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RESULTS MAGAZINE

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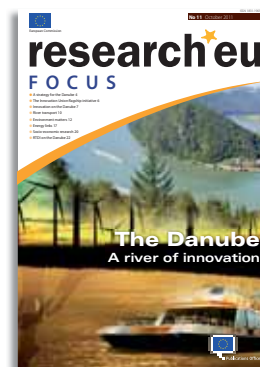
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From farm to fork... ecosystems and food security

Although we may not think about it every day, the food on our plate has to come from somewhere. That somewhere, more often than not, is a farm or a fisherman's net. But, of course, farms and fisheries are dependent on the ecosystems that surround and support them.

Pressure on environments and ecosystems, such as climate change, have knock-on effects for the production of food — and this is already undermining the food security of many people in the world today. The seriousness of these impacts is testified to by the recent setting up of an Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), analogous to the Intergovernmental Panel on Climate Change (IPCC).

According to Professor Augusto de Guimaraes Medina, coordinator of the FAHRE project, interviewed in this issue: 'Changing diet is also required to address food security: based on current trends, feeding the expected 2050 world population of 9 billion people will require an increase of up to 90 % in production of plant calories.'

The challenge of food security will also form part of the discussions at the United Nations Conference on Sustainable Development (Rio+20) meeting in Brazil in June.

This issue of *research*eu results magazine* focuses, therefore, on the relationship between ecosystems and food security — in a sequence of articles starting in our 'environment and society' section with 'Europeans develop innovative, sustainable food packaging product', on page 19.

As well as this special section, our regular 'biology and medicine' section's top story also looks at food packaging, this time from the perspective of nutrition labelling.

In the 'energy and transport' section we investigate a project that allows you to explore your transport options from the point of view of fuel consumption and CO₂ emissions.

Meanwhile, our 'IT and telecommunications' section opens with a project that has developed 'a cheap and fully optical solution for ultra-fast Internet', while the 'industrial technologies' section features an unusual source for improved robotics and automation — the eye movements of very young infants.

The issue ends, as usual, with a list of events and upcoming conferences relevant to fields in research and technology.

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

The editorial team



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Watch this space!

Coming up in issue 13 of *research*eu results magazine* — a special dossier on 'Growth through innovation: success stories from Europe's Public Private Partnerships'.

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BIOLOGY AND MEDICINE



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Interview: Professor Augusto de Guimaraes Medina on food and health research

Coming to an end in April 2012, the FAHRE¹ project aimed to increase the structuring of food and health research and support cooperation towards the European Research Area. Its goal was to provide a comprehensive map of food and health research, and research funding, in the EEA, and identify the key players and processes involved in research funding and policy at regional, national, and transnational level. The project also set out to gather information about the current needs of the research environment in this multi-disciplinary area, and identify the gaps and overlaps.

Strengthening research commissioning in Europe, especially by supporting national programmes, will support the Europe 2020 strategy to promote smart, sustainable and inclusive growth, with better products, better services and better quality of life for European citizens. The project therefore aimed to provide opportunities for decision-makers to discuss ways of ensuring closer cooperation, as well as to develop proposals on strategies for improving funding and policies.

Research*eu results magazine spoke to FAHRE's project coordinator, Professor Augusto de Guimaraes Medina, on the project's findings.

What was new or innovative about the project and the way it addressed these issues?

FAHRE's multidisciplinary partnership is supported by sets of experts gathering

information in 32 countries and across nine different themes, as well as dialogue with a wide range of initiatives, from policy-makers, funding bodies and industry representatives of large companies to SMEs, civil society organisations and researchers themselves. These combined to provide an innovative approach to the challenge of exploring ways to increase coordination of European food and health research and ensure it addresses the key social challenges associated with promoting a healthy diet in Europe.

What are some of the ways that research can contribute to better food, better public policies and a better quality of life?

Unhealthy eating is recognised as one of the major risk factors of non-communicable diseases (NCDs). Better diets will contribute significantly to reducing obesity and meeting

the EU target of lengthening people's average lifespan by two healthy years by 2020.

Changing diet is also required to address food security: based on current trends, feeding the expected 2050 world population of 9 billion people will require an increase of up to 90% in production of plant calories, but the increase needed could be limited to only 35% with a change of diet.

There is a 'knowledge gap' on how to influence diets and eating: we need research to help us better understand the behaviours, policies (including regulation) and actions that will effectively change dietary patterns.

What first drew you to research in this area?

The FAHRE project partnership recognised that in order for research and innovation to

support healthier eating, there was a need to address not only the future direction of European research, but also the accompanying research environment — so that all those who need to be involved have a means to communicate and work together to address the challenge.

What are some of the needs, gaps and capacities that you have identified in food and health research?

FAHRE found that there was a need to focus research on how to achieve healthier eating through changes in food production and individuals' behaviour, for example, as well as governmental policies and regulation. There should be better links between different areas of research relating to food and health — between food technology and medical research, for instance — and more use of social sciences to determine effective interventions.

FAHRE established that there was a need to improve the organisation of food and health research and associated research policy-making to ensure that all those who need to be involved in addressing the challenge have channels of communication that enable efficient use of public money allocated to research.

Furthermore, FAHRE found that while there is great diversity in Europe, few countries have integrated food and health strategies that include research, and there has been little collaboration between countries, particularly at the level of research programming.

What are the advantages of participating in an EU project?

This project has enabled FAHRE partners to combine their different backgrounds and experience in supporting improvements in European food and health research so they can contribute better to the great challenge of healthy eating. The project allowed us to gather information from 32 countries in Europe, providing us with a unique overview of the current situation and allowing us to make proposals for improvements that in turn will have a positive impact on the health and quality of life of European citizens.

What are some of the difficulties you have encountered?

One of the greatest challenges was collecting and analysing such diverse information from 32 countries and across a broad range of disciplines in food and health research. Another challenge was to address the different groups of individuals who need to participate in food and health research, and related policy-making, to ensure that their needs were considered by the project and included in its proposals for improvement.

How did you go about solving them?

A network of external experts with a well-defined brief helped in the gathering of information, which was analysed and summarised by the project partners, allowing us to identify knowledge gaps and other needs from which proposals could be formulated for improvements.

A considerable effort was made to consult with policy-makers, programme managers, SMEs and civil society organisations, as well as researchers from academia and industry at different stages of their career. This allowed us to capture different perspectives and make proposals that support the different roles and contributions that each can make to improving European food and health research.

What are the concrete results from your research so far — where could greater cooperation between countries strengthen the European Research Area in food and health, and how can this be achieved?

FAHRE has provided a position paper summarising its main results and proposals for strengthening the ERA in food and health. The project considers that there are significant risks from weak coordination between European-level initiatives. Moreover, as the greater share of all European research funds is national, it is important to coordinate EU and national research agendas, and to promote exchange of information and cooperation between all the 27 Member States.

