could then redirect to doctors and hospitals.

Project partners worked on the feasibility of developing ECG sensors that could be embedded into textile fibres. Software was developed with particular algorithms that enabled digital filtering and statistical classification of ECG patterns, so that they could recognise an abnormal ECG signal.

Reliable and efficient communication between the Heartronic device and a cellular phone was established, as well as data transfer between the cellular phone and a host station. A graphic user interface was

designed to provide the cardiologists with an easy graphic tool for viewing ECG data on his or her cellular phone.

Advantages of the Heartronic system include the elimination of a mass storage device since data is sent over a wireless network via Bluetooth. In addition, the device is completely automatic and does not require any technical competence, making it ideal for elderly or disabled people. Implementation of the system is expected to improve diagnosis of cardiovascular disease and

facilitate prevention, thus increasing the life expectancy of patients.

The project was coordinated by Acta Service, based in Italy.

1 'Heart rating for objective neural intelligent communication'.

Funded under the FP6 programme 'SME activities'.
<http://cordis.europa.eu/marketplace> >
 search > offers > 8534

Europe on the cutting edge: 'organic', the new electronics revolution

An 'organic' revolution is unfolding in the electronics industry. From flat-screen TVs and flexible displays to windows, lighting and solar panels, organic electronic components are offering unprecedented features, design flexibility and versatility at relatively low financial and environmental cost. EU funding is helping Europe strengthen its R&D lead in this fast-developing field by encouraging greater cooperation and coordination across national and commercial research efforts.



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'Organic and large-area electronics' (OLAE) is focused on materials and devices built from organic carbon-based molecules that are able to conduct electricity. Because these are lighter, more flexible and less expensive than inorganic conductors, such as copper or silicon, they are a viable alternative for many electronics applications.

More significantly perhaps, their unique properties create possibilities for many new applications that would simply be impossible with standard inorganic materials. Organic electronics could lead to intelligent packaging, low-cost 'Radio-frequency identification' (RFID) transponders,rollable displays, flexible solar cells,

disposable diagnostic devices and printed batteries.

'The range of applications for OLAE is extremely diverse... we are probably only just scratching the surface of what organic electronics can do and, to top it off, OLAE materials are more cost-effective to manufacture and more

environmentally friendly than traditional electronics,' explains Herman Schoo, a senior research fellow at Dutch research organisation TNO.

Dr Schoo coordinated the Polymap¹ project to help ensure funding for OLAE research is distributed and used as effectively as possible within the European research community. Supported by EUR 600 000 in funding from the European Commission, the project team helped to establish an 'ERA-Net Plus' network. This will build cooperation and coordinate funding streams from national governments and regional organisations. They also set up an online database to maintain up-to-date information on OLAE research, and provided support and training workshops for small and medium-sized enterprises (SMEs) active in this technology.

'Organic light-emitting diodes' (OLEDs) are the most common commercial application of the technology. They are behind the bright, ultra-high-contrast screens in high-end portable devices, and are increasingly replacing inorganic LED and standard lighting in homes and buildings.

But other organic electronic materials are also being used for flexible displays and 'electronic paper', for 'smart glass' that can switch from transparent to opaque at the touch of a button,

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for new types of semiconductors, for ultra-thin printed batteries, for smart clothing, and for flexible photovoltaic panels that can cover entire buildings.

Much of the pioneering work on organic electronics has been led by European researchers ever since Henry Letheby, a British analytical chemist created a partially conductive organic material by anodic oxidation of aniline in sulphuric acid in 1862. Today, innovative European companies such as Nanoident, PolyIC, Polymer Vision and Philips are working on devices, while leading materials suppliers like Degussa and Merck are actively involved in R&D.

'Europe — particularly European academia — continues to lead R&D in organic electronics. We want to make sure we maintain and strengthen our competitiveness in that area,' Dr Schoo says.

Closer coordination

The team's efforts were closely coordinated with three other EU-funded projects working in the OLAE domain: Opera, Prodi and Polynet. Together, the four are called the 'Quadrige' projects.

'We began by analysing funding across Europe for OLAE research and, unsurprisingly, found it to be very fragmented with little or no

coordination between the research programmes of different countries and organisations. Often, we found that money was being invested in the same sort of research in more than one country — that is simply not efficient, in fact it's wasteful,' Dr Schoo says.

The Polymap team sought to reduce this multiplicity of research through better coordination and collaboration between researchers and funding programmes.

'Surely it is better to pool resources into projects that lead to world-class results than having many overlapping projects that produce mediocre outcomes,' the Polymap coordinator emphasises.

The OLAE+ ERA-Net Plus network has taken an important step in improving the use of resources. Launched with the involvement of eight countries, it is continuing to grow and has received around EUR 18 million in funding from national research programmes, including EUR 6 million from the European Commission. The money is being used to fund pan-European OLAE research from leading research groups.

Bringing research to business

Meanwhile, the Polynet team also focused on helping technology

SMEs strengthen their position in the OLAE sector, or break into the field for the first time, organising a series of workshops and providing technology and training support, and guiding them on how to access public- and private-sector funding. The Polymap online database, an open Wikipedia-style website now maintained by the Organic and Printed Electronics Association (OE-A), was set up primarily with SMEs in mind to allow easy access to up-to-date information on OLAE research, which smaller companies may not have the resources to uncover for themselves.

'Though much of the OLAE research in Europe is carried out by academia, SMEs have an important role to play,' Dr Schoo notes. 'Crucially, the barriers to entry into the OLAE industry aren't as large as in traditional electronics. For one thing, the start-up costs are substantially lower than the billions needed to set up a factory to produce silicon-based devices, for example.'

Organic electronic devices are most commonly produced via printing or coating processes that use relatively cheap equipment and comparatively little energy, making OLAE devices not only cost-effective but also more environmentally friendly.

In Dr Schoo's view, efforts to coordinate research funding, such as those carried out in the Polymap project, should help Europe maintain its competitive edge in OLAE R&D, although the biggest challenge remains in putting European OLAE technology on the map commercially. Currently, only around 25% of the major companies worldwide that make printed transistors and memory, crucial for the future of organic and large-area electronics, operate in Europe.

'Go to a conference or look at a scientific journal and you'll see that the big advances in research in the field are taking place in Europe,' Dr Schoo says. 'Industry, on the other hand, is still not doing enough... but there is still time for that to change.'

The project was coordinated by TNO, based in the Netherlands.

1 'Technology roadmap of processes and materials for organic electronics.'

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
<http://cordis.europa.eu/marketplace/search> > offers > 8403

Advancing quantum computing

EU-funded researchers have made important advances in understanding the major stumbling block to realisation of quantum computers, a phenomenon known as 'decoherence'.

The quest for quantum computers capable of performing tremendously complex calculations extremely quickly based on the exciting properties of quantum particles has faced a major roadblock, in the form of 'decoherence'.

Whereas traditional computers rely on traditional 'bits' to code information, quantum computers rely on quantum bits, or 'qubits'. Unlike traditional bits that are either 0 or 1, qubits can be both simultaneously, via superposition, theoretically

enabling truly parallel processing and increasing computing capability tremendously.

However, decoherence, or random changes in quantum states as a result of interactions with the environment, makes it difficult to control and exploit qubits.

For magnetic molecules, theory predicts three main contributions to decoherence, namely from nuclear spins, from intermolecular dipolar interactions, and from phonons.

European researchers initiated the DECMMQUBIT¹ project in order to study the above phenomena in 'spin qubit' systems of molecular magnets. The goal was to enhance understanding and minimisation of decoherence to advance the frontiers of quantum computing. As a first step, scientists chose two molecules (polyoxometalates) capable of being synthesised without 'spin'. Theoretical studies demonstrated that they were quite likely to show 'Single-molecule magnet' (SMM) behaviour and thus were excellent candidates for spin qubits. The SMMs were subsequently synthesised and magnetically characterised.

The next stage was to prepare pure, and magnetically



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diluted samples, with which could be demonstrated that application of a transverse magnetic field significantly decreased the contribution of dipolar interactions to decoherence.