The broad range of stakeholders we consulted also addressed other issues for the ERA. Young researchers from nine EU countries recommended increasing the status of early-stage researchers, improving transparency of recruitment (including actions to reduce the impact of language barriers), and providing online information on food and health research organisations and available positions. A survey of major food companies showed their interest in research for product development and competitiveness, concerns about barriers to research (such as access to finance), and support for effective coordination of research. A survey of SMEs indicated the need for improved communication channels with both researchers and policy-makers, including tailored information regarding research results, increased opportunities for networking and participation in partnerships. Access to skilled labour and the ability to allocate sufficient time to research and innovation continue to be barriers to participation.

FAHRE supports the recommendations from the expert group on food and health research, set up by the European Commission's Directorate-General for Research and Innovation, to establish a strategy for food and health research. It proposes that future research be focused on



© FAHRE project

Professor Augusto de Guimaraes Medina

the knowledge gap in how to promote healthier diets, in particular including a greater contribution from the social sciences.

At the European level, benefit can be obtained from assessing and exchanging knowledge from different socio-cultural contexts and policies in different Member States. FAHRE recommends the creation of a 'European Commission inter-service group' on food and health issues; this would help ensure better coordination among EU initiatives and a more ambitious approach to integrating research programmes in all EU countries by extending the role of EU and national structures currently concerned with food safety. Mechanisms need to be put in place to allow programme owners to be informed of proposals, progress and achievements in other programmes.

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

Coordination is crucial for better food and health research in Europe. Our eating is now a great challenge to health — unhealthy eating causing not just obesity, but also many chronic diseases. Research must address prevention and, with industry, create new eating habits through incentives, policies and innovation. For food safety authorities to promote research, both in Europe and nationally, would be a big step forward.

The FAHRE project was coordinated by the Sociedade Portuguesa de Inovacao (SPI), based in Porto, Portugal.

1 "Food and health research in Europe".

BIOLOGY AND MEDICINE

Nutrition labelling: not as effective as you might think

Consumers use nutrition labels to make informed decisions about eating the 'right' foods for better health. But new research from Europe shows how there are limitations on how these labels can be used in real-life situations.

The results are an outcome of the FLABEL¹ project, which received almost EUR 2.9 million in funding under the 'Food, agriculture and fisheries, and biotechnology', or European Knowledge Based Bio-Economy (KBBE), theme of the EU's Seventh Framework Programme (FP7). The findings were presented by FLABEL scientific advisor Professor Klaus G. Grunert in a recent webinar.

The good news is that consumers can understand the information found on nutrition labels and use it to make healthful choices. Even information about vital nutrients, including fat, saturated

fat, sugar and salt, and energy for a range of products is understood and used properly by most consumers. It should also be noted that most consumers can also rank foods based on their level of healthfulness. The situation goes awry, however, when lack of motivation and attention make it difficult for consumers to choose foods based on nutrition labelling.

'Consumers need to be motivated to engage with nutrition information — for instance, by having a health goal — in order to pay attention to nutrition labels,' Professor Grunert says.

The impact of nutrition labels on the healthfulness of food choices is diminished because of a lack of attention. For the purposes of this study, the FLABEL team constructed a mock grocery store experiment, where they tracked the eye movements of shoppers as they selected foods for their shopping baskets. Based on the information they collected, the team found that the average attention paid to nutrition labels was between 25 and 100 milliseconds. This is not enough time for consumers to process the information.

When it comes to motivation, while consumers can pay more attention to nutrition information by being encouraged to look at nutrition labels for longer times, what could potentially help is to provide them with information on key nutrients and energy on the front of the pack in a consistent manner.

'Complementing this information with a health logo can also increase attention to, and use of, the information, especially when the consumer is under time pressure,' says Professor Grunert, who is the founder and the director of the Centre for Research on Customer Relations in the Food Sector (MAPP) at Aarhus University in Denmark. 'The use of colour-coding can increase attention, and use, in certain situations — although the effects are not strong.'

Consumers who participated in the FLABEL project noted they

prefer, and would opt to use, more complex labels that provide more complete information. The FLABEL results also indicate that 'liking' such information depends on consumers' previous exposure to, or familiarity with, the label.

The FLABEL team found that the presence of nutrition information on food labels in Europe is very high. More than 37 000 products across five product categories in all EU Member States, plus Turkey, were evaluated in this study. Overall, 85 % of food products had nutrition information on the back of the pack, and 48 % had nutrition information on the front of the pack. The product categories were biscuits, breakfast cereals, chilled pre-packed ready meals, carbonated soft drinks and yogurts.

The FLABEL consortium was coordinated by the European Food Information Council in Belgium, and consisted of experts from Denmark, Germany, Greece, the Netherlands, Poland, Turkey and the United Kingdom.

1 'Food labelling to advance better education for life'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE). Promoted through the Research Information Centre. <http://ec.europa.eu/research/infocentre> > search > 23953



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Turning waste into health and beauty products

A recent collaboration amongst a group of Mediterranean partners is helping the region use its natural resources more wisely, while at the same time bolstering its reputation as an exporter of health and beauty.

Southern Europe is a leading producer of fine wines, olive oil, tomato paste and other delicacies that make up the famously healthy Mediterranean diet. Behind the scenes, however,

lies a considerable waste management issue arising from the residues left over once the raw materials (grapes, olives and tomatoes) have been processed.

Scientists have long recognised that these residues in fact contain substances of nutritional, medicinal and even cosmetic value. The challenge is to extract them without breaking the bank. Researchers from the region took a closer look at this issue during the Bioactive-NET¹ project, which received funding from the EU.

Before moving forward, it was necessary to look backwards to

gather information about past efforts to separate vitamins, antioxidants, essential oils and so on from the processing residues. Once the best available technologies (BATs) were identified, workshops were organised to transfer this knowledge and demonstrate technical and financial feasibility where possible. The invitees included not only the companies that produce the residues but also those that perform the extraction

and purification, as well as firms interested in converting them into final products.

This information has been shared with the industrial community through a dedicated project website available in several languages. A Bioactive-NET manual has also been produced and distributed to interested parties.

Efforts such as Bioactive-NET are helping farmers in Southern Europe turn their waste products into something valuable, and not only for their pocketbooks.

The project was coordinated by the Verein zur Förderung des Technologietransfers an der Hochschule Bremerhaven e.V. in Germany.

- 1 'Assessment and dissemination of strategies for the extraction of Bioactive-NET compounds from tomato, olive and grape processing residues'.

Funded under the FP6 specific programme
'Food quality and safety'.
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Malaria and the cloak of invisibility

An international team of scientists has discovered a key molecule that helps the malaria parasite evade the human body's immune system. Partially funded by the EU-backed Evimalar¹ project, and presented in the journal Cell Host & Microbe, the findings of this study could provide fresh insight into how the parasite that triggers disease can dodge the defences built by the immune system.

Led by the Australia-based Walter and Eliza Hall Institute of Medical Research, researchers from Australia, Japan, the Netherlands and the United Kingdom identified the crucial molecule responsible for the 'invisibility cloak' the parasite uses to hide from the body's defence mechanisms. This molecule also helps the parasites' offspring remember how to 'produce' the cloak.

Professor Alan Cowman, from the Infection and Immunity division of the institute, and his team looked

for the molecule that controls the genetic expression of 'Plasmodium falciparum erythrocyte membrane protein 1' (PfEMP1), a protein that is responsible for triggering disease during malaria infection.

'The molecule that we discovered, named PfSET10, plays an important role in the genetic control of PfEMP1, an essential parasite protein that is used during specific stages of parasite development for its survival,' explains senior author Professor Cowman. 'This is the first protein that has been found

at what we call the "active" site, where control of the genes that produce PfEMP1 occurs. Knowing the genes involved in the production of PfEMP1 is key to understanding how this parasite escapes the defences deployed against it by our immune system.'

Malaria infection gets a boost from PfEMP1 in two ways: firstly, PfEMP1 allows the parasite to stick to cells on the internal lining of blood vessels; and secondly, it facilitates the parasite's escape from destruction by the body's defences. With respect to the first factor, by sticking to cells, the infected cells cannot be eliminated from the body. As for the second factor, the genetic code of the PfEMP1 protein is modified, thus allowing some of the parasites to pass undetected.

This could be likened to a 'cloak of invisibility', making it tricky for the immune system to detect the parasite-infected cells. This, say the researchers, is one of the reasons scientists have not been able to develop a viable malaria vaccine.

Putting the spotlight on the PfSET10 molecule is the first step in piecing together the puzzle of how the

parasite uses PfEMP1 to hide itself from the immune system.

'As we better understand the systems that control how the PfEMP1 protein is encoded and produced by the parasite, including the molecules that are involved in controlling the process,' says Professor Cowman, 'we will be able to produce targeted treatments that would be more effective in preventing malaria infection in the approximately 3 billion people who are at risk of contracting malaria worldwide.'

Over 250 million people are infected with malaria each year. More than 650 000 people die from this disease annually, and the majority of victims are children.

Evimalar was funded under the EU's Seventh Framework Programme (FP7) to the tune of EUR 12 million, and was coordinated by the Walter and Eliza Hall Institute of Medical Research in Australia.

- 1 'Towards the establishment of a permanent European virtual institute dedicated to malaria research'.

Funded under the FP7 specific programme
Cooperation under the theme 'Health'.
Promoted through the Research
Information Centre.
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BIOLOGY AND MEDICINE



Biosensors help keep pesticides off our plate

Biosensors offer the possibility of not only making sure the food on our plate is free of pesticides, but also helping farmers better protect valuable soil and water resources.

Pesticides are designed to eliminate specific pests and thereby increase crop yields. While purposely unhealthy for the pests, pesticides are also unhealthy for humans who eat the fruit and vegetables to which they have been applied. For this reason, many countries have set maximum residue limits (MRLs), above which the produce cannot be sold.

The costs that companies face when implementing controls can be overwhelming. In an effort

to make legal compliance more economically viable, a group of research organisations teamed up to promote biosensors. Biosensors provide instantaneous feedback and are consequently faster and less expensive than laboratory-based sampling techniques. The project, titled Biodet¹, was supported with funding by the EU.

Not all crops accumulate pesticide residue with the same affinity. The first step was therefore to identify which fruits and

vegetables are most susceptible to exceeding the MRLs. The attention then shifted to the research and development (R&D) community to obtain information about the state of the art in biosensors, with a focus on operationally ready technologies.

Several meetings and events were organised to bring together potential suppliers with customers, namely 'agri-food' companies, as well as academic and regulatory institutions. Following

an in-depth analysis of the knowledge obtained during Biodet, a strategy was developed to stimulate pesticide detection with biosensors. Future R&D actions were recommended to improve end-user satisfaction. To this end, funding from both European Framework Programmes and private investors should be sought. Development of relevant standards and protocols for the use of biosensors can smooth over regulatory obstacles. Finally, the network of experts established during Biodet should be maintained and expanded in years to come.

In addition to consumers, the environment also stands to benefit as improved monitoring will limit the pesticide burden on already strained soil and water resources.

The project was coordinated by the Asociación de Investigación de la Industria Agroalimentaria in Paterna, Spain.



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1 'Networking in the application of biosensors to pesticide detection in fruits and vegetables'.

Funded under the FP6 specific programme 'Food quality and safety'.
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New therapies for childhood cancer in the pipeline

An integrated European research initiative is set to introduce new diagnostics and pharmaceutical therapies, specifically for a form of paediatric cancer. Embryonal tumours (ET) currently threaten the health of an estimated 48 million children in Europe.

Cancer is one of the leading causes of death in European children, second only to accidents. Around a third of these malignancies are ETs, so-called because they are believed to originate in embryonic tissue. Unfortunately,

these often prove resistant to current conventional treatment. Unlike adult cancers, early appearance in a child's development means that the tumour results from only a very few genetic changes. ETs are therefore

ideal research candidates for the investigation of cancer-related genomic changes.

As new diagnostic tools and therapies are required to reduce the high mortality rate from ETs, the

E.E.T.-Pipeline¹ project aimed to establish a unique pipeline for the development of pre-clinical drugs for ETs. To achieve this ambitious goal, a multidisciplinary team followed an integrated approach using high-throughput technologies.

E.E.T.-Pipeline established two channels, one for state-of-the-art diagnostics and the other for novel drug development and

pre-clinical testing. For even more efficient use of resources, both pipelines were linked to a central bioinformatics platform. Meta-analysis further reinforced the integrated approach by linking fresh and existing data on ETs.

Post-genomic research has successfully been translated to applications in the clinical setting of paediatric oncology. Pharmaceuticals developed specifically for ET may be adapted for treatment of morphologi-

cally related cancers such as melanomas and lung cancers.

The project was coordinated by the Universität Duisburg-Essen, Germany.

1 'European embryonal tumor pipeline'.

Funded under the FP6 specific programme 'Life sciences and health'.
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Chewing over DREAM models

Understanding food structure can provide insight into the nutritional and health value of food, and how processing affects these factors. This requires the development of new models.

Food may be our daily bread but, scientifically, there is a lot to digest. Food is complex both in terms of composition and structure. Scientists have a good grasp of composition but their understanding of structure remains incomplete. It is important to improve our understanding of this because structure has a strong influence on human health, and processing often alters it significantly, with consequences for the nutritional value of food.

The DREAM¹ project was funded under the Seventh Framework Programme (FP7) to develop food models with well-characterised structures for simulating the impact of processing on the nutritional and microbiological properties of food.

Developing standard models for each major food category makes it easier for research partners to pool their knowledge and share it with the food industry, particularly small and medium-sized enterprises (SMEs). Scientists also need generic but realistic models that can mimic food structure complexity in order to assess the impact of a change in composition, or of processing conditions, on the nutritional and health properties of foods.

DREAM worked to develop models in four main structural groups:

filled cellular solids (fruit and vegetables), proteinous cellular networks (meat), combined gelled/dispersed/aerated systems (dairy products) and open solid foam (cereal products including bread).

One innovative aspect of the DREAM project involved the application of cognitive science to integrate scientific knowledge and know-how into the development of model foods and their standard operating procedures (SOPs).