Finally, coupling constants between phonons (quanta of vibrational energy) and different types of

potassium bromide (KBr), cyanide (CN) two-level systems were studied, with calculations supporting experimentally measured values.

Overall, DECMMQUBIT project researchers carried out experimental and theoretical studies on the three main contributors to decoherence

of qubits. Continuation of the project findings should further facilitate understanding of magnetic molecules as quantum objects and help break down the existing barrier to future quantum computer development.

The project was coordinated by the Universitat de Valencia, Spain.

- 1 'Decoherence in magnetic molecules as qubits'.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> >
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Every cloud has a green lining

Everything is going online, or into 'the cloud' as we call it today. We expect access to our emails, photos and files from any device. With zettabytes of data to process and deliver, data centres are becoming major power consumers. An EU-funded project is using some clever 3D design to build an energy-efficient super-server chip.

Climate change dominates the political agenda, but we all still use an awful lot of energy, especially with our growing number of electronic devices. We have laptops and smart phones to charge and iPods to sync. We use the Internet for shopping, entertainment and education and easily forget that even a simple web search uses power.

The market analyst firm IDC estimates that the digital universe had 1.8 zettabytes (one zettabyte is a billion terabytes; one terabyte is a thousand gigabytes) of information in 2011; they predict this to grow to 35 zettabytes by 2020. Within 15 years, there will also be trillions of 'things' — devices, sensors, objects — connecting to the Internet and flooding data centres with massive amounts of raw data that will have to be stored, processed and analysed.

When seen in these terms it is perhaps less surprising to discover that a typical data centre consumes up to 20 megawatts (MW) of energy (a typical commercial wind turbine has an output of up to 1.5 MW).

'Server energy consumption and hardware costs are becoming a great concern in the data centres in which the servers are built,' says Dr Emre Ozer, an R&D Staff engineer at chip technology company ARM. 'Cloud servers use high-end, expensive and energy-hungry processors and the chip manufacturers are now at the

limit of what they can easily do to minimise energy wastage.'

Serve up some greens

Dr Ozer is coordinating the EU-funded FP7 project known as EuroCloud-"247779"¹, which is looking into the potential for 3D server chips as one way to make them less energy hungry. EuroCloud-"247779" is one of Europe's flagship projects in Computing Systems.

The idea is to embed processing cores and memory in close proximity and in three dimensions. Access to on-chip memory uses significantly less energy because the physical distances between components are shorter and there are fewer 'junctions' for electrons to cross on their journey from memory to processor.

'3D chip technology has been around for a while, in particular in mobile computing where miniaturisation and energy efficiency are essential for devices. The main barrier to 3D chip technology becoming mainstream has been high manufacturing costs,' Dr Ozer continues, 'but semiconductor companies are now investing in significant R&D to overcoming this hurdle.'

So far, the EuroCloud partners have developed their design concept for the new server-on-chip architecture. The project has also developed a framework for monitoring the thermal behaviour of 3D chips (their efficiency is closely

coupled to how much heat they generate and how easy they are to keep cool).

Chips in

'We have already shown that multiple servers on a chip design increases the server chip performance density by 15% compared to existing server chip architectures built with today's technology,' explains Dr Ozer.

These early results are taken from simulations of chips containing multiple servers, but without integrated 3D memory. 'We are still in the process of measuring the chip performance density and energy

Having developed a 'proof of concept', the project hopes that the server-on-chip design will provoke the industry to develop server chips containing perhaps hundreds of embedded cores. 'We expect that data centres with 1 million processors will one day become a reality,' predicts Dr Ozer. 'We know we need them to meet the demand for cloud services, but we want to do it without a massive rise in energy consumption.'

EuroCloud-"247779" received EUR 3.3 million (of a total EUR 5.4 million project budget) in research funding under the EU's Seventh Framework Programme (FP7), ICT 'Computing Systems' programme.

The project was coordinated by ARM Ltd, based in the United Kingdom.



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to cost efficiency of multiple servers on a chip with integrated 3D memory,' he continues. 'Our target is to make these chips 10 times more energy-efficient.' Scaling this increased energy-efficiency to the data-centre level will result in huge energy savings.

- 1 'The energy-conscious 3D server-on-chip for green cloud services'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
<http://cordis.europa.eu/marketplace> >
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Investigating quantum entanglement

A fundamental investigation into quantum entanglement was carried out by European researchers aiming to improve the efficiency and reduce the error-making of existing quantum computers.

The control of quantum systems is attracting increasing scientific interest and promises powerful applications and technologies. Entangled states of many particles deepen our understanding of fundamental aspects of the quantum world and its transition to the scale of classical physics. To this end, the EU-funded Entanglement 40CAQIP¹ project aimed to explore fundamental and practical aspects of multi-particle entanglement with strings of ions.

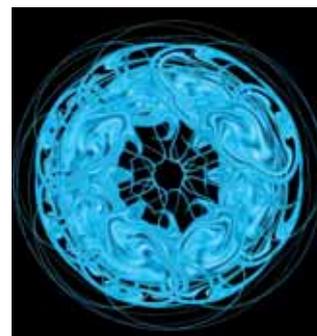
Scientists developed large-scale multi-particle-entangled quantum states and investigated the coherence decay and transition to classical state. Beyond the coherence decay, scientists observed that, when exposed to dissipative environments, multi-particle entanglement yielded dynamical features and new classes of states and applications.

As a solution to computation-generated errors, project members

implemented multiple-error-correction cycles in their computing architecture and a quantum-feedback algorithm. A major achievement of the project was the development of a digital quantum simulator, capable of reproducing with high accuracy the dynamics of interactions.

Results from the Entanglement 40CAQIP study shed light on the territory of quantum entanglement and will hopefully prove beneficial to experimental systems using quantum computation and metrology.

The project was coordinated by the Universität Innsbruck, Austria.



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1 'Entanglement for quantum information with ion strings'.

Funded under the FP7 specific programme People (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> >
 search > offers > 8680

Bringing open, user-centric cloud infrastructure to research communities

Thousands of scientists are toiling away in labs across Europe. Their work helps save lives or makes life easier, more productive or more comfortable. But few have access to powerful computing resources that could greatly speed up their progress.

An open, scalable and user-centred cloud computing infrastructure being developed with EU-funding is now putting all the computing power such scientists need at their fingertips. Being rolled out by the VENUS-C¹ project, the infrastructure marks a pioneering attempt to implement a user-centric approach to the cloud, putting the requirements of end-user communities — such as researchers and SMEs — at the forefront of development, and providing scalable and interoperable cloud resources that combine both open source and commercial solutions to offer the best of both worlds.

'Most researchers have never had access to supercomputer networks and have relied on desktop resources. They are the "long tail" of science: they number in the thousands for each traditional supercomputer user,' explains Andrea Manieri, the VENUS-C project director from ICT group Engineering Ingegneria Informatica in Italy.

'Cloud computing empowers them in a number of different ways, enabling them not only to do better science by accelerating discovery but also new science they could not have done before.'

By providing access via the Internet to distributed computation, software, storage and other resources, cloud computing is becoming increasingly essential to many disciplines of modern science. It is especially crucial for data-intensive research, with shared cloud resources able to crunch out calculations in minutes that would take days or weeks on a desktop PC, or otherwise require extremely expensive supercomputing or high-performance computing systems.

Supported by EUR 4.5 million in funding from the European Commission, the VENUS-C team sought to harness these benefits in a more scalable, interoperable and easy-to-use way than

existing commercial and open source systems. The resulting infrastructure integrates easily with users' working environments and provides on-demand access to cloud resources as and when needed.

Innovatively, their approach was guided by the requirements of end-users themselves: 27 teams of researchers from across Europe working in seven different scientific fields, from bioinformatics and drug discovery to civil engineering and civil protection; and 15 selected pilot projects that received seed money from VENUS-C, following an open call that attracted 60 proposals from 17 countries. The pilot teams' cloud computing requirements steered the infrastructure design.