The activities of the project focused on integrating mathematical knowledge for numerical food simulation models, including work on cellular solid models and proteinous cellular network models. Efforts were also dedicated to combined gelled/dispersed/aerated systems models and investigation of open solid foam models.

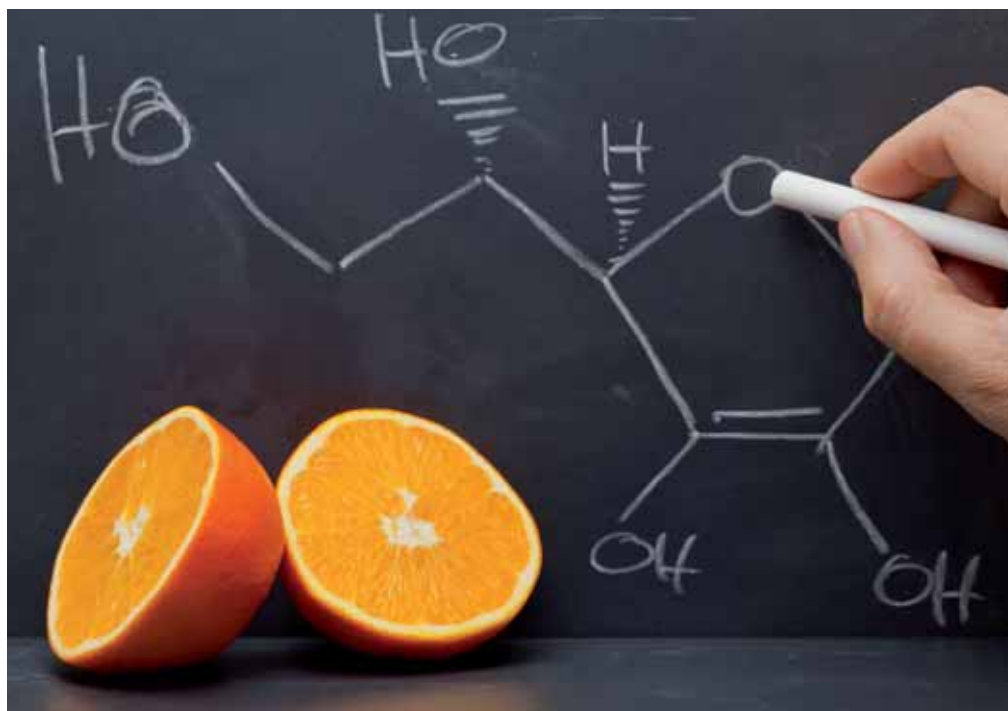
Project partners placed an emphasis on technology transfer and examined the needs of industry, particularly SMEs, to assess the

practicability of the food models and their protocol.

The project was coordinated by the Institut National de la Recherche Agronomique in Nantes, France.

1 'Design and development of realistic food models with well-characterised micro- and macro-structure and composition'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE).
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BIOLOGY AND MEDICINE

Strengthening immunity for South American youth

European research has analysed ways to improve 'antibiotherapy' and vaccines in the fight against childhood mucosal infections. These infections often lead to major health problems in developing countries.

Infectious enteric (gut) and respiratory diseases remain a significant threat to childhood health in developing countries in South America. Many of the bacteria responsible enter the body through the mucosa (moist linings of organs) including the respiratory and digestive tract. The Savinmucopath¹ project studied some of the bacteria causing these potentially lethal infections. The overall aim was to develop effective immune-intervention measures.

Three key species of bacteria that are mucosal and pose the worst damage to public health were selected by the Savinmucopath team — specific strains of *Streptococcus*, *Salmonella* and *Bordetella*. Indigenous to developing countries in South America, they are associated with high rates of sickness and even death in children living in poor socio-economic conditions.

The scientists analysed genetically controlled protein responses

to mucosal infection in animal models. Consequently they were able to screen out the bacterial compounds that induced mucosal immunity. The next step was to identify the protective mechanisms and infection processes that can alter host innate responses to *Streptococcus* and *Salmonella*.

As part of the host's defence mechanism, bacteria are 'sensed' by the recognition of 'Pathogen-associated molecular patterns'

(PAMPs) which bind to receptors in the innate immune system. Potential vaccine formulae that incorporate PAMPs will provide a more effective form of protection, and Savinmucopath scientists demonstrated that use of the molecular patterns can be harnessed to upgrade immune responses to the three bacteria under scrutiny.

Project research resulted in no less than 34 articles published in scientific journals, with plans for more publications. Training was provided through a course in 'Mucosal Innate and Adaptive Immunity' for PhD and post-doctoral students, as well as conferences, which helped the dissemination of information.

Savinmucopath research promises to deliver a profound impact on the development of adjuvants to help fight mucosal infections and the further study of vaccines. As a study on the mechanics of the innate immune system, the project may also provide a platform for investigation into prevention of other diseases.

The project was coordinated by the Institut National de la Santé et de la Recherche Médicale in Paris, France.



1 'Novel therapeutic and prophylactic strategies to control mucosal infections by South American bacterial strains'.



Exploring your transport options, the EU way

How can one drive and protect the environment at the same time? It is an important question, and one that weighs on the minds of Europeans. In an effort to help consumers, the EU is backing a key project that is investigating how ecological issues in traffic are becoming increasingly pressing — as personal transportation is one of the biggest contributors of carbon dioxide (CO₂) emissions. The Econav¹ project is supported by more than EUR 2.3 million under the 'Information and communication technologies' (ICT) theme of the EU's Seventh Framework Programme (FP7).

Researchers led by the Centre for Usability Research and Engineering (CURE) in Austria are developing a new mobile phone application, or 'app', that will inform you of a variety of situations, such as if your driving technique is bad or if you are a worse driver than your peers. You will receive a report card at the end of the week telling you where you went wrong. The app is also being designed to motivate motorists into making more eco-friendly journeys.

The Econav consortium is made up of researchers and business people from Austria, the Czech Republic, Greece, Ireland, the Netherlands and Switzerland. They will help bring the app to market.

Professor Brian Caulfield of Trinity College Dublin in Ireland, a member of the Econav team, says the app will provide directions like any satellite navigation (satnav) system, but it will also help the user make the right choice in environmental terms. Information will be integrated into the system, featuring various

forms of data like a city's transport options. The system will also be able to inform users of alternatives to driving, helping them choose to leave their car at home.

'It will tell you what the most environmentally-friendly and cost-effective modes are and will rank them,' Professor Caulfield says. Users will not even have to input their choice into the system because the app is linked to geopositioning satellites.

So, if you make a bad decision, such as taking the car instead of the train or bus, the app will 'scold' you, advising you about how much money you wasted on fuel. It will also criticise you for expanding your carbon footprint.

The Econav team says the app will link to social media channels and compare how one user performs against another. The partners plan to test the system by December of this year, starting in the Austrian capital of Vienna. More trials are expected in Dublin as well.

The Econav consortium marries expertise from navigation systems, transportation sciences, environmental modelling, artificial intelligence, persuasive technology, human-computer interaction and software development to make this project a success. The project is coordinated by the Centre for Usability Research and Engineering (CURE) in Austria.

1 "Ecological aware navigation: usable persuasive trip advisor for reducing CO₂ consumption".

ENERGY AND TRANSPORT

Modernising photovoltaic surfaces

Changing regulations, costs and consumer sensitivity regarding conventional versus sustainable forms of energy have led to a growing demand for photovoltaic (PV) systems. Given that approximately 90% of the buildings in the market for PV building integration are older, rather than newly built, there is now a demand for a more aesthetic alternative to the typical ultra-modern mirror-like surface of most PV modules.

The BIPV-CIS¹ project was undertaken to address this need by applying CIS thin film technology (referring to the three elements used: copper, indium and

selenium) to developing façade and roof elements which incorporate PV modules that blend in with the building's original materials and design.

The researchers evaluated patterned, matte and coloured architectural glasses for both aesthetics and usability in CIS thin film modules. The team also investigated European building regulations concerning dimensions and construction methods that often prohibit the use of standard PV modules in building integration.

The investigators developed PV roof tiles and façade elements adapted to the visual appearance of conventional architecture. They installed CIS modules outdoors at four locations in Europe and successfully tested one PV façade according to standards for water and air tightness.

In summary, the EU-funded BIPV-CIS project team produced new technology and procedures for integrating solar panels into pre-existing buildings such that they blend naturally with the architecture. Given the push for increased

use of alternative energy sources, together with the fact that the majority of buildings being fitted with PV modules are older ones, the BIPV-CIS project outcomes have the potential to significantly impact the European economy and, of course, lessen dependence on fossil fuels for many Europeans.

The project was coordinated by the Zentrum für Sonnenenergie- und Wasserstoff-Forschung, Baden Württemberg in Germany.

1 'Improved building integration of PV by using thin film modules in CIS technology'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8145



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Better fuel cells on the horizon

The identification of new materials, techniques and substances that enhance the lifetime of 'Solid oxide fuel cells' (SOFCs) may lead to new, more efficient and more powerful batteries in the future.

SOFCs produce electricity directly from oxidising a fuel. They are generally very efficient but suffer from high operating temperatures and age relatively quickly. The EU-funded project REAL-SOFC¹ looked at extending the lifetime of these cells to tens of thousands of hours in different conditions. It also wanted to make them more resistant to fluctuating outside temperatures and fuel impurities.

The project team studied degradation processes and identified new materials to include in the devices. Working closely with researchers and industry, REAL-SOFC considered novel cost-effective materials, protective coatings, low-cost components

and improved manufacturing processes. It also worked on standardising test procedures, as well as dissemination and training initiatives on the latest SOFC technology to raise public awareness.

At the end of the project, the team made significant headway in various areas related to SOFC. It outlined state-of-the-art components necessary to advance SOFC, including the powders needed for cathodes, anodes and interlayers within the cells. The team optimised cathode materials, produced dense-yet-thin internal layers to improve the cells and identified the most ideal conductive steels for them. These advances in technology and several other developments will



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help propel SOFC research much further and bring industry a lot closer to producing much more efficient fuel cells.

The project was coordinated by the Forschungszentrum Jülich in Germany.

1 'Realising reliable, durable, energy efficient and cost effective SOFC systems'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8165

Cutting harmful emissions from biomass combustion

European research has completed a study on biomass combustion and developed new technology to minimise harmful particulate and aerosol emissions.

In the face of Europe's increasing dependency on fossil fuels, using biomass is an alternative way of ensuring security of supply and sustainable energy. Biomass combustion is a relatively cheap fuel source, particularly when residues and by-products such as straw and sawdust are burned. Energy crops are another inexpensive fuel source and include switchgrass, poplar and willow, all grown to create feedstock.

Disadvantages, however, include more air pollution than conventional heating fuels, despite recent advances in combustion technology. Aiming to investigate how to reduce the release of ash-forming compounds, the Bioash¹ project researched fixed-bed and pulverised fuel systems. Project researchers also looked at co-firing, the process whereby part of the fossil fuel supply is replaced with a low-carbon renewable alternative.

Bioash focused on developing new technology for cost-effective and efficient aerosol deposition in small-scale biomass combustion units. Computer-aided simulation tools were improved for advanced models, so as to predict aerosol (sub-micron particles) and deposit formation based on data on release behaviour of the fuel's ash-forming elements.

One of the primary lines of research involved the effects of emissions on human health. Researchers quantified the release of the aerosol-forming elements — such as potassium, sodium, sulphur, zinc and lead — commonly found in biomass materials. Short-term toxicity tests on particulate emissions from biomass combustion and co-firing were compared with those of coal combustion and traffic exhaust.

The project's scientists developed a user-friendly, deposit-formation prediction tool for industry stakeholders, including boiler



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manufacturers and engineering companies with an interest in efficient boiler and furnace design. Furthermore, a newly developed, aerosol-condenser heat exchanger was tested to investigate the possibility of reducing aerosol emissions. The principle behind this innovation is the condensation of aerosol-forming vapours on the heat-exchanger surfaces.

In some European countries, biomass combustion accounts for a significant portion of renewable energy production. The work of the Bioash project promises to clean up emissions and increase the efficiency of this alternative to fossil-fuel consumption.

The project was coordinated by the Technische Universität Graz in Austria.

1 'Ash and aerosol related problems in biomass combustion and co-firing'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8189

ENERGY AND TRANSPORT

Cost-effective energy from the Earth's crust

EU-funded researchers have developed tools to extract geothermal energy. This promises to cut investment costs by more than half, significantly increasing the economic competitiveness of this sustainable, clean source of energy.

Below the Earth's crust is a layer of hot, molten rock called magma that continuously produces heat. The energy is most easily tapped at volcanic sites, often located near tectonic plate boundaries, where the 'cracked' earth allows the heat to escape and form so-called hot spots of very high underground temperatures that heat local fluids and produce steam.

The I-GET¹ project was designed to develop innovative geothermal exploration methods to minimise the exploration and drilling costs that account for 60% of the total investment in a typical geothermal facility.

In order to develop appropriate models that enable the detection of fluids or steam prior to drilling, the researchers evaluated exploration methods used at

the Travale test site in Italy, the Hengill volcanic site in Iceland and the Gross Schönebeck geothermal research well in Germany.

I-GET researchers used a combination of seismic profiles, magnetotelluric (MT) data, transient electromagnetic (TEM) soundings and geophysical measurements to produce reservoir models. The models improved researchers' understanding of the geothermal processes, while a three-dimensional (3D) model of the resistivity structure (related to its ability to conduct heat) of the Hengill reservoir revealed deep conductors (3 to 9 km long) under the geothermal system.

The investigators complemented the field studies with experimental rock physics studies simulating the high pressures and temperatures



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in the reservoirs and 'Controlled-source audio-frequency magnetotellurics' (CSAMT) measurements.

Integrating experimental and theoretical data, the team created resistivity and structural maps of the areas of interest for geothermal investigations, indicating lower resistivities (higher heat conduction capability) in central and south-eastern parts of the region.