'Cloud computing is a fast-moving field. By and large, cloud standards are still immature and the number of standards organisations working independently is large,' Mr Manieri explains. 'Providing a common layer to access heterogeneous infrastructures has proved technically challenging. But as a result, our approach to the interoperability layer tackles current challenges with our users firmly in mind.'

The VENUS-C team defined common ways of naming resources and properties so that the same information is interpreted in the same way, irrespective of the infrastructure. They focused on three key areas of standards interoperability, including job submission leveraging established protocols (BES/JSDL) and cloud data storage (the so-called 'Cloud Data Management Interface').

Democratising science with real-world applications

'Our approach to "openness" has been to tie together user requirements so as to deliver them with solutions and services that are more efficient and cost effective in their everyday work, the sharing of best practices through seed fund allocation, and leveraging open standards developments,' explains Ignacio Blanquer from the Universidad Politecnica de Valencia in Spain, community manager at VENUS-C. 'The cloud has the potential to democratise science by providing powerful computing and data analysis to any researcher.'

For example, members of the project experimented with



IT AND TELECOMMUNICATIONS

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BLAST, a data-intensive tool used by biologists to find regions of local similarity in amino-acid sequences of different proteins or the nucleotides of DNA sequences. Using the VENUS-C infrastructure on Microsoft's Windows Azure cloud platform, the experiment cost less than EUR 600 and took just one week to process data that would have taken one to two years on a single PC.

'The advantage of using VENUS-C BLAST compared with renting cloud resources and deploying high-performance computing or high-throughput versions of BLAST is that deployment efforts are minimised and client impact is also minimal, since users don't have to log-in on a different machine,' Prof Blanquer explains.

Researchers at the University of Newcastle in the United Kingdom are using VENUS-C infrastructure to provide cloud services on their 'e-Science Central' platform which also combines software as a service accessible through a simple web browser and social networking functionalities for user interaction.

'It illustrates two important characteristics of cloud-based scientific systems: spreading tasks over 300 Windows Azure cores with a higher than 90% efficiency, and user input through a web service allowing multiple users to invoke the same instantiation of the service at the same time. This interactive model is far different from the traditional batch approach used in supercomputing facilities,' Prof Blanquer notes.

In Greece, researchers at Aristotle University are spearheading an innovative use of the cloud for assessing and tracking trends in social media to help businesses and policy-makers better understand the concerns and interests of citizens. Another team at the same university is using VENUS-C infrastructure for earthquake impact assessment.

'Our involvement in VENUS-C offers a prime opportunity to access unprecedented resources only when and where necessary for earthquake impact estimation and related information dissemination, without worrying about how to build and maintain the corresponding infrastructure and operational tools,' says Costas Papazachos, a geophysicist who is heading the pilot project.

Meanwhile, at the University of the Aegean, Kostas Kalabokidis, a senior geography researcher, has adopted a pioneering approach to using cloud computing for predicting wildfires. The system uses weather, topography, vegetation data and digital images to predict the spread of forest fires, giving firefighters a one-hour head start on the blaze. It also provides forecasts of the risk of fires up to five days in advance, integrating Microsoft Bing Maps, Silverlight and Windows Azure.

'While there are many fire-risk algorithms around the world, our tool is different because it provides a quantitative and systematic approach, based on geographic information systems. It can predict

fires at an hourly rate,' explains Prof Kalabokidis.

Other researchers in Spain, Denmark, Italy and the UK are using VENUS-C infrastructure for complex data analysis in the bioinformatics and biomedicine domains, for civil engineering applications, for cosmological calculations, and for biology to study the dynamic movement of cells at the molecular level. Outside of academia, companies and SME partners are also reaping important benefits from the technology.

VENUS-C received research funding from the European Union's Seventh Framework Programme (FP7). Project partner Microsoft is providing computing and human resources. The project was coordinated by Engineering — Ingegneria Informatica, based in Italy.

- 1 'Virtual multidisciplinary environments using cloud infrastructures'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
<http://cordis.europa.eu/marketplace> > search > offers > 8520

Self-organisation on a chip

An EU-funded project has devised a high-throughput biochip that can agitate fluids and organise itself into a nanowire as well as a high-density array.

High-throughput assays are undoubtedly the way forward for tailored drug design and therapy at the nano level. The core of a new system is a chip-based platform and its subsequent analysis based on the strength of interaction between a ligand and its receptor. Applications include biomarker assays as well as lead screening.

Armed with novel technologies for biochip design, the EU-funded NABIS¹ project combined a variety of state-of-the-art nano-techniques to develop an optimised biochip system. Using various techniques made possible by the nano-environment and its properties, project scientists aimed to increase the throughput

of ligands and enhance kinetics to improve not only sensitivity, but also speed.

Perhaps the crux of the biochip design came from self-organisation of fluids into a predictable format. Both microarray (static) and microfluidic (dynamic) systems were utilised and a combination of the two formats could be used to avoid hold-ups and related reduction in speed in the automatic high-throughput assays. Moreover, efficient fluid agitation of nano-droplets can be achieved using acoustic wave manipulation on the surface of the chip.

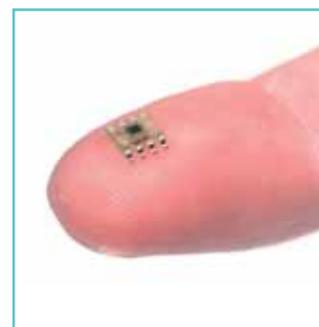
For the development of high-density arrays, NABIS scientists controlled

the surface expansion in nano-domains, small sets of atoms within the nano definition of size. Self-assembly polymers on the enlarged surface of nano-dots form high-density arrays.

Nano-dots also formed the basis of anchoring points where nanoparticles, when subjected to a magnetic field, convert into bio-nanowires. A nano-electrochemical detection system would connect with the bio-assays on the chip format.

An optimised biochip using the cream of nanotechnology techniques would mean even faster diagnostics for drug screening and discovery, environmental monitoring and personalised medicine.

The project was coordinated by the Kungliga Tekniska Högskolan in Sweden.



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- 1 'Nanobiotechnology with self-organising structures'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
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Invisibility field cloak a reality

Science fiction fans are one step closer to having their dreams realised thanks to Slovak and Spanish electrical engineers who have developed a prototype invisibility field.

The researchers used simple materials, such as a superconductor, and ferromagnetic materials that are freely available on the market, to create an invisibility field that can effectively hide contents from the prying eyes of magnetic fields. The results of the study were presented in the journal *Science*.

Scientists from the Institute of Electrical Engineering of the Slovak Academy of Sciences in Slovakia and from the Universitat Autònoma de Barcelona (UAB) in Spain described the device as a cylinder they created using a high-temperature superconductor material, which was later refrigerated with liquid nitrogen and covered in a layer of iron, nickel and chrome. When the cylinder was subsequently placed directly in the path of a magnetic field, the researchers observed that the device had no impact on the path of the magnetic field lines. Specifically, magnetic 'waves' did not bounce off, create a shadow or generate any sort of reflection. As a result, anything placed inside the device could not be detected.

This special feature has implications for security scanners and other devices that use magnetic

fields to detect hidden objects such as concealed weapons. In fact, one of the lead researchers, UAB's Àlvar Sánchez said he envisions their research can be used in a variety of fields ranging from military to medical. 'There are many applications — for some cars, ships or a submarine,' Dr Sánchez is quoted as saying. 'For the submarine, you have to make a shell around the submarine that will make it magnetically undetectable.'

At the moment, 'Magnetic resonance imaging' (MRI) faces difficulties when used with patients who have received pacemakers or reconstructive surgery. The new device could be employed to avoid the image created by the MRI being distorted. 'This could also be used to protect some (military and medical) equipment against electromagnetic disturbances,' Dr Sánchez explained.

Researchers at UAB initially designed the mathematical formula for the device in what the university calls 'an extraordinarily simple equation'. In theory, this formula would allow a cylinder to be undetectable to magnetic fields from the outside, while maintaining everything inside completely isolated from these fields.