I-GET has successfully developed models enabling identification of geothermal regions with high heat conductivity potential without the need for drilling. Given that drilling and exploration accounts for more than half of the investment cost of geothermal energy facilities,

application of the results has the potential to significantly enhance the economic competitiveness of sustainable geothermal energy. Associated benefits extend to European employment, consumer costs and the environment.

The project was coordinated by the Geoforschungszentrum, Potsdam in Germany.

- 1 'Integrated geophysical exploration technologies for deep fractured geothermal systems'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8222

Energising Africa

By working on initiatives that help Africa meet its energy needs through sustainable energy solutions, the EU is helping to alleviate poverty and improve the continent's standard of living.

Africa is arguably the world's poorest continent and would benefit tremendously from sustainable development in the energy sector. The EU-funded project 'Partners for Africa'¹ provided support for renewable energy and related policy-making in the continent. In particular, the project encouraged resource management, public health and businesses

development through local and global partnerships and projects.

Partners for Africa organised a policy dialogue on sustainable energy in South Africa and Zambia, in addition to producing a policy declaration on renewable energy for African countries to combat poverty. It also established a dynamic website

and information exchange platform to foster sustainable energy, highlight related events, provide access to important archives and promote relevant links. The website includes a sizeable list of publications that discuss key topics such as biomass, gasoline blending options, biodiesel production, ethanol production, energy policy and more.

In addition to the website, the project team built a database of contacts for registered users — featuring local, regional and global contact partners — to promote partnerships in the sustainable energy sector. These efforts were complemented by the Partners for Africa newsletter, which provided a forum of exchange for project

partners and stakeholders in the alternative energy sector from around the world.

Publications like the results and newsletter can serve as a basis to steer Africa towards a more sustainable future in terms of energy production, as well as contribute to alleviating poverty. Thanks to initiatives such as this one, a much more sustainable future for Africa could be in the making.

The project was coordinated by WIP-KG, based in Munich, Germany.

- 1 'Renewable energy partnerships for poverty eradication and sustainable development in Africa'.

Funded under the FP6 programme 'International cooperation'.
<http://cordis.europa.eu/marketplace> > search > offers > 8265



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Super-capacitors for hybrid fuel cell applications

EU-funded researchers have produced novel super-capacitors (SCs) that could enhance their widespread use in hybrid cars and stationary power systems. The new technology will bring important cost and health benefits for manufacturers and consumers.

Attention has recently focused on the use of SCs in hybrid electric vehicles. The 'Polymer electrolyte membrane' (PEM) fuel cell charges the SC, which then stores the electricity to power the motor. The fast charge/discharge cycles

of the SC can be used to smooth the required peak power output of the fuel cell, enabling near steady-state operation.

The Ilhypos¹ project was initiated to develop novel SCs employing

improved ionic liquids as electrolytes to produce green, safe, high-power SCs for use in both PEM fuel cell-powered electric vehicles as well as in delocalised small-energy facilities that use PEM fuel-cell technology.

The researchers set out to synthesise novel ionic electrolytic liquids, with enhanced properties at low temperatures and superior performance at higher temperatures. Commercial SCs, based on organic electrolytes, can be hazardous to human health at the temperatures typically encountered in PEM fuel cell-powered electric vehicles and stationary power supplies, which cause the evaporation of 'Volatile organic compounds' (VOCs).

In addition, the research team sought to synthesise 'Electrically conducting polymers' (ECPs), which can be used as the positive electrode, and to identify high surface-area carbons for use as the negative electrode.

The Ilhypos team successfully synthesised and optimised the scaled-up production of three

novel prototype fuel cells, which were tested to verify performance. Specifically, they demonstrated the successful operation in terms of power output, cycle life and cost of symmetric carbon/carbon cells, hybrid carbon/ECP cells and asymmetric carbon/carbon cells, all with an ionic liquid-based electrolyte solution.

Project outcomes have important potential applications for hybrid electric vehicles as well as stationary power units, with significant power, cost and health benefits relative to commercially available alternative technologies.

The project was coordinated by the Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA) in Rome, Italy.

1 'Ionic liquid-based hybrid power super-capacitors'.

Funded under the FP6 programme
'Sustainable development, global change
and ecosystems'.
<http://cordis.europa.eu/marketplace> >
search > offers > 8208



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Harnessing sunlight for very large surfaces

Titania-based thin films incorporating novel nanoscale architectures are very promising for use in industrial and commercial applications. Among others, they have potential as photocatalysts for environmental and health protection, energy production via water splitting and chemical synthesis.

To date, a major obstacle has been insufficient understanding of the relationship between the nano- and atomic-scale structure of these films and the synthetic process required to produce desired end properties and functions. In addition, the synthetic methods must be cost effective and scalable for industrial production.

The EU-funded Natama¹ project was initiated to address these issues and pave the way for widespread industrial application

of photo-activated titania-based thin films. The project built on the expertise of four academic and two industrial partners from three countries and included two end-users.

The consortium produced novel nano-structured materials with precisely engineered architectures as thin films. All synthetic methods were completely new and had never been described before. The most important application for which the films were optimised was the ability to use



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sunlight to generate hydrogen from water molecules.

In addition, the researchers focused on — and successfully developed — a process for coating large areas with the films to increase the commercialisation

potential for use in large solar-activated surfaces. The most promising films were tested using sunlight at a solar power facility near Seville, Spain.

The consortium also developed a new method for



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coating optical lenses used to concentrate sunlight for photovoltaic technology. The coating protected the lenses from ultraviolet (UV) damage, enabled self-cleaning by rainwater, and improved light transmission through the lenses.

To summarise, the Natama project successfully produced nano-structured, visible light-sensitive thin films that performed

equally well if not better than currently available state-of-the-art films. In addition, they were able to coat much larger surface areas than previously possible, demonstrating their certain potential for commercialisation.

The project outcomes should enhance European competitiveness and create new jobs, particularly those related to small and

medium-sized enterprises (SMEs) involved in development of coating equipment and technology, solar technology, water and air purification and anti-microbial coatings for medical equipment, among others.

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

- 1 'Nano engineered titania thin films for advanced materials 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 > 7878

Underground-reaching radar improves rail safety

A sophisticated radar and antenna system has proved successful in monitoring rail tracks, increasing safety and reducing downtime for trains.

Accurate rail safety in today's high-speed trains cannot be monitored by man alone and requires cutting-edge systems to achieve the task. 'Ground-penetrating radar' (GPR) systems are increasingly being used to monitor crucial substructure conditions and geological aspects under the railways.

The EU-funded project Safe-Rail¹ developed a highly advanced GPR solution to further rail safety. The system prototype assessed hidden and inaccessible substructure conditions quickly and accurately, providing an evaluation of rail-track substructure conditions. It was found to improve risk management and accident prevention

while optimising construction and maintenance.

The new on-board diagnostic system interpreted data and provided early warning against possible critical failures by localising deterioration in the rail-track ballast, sub-ballast and sub-grade.