With their equation, the researchers at the UAB needed the expertise of a laboratory specialising in the precise measurement of magnetic fields. Enter the Institute of Electrical Engineering of the Slovak Academy of Sciences in Bratislava.

Working together, the team was able to create positive results after just a few months. The cylinder they created consists of two concentric layers. The inner layer is made up of superconducting material that repels magnetic fields, while the outer one comprises a ferromagnetic material that attracts the same magnetic fields. The cylinder was made invisible to magnetic fields and, according to the UAB, represents a step towards making objects invisible to light — which is also an electromagnetic wave.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 24693

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Enhanced technologies for plastics production

Plastics have become ubiquitous in everyday life and the plastics manufacturing industry plays a key role in Europe's economy. EU-funded researchers provided new tools and technologies that promise to enhance Europe's competitive edge in this booming sector of the world economy.



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One of the most common methods for plastic parts production is injection moulding, a process by which the heated material is forced (injected) into a mould cavity where it cools and hardens to form the desired part. Compared to other production methods, the cost per unit is relatively high unless very large quantities are produced.

EU researchers, supported by funding for the Icon-Hisim¹ project, sought to develop new technologies for high-speed injection moulding. Specifically, goals included enhanced productivity and reliability with simultaneous reductions in cost and energy consumption to increase European competitiveness in the booming field of plastics production.

Investigators developed a simulation tool, including the drive or control systems for the clamping and injection units that facilitated virtual design and optimisation of system performance.

Three different virtual prototypes were developed incorporating adaptive control of the clamping unit for enhanced accuracy and performance as well as iterative learning to control injection velocity for high-quality reproducible parts.

Icon-Hisim successes included development and testing of a compact control system for the clamping unit, alongside the development of optimum process control of the injection unit — the latter resulting in reduced energy consumption and an approximately 50% increase in system efficiency.

Use of the virtual prototype tool should facilitate reduction of set-up costs associated with high-speed injection moulding as well as of

overall costs via enhanced efficiency with decreased energy consumption. In addition, commercialisation of the prototypes has the potential to improve reproducibility and reliability of products.

Overall, Icon-Hisim project outcomes could significantly enhance European competitiveness in the global high-speed injection-moulding sector used to produce a plethora of common plastic components.

The project was coordinated by the Technische Universität Dresden, Germany.

1 'Intelligent controls for high-speed injection moulding machines'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace/search/offers/8561>



Interview: 'diving into the world of the very small'

Nanotechnology — the science of making and manipulating the very small — has the potential to transform our lives. With the help of ERC funding, Dr Davide Iannuzzi is building microscopic moving parts on to the ends of optical fibres, which in turn may be able to help push nanotechnology even further — as well as opening up new areas for research and medical technology.



© Portrait_D_Iannuzzi

Imagine a circular swimming pool with a diving board at its rim. Now imagine that this 'swimming pool' is the round end of an optical fibre and the 'diving board' is thinner than a human hair. This is precisely what Dr Iannuzzi makes: it is called a 'fibre-top cantilever' and has the potential to transform many different areas of research.

The FTMEMS¹ project arose from Dr Iannuzzi's experiments in fundamental physics. His research focused on trying to measure forces due to quantum effects, like the 'Casimir Effect', between two objects very close together. The usual apparatus shines a laser beam on to a tiny cantilever. The force to be measured

will bend the lever and, if you can measure this bend through deflection of the reflected laser light, you can measure the force.

The project has developed a version of this equipment that builds the cantilever on to the end of the same standard optical fibre as is used in telecommunications — a 0.1mm-diameter glass fibre, transmitting a 0.01mm light beam within it. This is a kind of 'Micro-electro-mechanical system' (MEMS).

The advantage is that the laser light emerging from the fibre automatically shines precisely on to the cantilever and is reflected back into the fibre itself.

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Interference between the emitted and returning light causes changes in the intensity of the light detected at the opposite end — which indicates the amount of movement.

Thanks to an ERC Starting Grant in 2007, the team have been able to bring this technology to maturity and patented a method to fabricate the devices.

*Research*eu magazine* asked Dr Iannuzzi to explain a little more about the project:

What were the main themes and objectives of the FTMEMS project?

The main goal was to bring this technology from 'an idea on a blackboard' to maturity, and demonstrate its potential as a new platform for sensors and other research instruments. We can now produce many probes per day, and these can be used to investigate phenomena that were previously impossible to observe in this way — from microscopy to measurements of vibrations, accelerations and flows in harsh environments.

The project started in 2007 and now, as we enter the last year of the grant, has produced working sensors — which can be used to measure properties such as pressure, flow and humidity — that are already under evaluation in 15 labs across Europe. We have therefore been able to bring the technology to maturity and diffuse the technology for use around Europe.

There are a range of possible applications: from measuring mountain vibrations in order to predict landslides (in collaboration with the University of Padua), to wind tunnels (in collaboration with the Second University of Naples), space technology and bio-physics. We are now focusing on developing the instruments for use in biological applications, like measuring the stiffness of human tissue. Our aim is to make the instruments easy to use and suitable for clinical use. We have already managed to develop a table-top device and are now working to make a hand-held model.

What first drew you to research in this area of micro-engineering and MEMS?

I guess you could say my 'cultural background' is as a physicist, and I was drawn to do physics out of curiosity. This project started from experiments in fundamental physics.

When trying to measure forces, such as the Casimir Effect, the commercial instruments we used were causing spurious effects and we wanted to eliminate this source of errors. The focus of the laser was too wide and the light missing the lever would cause problems in the very sensitive, small-scale measurements we were trying to make.

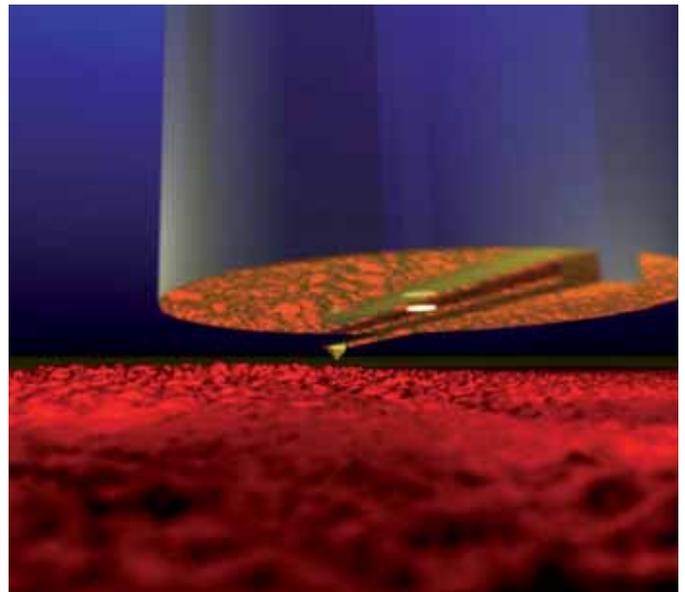
In an attempt to design new equipment that could avoid these problems, we suddenly hit on the answer: 'Why not fabricate the cantilever directly on to the end of an optical fibre?'

What is new or innovative about the project? And what are the concrete results from the research so far?

The applications include 'Atomic-force microscopy' (AFM) — a sharp tip on the end of the lever can be pressed to a surface and moved like the stylus of a record player. By recording the location and movement of the 'stylus' you can build up a map or image of the surface with a resolution of nanometres that is much better than is possible using optical microscopes.

Normally, this equipment is bulky, expensive and requires complex alignment of mechanical and optical parts, but with fibre-top technology there is no need for alignment. Even if the sensor is more expensive to make, this leads to cheaper and smaller microscopes.

In addition, building a mechanical device on the tip of an optical fibre means we can see what happens to the mechanical part from a long way away, at the other end of the optical fibre. This makes it suited for use in harsher environments, with light source and electronics kept at a safe



© Q+A_Fibre-top_Photo

distance. It can also be used in small, narrow spaces: the dream is that we could eventually use it in applications such as minimally invasive surgery.