The project achieved its aims by identifying the needs of rail-track owners and maintenance engineers. It then outlined system specifications and design, testing and validating the different sub-systems involved. Once the prototype was ready, the project team tested it in real-life situations in collaboration with end-users.

The resulting system comprises 'Fast substructure array radar' (FSAR), based on an innovative 'Antenna array' (ANTS), and a 'High-performance radar control unit' (HPRCU) supporting train speeds over 300 kmph. It also features a 'Rail-track positioning unit' (RTPU) and 'On-board processor' (OBP) for real-time GPR data interpretation.

The Safe-Rail prototype proved to be very capable in data acquisition, data interpretation and data processing. The project fully succeeded in devising an innovative GPR system that was cost efficient and reduced downtime. The operationally validated system prototype is set to feature on Europe's trains and make transport safer and more efficient.

The project was coordinated by Dáppolonia s.p.a. in Italy.

- 1 'Development of an innovative ground penetrating radar system for fast and efficient monitoring of rail track substructure conditions'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 8186





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Europeans develop innovative, sustainable food packaging product

We are constantly on the go, and products that make our lives easier are always welcome. But keeping products safe is important. This is especially true for the food industry. When fats, oils and other food components are oxidised, the foods we eat lose nutrients and colours. Steering clear of oxidation is crucial for food packaging.

An EU-funded team of researchers has developed a biomaterial from whey protein, as well as a commercially viable method of producing multifunctional films on an industrial scale. This is an advance on conventional films based on petrochemicals. The results are an outcome of the Wheylayer¹ project, which received more than EUR 2.5 million from the 'Research for the Benefit of SMEs (small and medium-sized enterprises)' theme under the Seventh Framework Programme (FP7).

The fruits of their labour are part of a strong European effort to develop a sustainable packing material whose production is both cost-effective and good for the environment. Industry will benefit immensely from this latest innovation because it will help keep their food products safe from oxygen, moisture, and chemical and biological contamination. The upshot of this development is that foods will remain fresh for longer.

Current methods focus on the use of expensive, petrochemical-based polymers — like 'Ethylene vinyl alcohol' (EVOH) co-polymers — as barrier materials. The German Society for Packaging Market Research believes that

over 640 square kilometres (km²) of composite materials using EVOH as an oxygen barrier layer will be manufactured and used in Germany in 2014.

According to the Wheylayer project, natural ingredients in the whey extend the shelf-life of food products. An added bonus is that the whey protein layer is biodegradable.

Commenting on the results of their study, Wheylayer partner Markus Schmid of the Fraunhofer Institute for Process Engineering and Packaging IVV in Germany said: 'We've managed to develop a whey protein formulation that can be used as the raw material for a film barrier layer. And we have also developed an economically viable process which can be used to produce the multifunctional films on an industrial scale.'

To develop the whey layer, the German team first purified sweet whey and sour whey, and then produced high-purity whey protein isolates. Various modification methods were tested to obtain suitable proteins with superior film-forming properties. The proteins withstood the mechanical loads involved because the team mixed them with different

concentrations of various bio-based softeners and other additives.

'All these additives are approved substances,' Mr Schmid explained. 'Our work at the IVV to manufacture a multilayer film of this kind using a roll-to-roll method is a world first.'

The good news for enterprises that would like to make the switch to whey proteins is that this will only require minor modifications to their plants. The researchers said they have applied for a patent on this innovative technology.

Coordinated by the Spain-based Patronal de la Petita i Mitjana Empresa de Catalunya (PIMEC), the Wheylayer consortium consists of experts from Germany, Spain, Ireland, Italy, Hungary and Slovenia.

1 'Whey protein-coated plastic films to replace expensive polymers and increase recyclability'.

Funded under the FP7 specific programme Capacities under the theme 'Research for SMEs'.
Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 23873

ENVIRONMENT AND SOCIETY



Scientists raise red flag on fish sustainability

An international team of scientists has discovered that the effect of fishing for tuna and similar species since the early 1960s has led to a decline in these populations by around 60%. The study, presented in the journal Proceedings of the National Academy of Sciences, was funded in part by the Metaoceans¹ project.

The Metaoceans project clinched a Marie Curie Early Stage Research Training (EST) grant worth EUR 2.23 million under the EU's Sixth Framework Programme (FP6). The results have raised red flags, highlighting how several fish species have been overexploited, and particularly how the majority of tuna fish stocks have been exploited to the limits of sustainability.

Researchers from Canada, Italy, Spain and the United Kingdom have identified that cold-water tuna is the species hardest hit by exploitation, with data showing that their numbers have shrunk by 80%. The Atlantic bluefin and

the southern bluefin are part of this group, which is known for its large size, long lifespan, and significant economic value.

Another species, the mackerel, has also felt the impact of overexploitation on its numbers. Despite being smaller and having shorter lifespans, the decline in mackerel stocks is part of a growing and worrying trend. The study's findings suggest that fishing knows no boundaries: large or small, all species are at risk.

'The results of this study, which are based on a compilation of more precise estimates, show a global situation of tuna

populations that differs from bleaker past interpretations,' explains lead author María José Juan-Jordá of the University of A Coruña in Spain.

A past study, published in *Nature* in 2003, found that numbers of pelagic fish, including tuna, had shrunk by 90% in the last century. Ms Juan-Jordá, a doctoral student, says, 'there are worrying factors that regional fishing organisations should solve in order to ensure a sustainable future in these fisheries.'

The authors of the study note that the management of tuna populations can be a viable solution, but researcher Nicholas Dulvy, one of the authors of the study and based at the University of Simon Fraser in Canada, adds, '... with some species, fishing management needs help. The ones with the highest economic value are the most overexploited. There are clearly still people who benefit

economically from illegal fishing of bluefin tuna, a case in which international trade goes beyond international fishing regulations, which are usually effective.'

Ms Juan-Jordá says, 'fishing management organisations must not just use their resources to manage high-value species, such as large tuna, but also for species of lower economic value, which are important as they are a big source of protein for many developing countries.'

The findings suggest that boosting hauls could continue to be a risky act, and that any global fishing effort must be followed with a great deal of care as demand continues to grow.

'Therefore, everyone must concentrate now on creating a real future for these populations and the fisheries that depend on them,' comments co-author Iago Mosqueira, a fishing scientist from the Joint Research Centre of the European Commission at Ispra, Italy.

Commenting on what needs to be done to ensure the species' sustainability, co-author, Professor Juan Freire of A Coruña University, says, 'serious efforts and effective action are needed to reduce global overfishing, to recover overexploited populations and regulate trade that endangers them. Only then can we guarantee bigger catches, stable financial profits, and reduce our impact on marine ecosystems.'

The project was coordinated by the Marine Research Unit of the AZTI Foundation based in Sukarrieta in Spain.

1 'Elucidating the structure and functioning of marine ecosystems through synthesis and comparative results'.

Funded under the FP6 programme 'Marie Curie Actions — Human resources and mobility'.
Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 23993





Using genomics to study marine ecosystems

A European project has implemented novel genomic tools for studying marine organisms and aquatic ecosystems.