But we can also use the light to collect optical data from the sample. We can push on the sample and simultaneously see how it reacts with light through spectroscopy — we know the force applied and can then interrogate the effect with light, collecting mechanical and optical data from the sample at the same time in a single device. We have started to test this concept with a first series of experiments on plastic samples, and it seems to work just fine. We are now aiming at extending the studies to small perturbations of biological samples — which one could call 'nano-trauma' or 'nano-palpatation' — first *in vitro*, and, hopefully, one day, *in vivo* and at the clinical scale.

What are some of the difficulties you have encountered? And how did you go about solving them?

The first issue was fabrication. Before the ERC's grant, we produced the fibre-top devices by carving them directly into the tip of an optical fibre, but doing so accurately at such a small scale was too expensive in terms of time and equipment.

We have therefore developed two new fabrication techniques: in the first, we nest the much thinner

optical fibre inside a 3x3mm block and machine the whole block — we can then use much cheaper carving instruments, since the object they are working on is 30 times bigger. The second technique is still at the proof-of-concept testing stage — applying the same fabrication technology used for silicon microprocessors and MEMS to optical fibres.

We have patented our new solution, using photo-lithography to define the geometry of the mechanical parts on glass fibre, so we can grow or deposit material on the end of the fibre and then select a pattern for etching this material away to leave the fibre-top cantilever. We are now trying to demonstrate the scalability of the technique.

At first, it was also not easy to find researchers who wanted to use the technology. We started by approaching engineers and physicists — researchers who are looking into flow, vibration, etc. And now we are receiving a lot of interest from scientists working in bio-physics and medicine as well — although the technology is still a long way from clinical use in hospitals.

But thanks to the ERC Starting Grant, surgeons, dermatologists, and scientists working on tissue mechanics can come and see our instruments in the lab. This has been one of the main benefits — giving us the opportunity to show a complete work- >

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available for testing and use by other researchers. We were able to develop the technology to a maturity that attracted interest from other fields. In order to gain their trust, we needed to be able to show something concrete and in the 'critical mass' necessary to show the scalability of the technology.

What are the next steps for the project, or next topics for your research?

This is a very exciting period for the project. We are currently in discussions with neuroscientists and doctors, because we have become

aware that this instrument can do more than we thought.

We have demonstrated that we can fabricate micro-machined devices on glass fibres by means of the very same techniques used to manufacture silicon-based MEMS. With the help of a new ERC 'Proof of concept' Grant, we now want to show that this process can be scaled up to volume production. This would be a tremendous result for our research group and for Optics11, the start-up company we have created to commercialise fibre-top technology.

Combining optical techniques with AFM could turn out to be very powerful. The light beam can be used to generate fluorescence in the materials being studied, so researchers can collect chemical data from the same point at the same time as scanning its nano-scale image. Researchers could use the new apparatus to examine the physical properties of biological cells, detecting the stiffness of the cell wall, indicating health or illness. These biophysics applications could result in greater understanding of the fundamental properties of cells,

which in turn can lead to potential medical and surgical applications.

This Starting Grant project was hosted by the VU University Amsterdam, The Netherlands.

1 'Fiber-top micromachined devices: ideas on the tip of a fiber'.

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories> > search > 'diving'



Innovation and training in ultrafast quantum dynamics

An EU-funded initiative is training young researchers in the domain of advanced techniques for the ultrafast manipulation of atoms and molecules using strong femtosecond laser pulses. With a consortium of European universities and companies involved, the effort represents the cutting edge of research in this field which has a wide range of applications.



The use of strong shaped femtosecond laser pulses — ultrashort pulses on the order of 10^{-15} seconds — opens an innovative avenue to controlling quantum dynamics via hitherto inaccessible physical mechanisms. However, these new scenarios require the development of novel versatile femtosecond sources in the 'Ultraviolet radiation' (UV) and 'Vacuum ultraviolet radiation' (VUV) range of high-shaping capabilities.

The Fastquast¹ project has gathered together leading experts from Europe to push research and training in this field. Involving 18 doctoral students and six young postdoctoral researchers, the initiative is preparing the next generation of innovators and developing new principles of control of quantum dynamics by shaped strong fields.

The project includes a number of specialised work groups as well as several mini-schools and workshops focusing on the elementary and advanced principles of quantum control. Areas of specific research and experimentation include nuclear and electron wave-packet dynamics, the principles of strong-field coherent control by shaped pulses, the measurement and stabilisation of cold atoms and molecules, and ultrafast information processing.

In addition to the technical scientific training, there have also been sessions building the complementary skills of the young researchers, including aspects such as project management, presentation and planning.

With the involvement of 10 universities and three companies, the network represents the leading players working in the field of femtosecond light-matter interaction in Europe. The initiative will continue to advance training and research in this area and build collaborative working relationships that will outlive the project, which ends in September 2012.

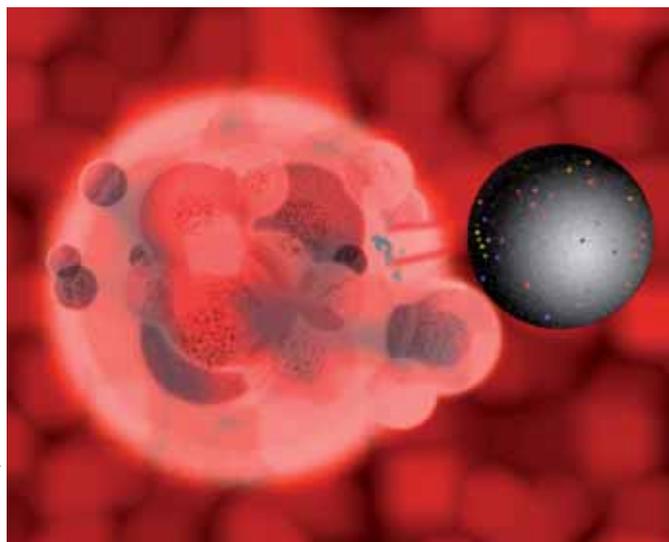
The project was coordinated by the Université de Bourgogne, France.

1 'Ultrafast control of quantum systems by strong laser fields'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> > search > offers > 7582



The new generation of microscopic robots



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Inspired by both nature and science fiction, the ERC-funded Chobotix¹ project has brought the first prototypes of microscopic robots to life. These tiny robots could have applications in various fields, from seeking out a source of contamination and neutralising it in toxic waters to treating patients in a more efficient way by delivering them the exact amount of medication without dosing their whole body.

This project, which works on the design and synthesis of chemical swarm robots, is the first to benefit from an ERC Starting Grant in Czech Republic. These micro-entities can also be defined as 'artificial cells' or 'artificial single-cellular organisms' (called 'chobots'). These chobots are

sized in only tens of micrometres so they can get to the tiniest places.

As synthetic single-celled organisms, they can move in their environment and selectively exchange molecules with their surroundings in response to local changes in temperature or concentration. They can also process the chemical composition of molecules and either accumulate or release a substance.

The main areas being explored in the course of this project are: the synthesis of suitable shells for chemically active swarm robots; the mechanisms of molecular transport into and out of such shells and means of its active control; and the collective behaviour of chemical

Toxic spills can be devastating to humans, animals and to the ecosystem. The ERC-funded Chobotix project has successfully created the first prototypes of chemical robots that could be used for 'intelligent cleaning'.

swarm robots and their response to external stimuli.

In future, chemical robots could be used for different purposes, for instance to deliver substances in a more efficient way, to find the source of pollution or to identify chemicals or cancerous cells in the human body. Robots might even be able to deliver the exact amount of drug directly to the right place without harming any other cells, as is the case in current cancer treatments. Chemical robots could also play a key role as they are potentially able to act in very remote or hardly accessible areas and could be used for 'intelligent cleaning'. Other potential areas of use are agro-chemistry, cosmetics, and consumer chemistry in general.

Research is being carried out in the Laboratory of Chemical Robotics at the Institute of Chemical Technology in Prague, Czech Republic. The leading figure of the international team of young researchers, František Štěpánek, says that after three years in existence his project has fulfilled its goals and more: 'We have created the first prototypes of our chemical robots. In cooperation

with other research teams of biochemists, we have managed to create a structure that can deliver the substance on demand, where needed, and which is able to release its content repeatedly. We are now entering the phase of demonstrating "swarming", i.e. collective behaviour of robots.'

With a truly visionary angle, the Chobotix project covers many scientific fields, ranging from chemical engineering, material engineering, biophysics and microbiology to applied mathematics for computer simulation. František Štěpánek's small laboratories in Prague will assuredly bring physicists more surprises.

This Starting Grant project was hosted by the Institute of Chemical Technology, Prague.

1 'Chemical Processing by Swarm Robotics'.

Funded by the European Research Council (ERC) under the FP7 specific programme Ideas.
<http://erc.europa.eu/success-stories> >
 search > 'robots'



Photonic light for nano applications

A training-focused initiative is advancing the skills of young scientists in the fields of materials science and nanotechnologies. Project outcomes are also enhancing knowledge for applications in optoelectronics.

The Finelumen¹ project is centred on the training of highly skilled young fellows, particularly in the fields of luminescence, carbon nanostructures and supramolecular chemistry. Toward this end, activities are focused on the preparation and characterisation of luminescent

materials in which luminophores are encapsulated within nano-containers such as 'Carbon nanotubes' (CNTs) and coordination cages.

The project's ultimate objective is to create a library of luminescent modules emitting throughout >



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the visible-near infrared region for production of improved hybrid materials. The versatile properties of these materials make them attractive for applications in areas such as bio-imaging, and also for optoelectronic devices and sensors.

Project partners have made advances in the production of CNTs and the testing of various treatments to enable their encapsulation function. Work on luminophores has resulted in

the preparation and full characterisation of numerous inorganic compounds and several organic emitters. Those displaying the most desirable combinations of physical and chemical properties have been selected for encapsulation inside CNTs.

Finelumen team members have discovered how to best insert emitters inside CNTs, and have reached a major milestone with the preparation of endohedral hybrid materials. Success in

producing brightly luminescent CNTs has proved the feasibility of using rare earth emitters for this purpose.

Training through advanced research in chemistry, physics and materials science aims at preparing young researchers for highly qualified jobs in academia and industry. Moreover, this project goal has been approached by attracting students both from within the European Union and beyond its borders, and by

promoting the scientific careers of women.

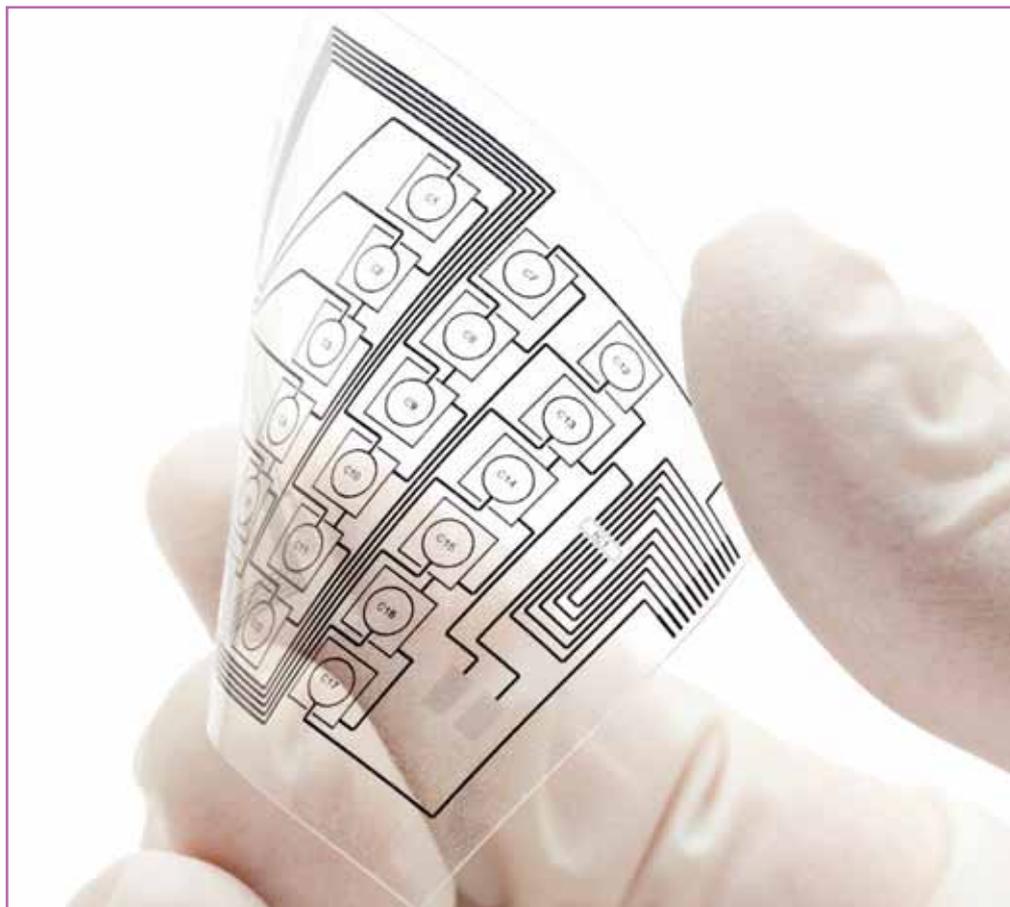
The project was coordinated by the Consiglio Nazionale delle Ricerche, Italy.

- 1 'Cavity-confined luminophores for advanced photonic materials: a training action for young researchers'.

Funded under the FP7 specific programme 'People' (Marie-Curie actions).
<http://cordis.europa.eu/marketplace> > search > offers > 7317

New technology for flexible printed circuit boards

EU-funded researchers have developed a patent-pending process for producing flexible printed circuit boards that could significantly enhance Europe's position in a rapidly growing sector of the electronics industry.



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Flexible circuit boards are a rapidly growing and emerging electronics sector with widespread application for computer peripherals, hand-held devices and telecommunications equipment as well as automotive, aerospace and medical devices.

European researchers, supported by funding for the EMCI¹ project, sought to develop an 'Embedded micro-connector injection' (EMCI) process for the 'Printed circuit board' (PCB) manufacturing industry with a focus on reducing cost and environmental impact.

Given that flexible circuit materials are sensitive to the high temperatures required for lead-free soldering, extensive research was required to develop cost-effective solutions for small and medium-sized enterprises (SMEs). In addition, researchers sought to develop

flexible PCBs and processing techniques compatible with standard 'Surface-mount technology' (SMT).

Research and development (R&D) focused on the necessary machines and tools required for the EMCI process and exploration of the potential for three-dimensional (3D) circuit boards.

A functional demonstrator exhibited good performance capabilities. Commercial exploitation of the many valuable results has the potential to enhance European SMEs' position in the rapidly growing and widely applicable field of flexible PCBs, providing important benefits for business, the economy and consumers alike.

The project was coordinated by ITC Intercircuit Electronic GmbH, based in Germany.

- 1 'Embedded micro-connector injection'.

Funded under the FP6 programme 'SME activities'.
<http://cordis.europa.eu/marketplace> > search > offers > 8597

Toward next-generation magnetic data-storage devices

The electronics industry has achieved tremendous success in enhancing the performance of products by shrinking the size of devices. EU-funded researchers have contributed important technological advances and experimental data related to quantum mechanics and magnetic data storage.



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As the physical limits of size reduction are approached, and given that the maximum amount of storage capacity on disk drives is limited by the size of the magnetic particles on the surface of the disk, a phenomenon called 'Ballistic magneto-resistance' (BMR) has been gaining interest.

BMR refers to a quantum-mechanical effect related to an electron's intrinsic angular momentum or spin that effectively turns the electron into a tiny compass needle. An increase or decrease in electrical resistance in an applied magnetic field provides a sensing device with dimensions similar to those of the magnetic particles on a disk.

Although the field is blooming, numerous contradictions and experimental difficulties exist and scepticism remains.

European researchers launched the BMR¹ project to develop state-of-the-art nano-fabrication techniques, to employ them together with thin-film deposition to produce thin-film nano-constrictions (essentially wave guides for the electrons) and to study BMR behaviour in these various nano-contacts.

Researchers successfully used 'Focused ion beam' (FIB) nano-fabrication to produce 'Current-in-plane' (CIP) and 'Current-perpendicular-to-plane' (CPP) thin-film nano-constrictions and characterised nano-scale spin transport in these devices.

Analysis of extensive experimental data could not confirm the existence of BMR in these devices. Rather, experimentally obtained magnetoresistance data related to constriction size contradicted BMR predictions based on current BMR theory.

BMR results make an important contribution to nano-fabrication techniques that could lead to a new generation of transistor

devices. In addition, researchers have extended the experimental data required to test BMR theories and fostered a better understanding and exploitation of quantum-mechanical phenomena.

Continued research should open the way to new data-storage and spintronic devices and computers, with important implications for the European economy.

The project was coordinated by the University of Plymouth in the United Kingdom.

1 'Ballistic magneto-resistance in thin-film nanocontacts'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'. <http://cordis.europa.eu/marketplace> > search > offers > 8636

Increased applicability of glass coatings

EU-funded researchers have developed a technology to enhance the applicability of glass coatings with important implications for a sagging sector of the European economy.

Coatings are applied to numerous materials to protect them from wear and oxidation. Glass-based coatings are a subclass of such technologies particularly applicable to chemical reactors, injection moulding machines and concrete construction components, among others.

Conventional industrial processes for producing thick glass coatings, such as enamelling and glazing, are limited both in terms of the types and sizes of substrates to which they can be applied, given that they require the use of a high-temperature furnace.

European researchers, supported by funding for the Glascoat¹ project, sought to develop novel processing technology enabling thick glass coatings with enhanced properties and without the use of a furnace.

Specifically, investigators focused on a variation of thermal spraying called flame spraying in combination with near-infrared (IR) crystallisation to develop high-performance nano-structured glass-ceramic coatings and glass-based nano-composite coatings not previously produced. >



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Recent sol-gel techniques were used to produce the nano-structured particles to be used in the flame-spraying process, enabling the deposition of nano-composite coatings, the processing of which previously required the use of very high temperatures.

Investigators employed computational models to simulate and optimise process parameters

and developed novel spray-gun designs for use in flame spraying.

Glascot's technologies should enable the spray coating of glass-ceramics and glass-based nano-composites to substrates of composition and size previously unattainable, with potential applications to machine tools as well as to the textiles and automotive industries. Commercial

exploitation of project results could boost the European glass-coating industry, which is currently in decline due to the lack of knowledge-based development and competition from low-wage countries, making a positive impact on European jobs and the economy.

The project was coordinated by London South Bank University in the United Kingdom.

1 'High-performance glass-based coatings'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace> > search > offers > 8643

Novel super-hard protective coatings

New materials and processes for the production of super-hard thin-film protective coatings, developed by a group of EU-funded researchers, should rival the performance of conventional diamond and cubic boron nitride.

'Super-hard materials' (SHMs) are classified according to a scientific test to determine their ability to withstand indentation or deformation in response to a standardised force.

As a result of their unique properties, SHMs are particularly useful in machine tools, engine parts, gas turbine blades and the like, where moving parts create high friction or function in hot, corrosive environments.

The most well-known and widely used SHMs are diamond and 'Cubic boron nitride' (CBN), although their instability at very high temperatures limits their applicability.

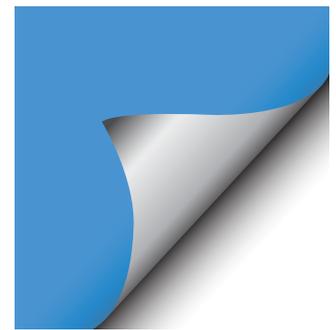
Given that nano-structured materials often exhibit enhanced properties compared to bulk materials and that molecular defects in bulk materials can lead to fractures, nano-structured SHMs have been gaining increasing interest. The Deshnaf¹ project therefore sought to enhance fundamental knowledge about nano-structured SHMs and to improve the properties of nano-composite film coatings applied through various deposition methods.

In particular, researchers focused on two families of SHMs (one containing two hard phases and one containing a hard and a soft phase) and three deposition techniques,

namely 'Physical vapour deposition' (PVD), 'Plasma-assisted chemical vapour deposition' (PACVD) and 'Plasma-assisted physical vapour deposition' (PAPVD).

Deshnaf investigators evaluated the super-hard nano-composite film coatings for temperature stability, oxidation resistance and other properties associated with motion, such as friction and wear. In addition, they evaluated process parameters for optimisation.

Deshnaf project results could provide an alternative to conventional SHMs, such as diamond and CBN, as well as enhancing the future development of super-hard nano-composite film coatings with superior properties, given a better understanding of typical deposition processes. Commercial exploitation has the potential to positively impact numerous industrial sectors



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thus enhancing the EU economy and stimulating production of superior performance components.

The project was coordinated by Euro Consultants Ltd., based in Israel.

1 'Deposition of super-hard nanocomposite films by plasma processing'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.
<http://cordis.europa.eu/marketplace> > search > offers > 8647

Novel thin-film fabrication and evaluation technology

As a result of EU-funded research, new technologies are positioned to advance the state of the art in oxide thin-film deposition — of critical importance to the electronics industry.

Thin films, or layers of materials of nano-scale thickness, have become ubiquitous recently with growing prevalence in the electronics and protective-coatings sectors.

Oxide thin films have become a key focus of the electronics industry, given their unique capabilities for

handling higher voltages than silicon-based electronics, stability at higher temperatures, transparency (imagine transparent electronics) and eco-friendliness.

European researchers set out to develop a novel cost-effective, flexible and sustainable

thin-film deposition process via the 3D-DEMO¹ project.

While many techniques exist for thin-film deposition, the ability to mass produce multi-component oxides with three-dimensional (3D) patterning during the deposition phase in only one step is currently unattainable although key to future device designs.

Investigators developed 'Chemical beam epitaxy' (CBE) thin-film deposition to achieve 3D patterning

in a single step. Results were compared to 'Pulsed laser deposition' (PLD), a process that enables rapid reliable growth of thin films but in smaller quantities.

In addition, researchers developed a modification to 'Near-field scanning optical microscopy' (NSOM), namely 'Heterodyne interferometric NSOM' (H-NSOM), to better investigate patterning and optical uniformity.

Metal PLD thin films exhibited problematic electromagnetic behaviour

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as well as rough and unstable surfaces at high temperatures leading to cracking. In contrast, CBE films of 101-oriented lithium niobate (LiNbO_3) deposited on magnesium oxide (MgO) were smoother and

capable of deposition at lower temperatures, demonstrating the superiority of the CBE process.

Wave guides — special types of electromagnetic transmission lines — were among the devices tested. In addition to successfully implementing the CBE process for manufacture, researchers applied H-NSOM for better definition of spectral properties of $\text{LiNbO}_3/\text{MgO}$ thin-film waveguides.

Overall, 3D-DEMO developed new technology for 3D patterning of thin-film oxides in a single step as well as optical microscopy methods for evaluation of thin-film spectral properties. Exploitation of

results could have an important impact on the European electronics device industry, reducing costs and enhancing mass-production capabilities.

The project was coordinated by the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland.

1 'Single step three-dimensional deposition of complex nano-patterned multifunctional oxide thin films'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'. <http://cordis.europa.eu/marketplace> > search > offers > 8640

Nano-powder ceramics as an alternative to metals

In the future, nano-powder-based ceramics could be used instead of metals in the manufacturing of wear-resistant wood-cutting tools and medical devices, thanks to EU-funded research.



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Cutting tools, gears and bearings are typically made of metal parts. Ceramic nano-powders offer an alternative to metal for the production of wear-resistant wood-cutting tools, as well as parts for medical technology, micro-reactors and micro-sensors.

To exploit their potential, European researchers in the Nanoceram¹ project, set out to develop plasma chemical technology for nano-powder manufacture as along with new technologies for surface modifications of the powders used in standard gel casting, injection moulding and pressing. In addition, they wanted to develop sintering methods for producing dense materials with nano-sized microstructure.

In particular, researchers focused on the use of silicon nitride (Si_3N_4) for wood-cutting tools and yttria (Y)-stabilised zirconium oxide (ZrO_2) for parts in medical technology and micro-devices.

Investigators successfully produced four batches of plasma-processed Si_3N_4 powders of required quality and quantity. In addition, they carried out surface modifications of the nano-sized powders to achieve good particle dispersion and high solid loads.

A gel-casting procedure was developed for manufacture of parts

from pure Si_3N_4 plasma powder or mixtures of it. Manufactured plates were free of defects with excellent bending strength, hardness and fracture toughness.

In addition, parts shaped from Si_3N_4 plasma powder, or mixtures of it, via gel casting, 'Metal powder injection moulding' (MPIM) and 'Cold isostatic pressing' (CIP), were then sintered to optimise sintering regimes.

Milling cutters produced from Si_3N_4 were tested against hard-metal cutters. Although the ceramic cutters produced flakes or fragments, field emission scanning electron microscopy of the edges detected no damage after grinding.

Nanoceram has developed valuable new technology that can enable the production of wood cutting, medical and micro-devices from nano-powder ceramics using standard shaping methods, including gel casting, injection moulding and pressing.

The project was coordinated by Diceram Components GmbH, based in Germany.

1 'Cutting tools and miniaturised parts with complex geometry based on nano powders'.

Funded under the FP6 programme 'SME activities'. <http://cordis.europa.eu/marketplace> > search > offers > 8592

EVENTS

East-Meets-West on Innovation and Entrepreneurship' Congress and Exhibition

The European Office of Cyprus will organise a Congress on Innovation and Entrepreneurship on 1 to 4 September 2012 in Nicosia, Cyprus.

The congress will explore new tools to bring researchers and enterprises together from all over the world. The event aims to harness the potential of entrepreneurship to transfer innovation ideas into products and services. The main objective of the conference is to promote cross-national collaboration between East and West as a tool to overcome national limitations on knowledge, financial resources, technology and services.

For further information, please visit:
<http://www.eastmeetswest.eu.com/>

First European Mineralogical Conference

The first European Mineralogical Conference will take place from 2 to 6 September 2012 in Frankfurt, Germany.

Mineralogy is the study of chemistry, crystal structure, and physical properties of minerals. Specific studies within mineralogy include the processes of mineral origin and formation, classification of minerals, their geographical distribution, as well as their utilisation.

The idea of having a joint conference between European mineralogical societies was launched to foster exchange of new research results between the European countries. The conference programme will include sessions on selected topics, invited talks and an open session.

For further information, please visit:
<http://emc2012.uni-frankfurt.de/index.php?id=4>

Workshop on formal methods and automated software engineering for cloud computing

A 'Workshop on formal methods and automated software engineering for cloud computing' will take place from 4 to 7 September 2012 in Fukuoka, Japan.

The workshop will be a forum for discussion and research about formal verification and automated software engineering for all aspects of cloud computing. Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software and information are provided to computers and other devices over a network. With the development of mobile and Internet applications, cloud computing is becoming increasingly important. More and more data are 'in the cloud'. It is thus very important to have reliable, safe and secure cloud environments. One very promising research area is software composition in cloud computing that is based on web services. Verification of the composition of such web services is a key component, and could take several forms. The event is being organised through the cooperation of six European and Japanese universities: the University of Torino, Italy; the University of Paris-East - Créteil, France; Kochi University of Technology, Japan; the University of Orleans, France; the University of Leicester, United Kingdom; and the French Alternative Energies and Atomic Energy Commission.

For further information, please visit:
<http://tracljfo.univ-orleans.fr/PaPDAS/wiki/ForMASECC2012>

Electronics Goes Green 2012+

The Fraunhofer IZM and Technical University Berlin will organise the 'Electronics Goes Green' event on 9 to 12 September 2012 in Berlin, Germany.

The event is a cutting-edge forum for discussion on electronics and the environment. Leading technology experts and eco-designers will meet for four days of lectures, workshops and networking on this ever-more important topic.

For further information, please visit:
<http://www.egg2012.de/>

'SMARTeST' International conference on implementing flood resilience

'SMARTeST' The conference on implementing flood resilience will be held on 27 and 28 September 2012 in Athens, Greece.

The climate is changing, and floods are becoming more frequent and more intense throughout Europe. Science and flood-resilience technology are advancing towards increased efficiency and reduced damage costs. The conference will address innovative flood-resilience technologies and systems, testing of standards, damage modelling, decision support, and future actions needed. The event will run in parallel with an international exhibition dedicated to flood-resilient technologies and systems for the built environment.

For further information, please visit:
<http://www.floodresilience.eu/conference/>

19th World Congress on Intelligent Transport Systems

The 19th World Congress on Intelligent Transport Systems will be held from 22 to 26 October in Vienna, Austria.

Decision-makers from the fields of politics, business and administration as well as specialists from the fields of IT, telecommunications and automation will present and discuss the latest technical developments in the mobility sector along with the most recent advances in the networking of transport-relevant data. The event will be organised by ERTICO - ITS Europe in cooperation with ITS America and ITS Asia-Pacific and hosted by the Austrian Federal Ministry for Transport, Innovation and Technology (bmvit).

For further information, please visit:
www.itsworldcongress.com

International Conference 'EuroMed 2012' — on cultural heritage

The International Conference 'EuroMed 2012', dedicated to cultural heritage, will be held from 29 October to 3 November 2012 in Cyprus.

The fourth EuroMed conference brings together researchers, policy-makers, professionals and practitioners to explore some of the more pressing issues concerning cultural heritage today. In particular, the main goal of the conference is to focus on interdisciplinary and multi-disciplinary research on tangible and intangible cultural heritage, and the use of cutting-edge technologies for the protection, restoration, preservation, massive digitalisation, documentation and presentation of cultural heritage content.

For further information, please visit:
<http://www.euromed2012.eu/>

FLOODrisk 2012

The second 'European conference on flood-risk management' will be held from 20 to 22 November 2012 in Rotterdam, the Netherlands.

The second 'European conference on flood-risk management' ('FLOODrisk 2012') will explore research advances in flood-risk analysis and innovations in flood-risk management practice. It will consider all aspects of flood risk and will cover the causes of floods, their impacts on people, property and the environment, and portfolios of risk-management measures.

For further information, please visit:
<http://www.floodrisk2012.net/>

Denkmal

The 'Denkmal' trade fair for conservation and restoration will take place from 22 to 24 November 2012 in Leipzig, Germany.

With its combination of trade fair, specialist programme, practical demonstrations, award ceremonies and special presentations, Denkmal has developed an extensive service for exhibitors and visitors that enables the communication of knowledge, the exchange of experience and specialist discussions. The fair's concept, range of exhibitors, schedule of seminars and conferences, and highly qualified, experienced audience of industry insiders makes it a leading trade fair in the field of conservation, restoration and old-building renovation. It is also a contact forum for specialised handicrafts and conservators, historic conservators, architects, building owners and contractors from the private, public and church sectors as well as for interested individuals and lovers of art and cultural heritage.

For further information, please visit:
http://www.denkmal-leipzig.de/LeMMon/denkmal_web_eng.nsf/

PACITA Conference: technology assessment and policy areas of Great Transitions

The first PACITA Conference, entitled 'Technology assessment and policy areas of Great Transitions', will be held from 13 to 15 March 2013 in Prague, Czech Republic.

The conference is open to policy-makers, government representatives, researchers, students and representatives of NGOs, as well as media, experts dealing with the method of technology assessment and the general public. The conference will allow discussion at the plenary session, in parallel sessions and workshops. The workshops will deal with healthcare and medicine, energy supply, climate change and mobility — in addition to the use of computer technology in all areas of society.

For further information, please visit:
<http://www.tc.cz/detail-event/id-1724/>

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