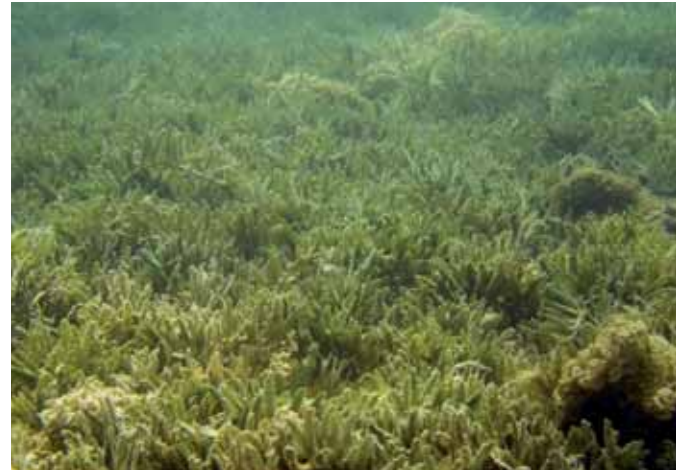
Despite long-active research in the field of marine biology, knowledge of marine organisms and the functioning of ecosystems is rather fragmented. Exchange of scientific expertise and technological resources is vital for understanding aquatic ecosystems and managing marine resources. The Marine Genomics¹ project was an EU 'Network of excellence' (NOE) set up to address these issues.

Network partners initiated collaborations among European research centres with the ultimate goal of developing genomic approaches for studying marine ecosystems, integrating research efforts and disseminating findings.

As a first step, the network ensured that access to existing genomic, proteomic and bioinformatics platforms was made available to stakeholders. Through the development

of genomic and proteomic tools, the network undertook research in the fields of comparative, functional and environmental genomics. More specifically, researchers studied aquatic species, evolution and the development of diversity, alongside marine phytoplankton. The latter was used as a means of examining the impact of environmental stress conditions on the physiological status of natural oceanic populations. To interpret genomic data, the consortium established molecular techniques that would allow them to study how certain genes function in fish.

An important achievement of the Marine Genomics network was the transfer of knowledge on sample preparation and technology application among partners, which was further facilitated through the development of a bioinformatics platform.



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Overall, the Marine Genomics project managed to implement genomic approaches for studying the biology of marine organisms and to integrate research activities across Europe. Research findings also have a wide variety of commercial applications including fisheries management and improvement of aquaculture species.

The project was coordinated by France Innovation Scientifique et Transfert (FIST), the technology

transfer office of the Centre National de Recherche Scientifique (CNRS) in Paris, France.

1 'Implementation of high-throughput genomic approaches to investigate the functioning of marine ecosystems and the biology of marine organisms'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> > search > offers > 7870



Fisheries management goes green

Overfishing, climate change and an imbalance of species in the seas have required more eco-friendly approaches to managing fisheries and the ecosystems they harbour.

Seafood forms an important part of the European diet, creating a need to manage key species

of fish and shellfish. One such management initiative was the EU-funded Because¹ project.

The project identified biological interactions among fish species and their predators to help

formulate new management strategies that preserve the ecosystem. It looked at food web models and studied critical interactions closely, in addition to predicting stock trends by using improved forecast models. This was intended to help manage fisheries better and improve yields.

The Because project examined five case studies with different models and developed simulations to quantify predation mortality, as well as consumption of different prey by predators. The simulations also considered different environments and fishing activities in order to evaluate the fisheries more effectively. This assessment led to refining alternative strategies and outlining controls which considered conflicting objectives and ecosystem management needs. >



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Overall, the project is expected to support governments, global organisations, researchers, environmental groups, marine environments, policy-makers and other stakeholders in management strategies to counter overfishing and address climate change. It has developed an environmental and ecosystem-based approach

to European common fishery policies and management.

In addition, the project has facilitated the incorporation of environmental issues into European fishery policies. Lastly, Because increased the potential for integration of an ecosystem-based approach into management

strategies for the fishing sector. Project results have been disseminated through scientific publications, conferences and online.

The project was coordinated by the University of Hamburg in Germany.

- 1 'Critical interactions between species and their implications for a precautionary fisheries management in a variable environment- a modelling approach'.

Funded under the FP6 programme
'Research for policy support'.
<http://cordis.europa.eu/marketplace> >
search > offers > 7857



Upgrading collaboration for agriculture research

'Agricultural research for development' (ARD) is vital for boosting the sector and helping sustainable development in Africa. Efforts in this direction, like those made by one EU-funded project, can also help the continent meet various Millennium Development Goals (MDGs) aimed at alleviating food insecurity and poverty.

The Paepard¹ project worked to stimulate and improve collaboration among European and African agriculture research for development stakeholders through better opportunities for mutual learning and knowledge sharing. In this way, the initiative aimed to increase the number and value of research projects funded by the '10th European Development Fund' (EDF10) and 'Seventh Framework Programme' (FP7) for African ARD.

The project's main partners and contractors were the Forum for

Agricultural Research in Africa (FARA) and the European Forum on Agricultural Research for Development (EFARD) — through its institutional networks the European Consortium for Agricultural Research in the Tropics (ECART) and the Network of European Agricultural Universities and Scientific Complexes Related with Agricultural Development (NATURA). Project members made an assessment of specific African-European ARD partnerships, together with an online survey of European and African stakeholders, and held three consultation workshops in Africa.

The results and main findings of these activities were published in a 2007 report identifying a number of major constraints critical to the progress of African-European ARD collaboration. According to researchers, ARD partnerships have the following characteristics: there is a lack of information and knowledge regarding funding opportunities; partners come mainly from universities and research institutes resulting in limited private sector or civil society participation; EC-funded coordination mechanisms can do more to facilitate interaction among the various stakeholders; and African partners find it difficult to access EC instruments supporting ARD and encounter difficulties in implementing financial and administrative rules.

Paepard efforts highlighted the importance of a platform linking

the two continents for a 'community of practice' among scientists, farmers and non-governmental organisations (NGOs), as well as the private sector and government officials. Lessons learned emphasise the need for more inclusive research partnerships that also involve non-research stakeholders, neutral intermediaries who can facilitate communication and assist in the formulation of related initiatives, mechanisms and resources supporting dynamic partnerships and an effective information system for relevant information on funding opportunities.

Putting such support mechanisms in place promises to boost initiatives aimed at achieving the MDGs and help Africa benefit from a better coordinated ARD community, offering relevant skills and knowledge for the battle against poverty and environmental threats.

The project was coordinated by the Forum for Agricultural Research in Africa, based in London in the United Kingdom.

- 1 'Building up a platform for African-European partnership on agricultural research for development'.

Funded under the FP6 programme
'Co-ordination of research activities'.
<http://cordis.europa.eu/marketplace> >
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Reconciling aquaculture with marine ecosystems

Rapid growth in the human population has increased the need for food, resulting in the expansion of aquaculture and increased demands on the environment at both the local and global level. Therefore, an EU-funded initiative examined the future environmental, economic and social impacts that may result from developing this industry.

The SAMI¹ project reviewed what is currently known about the increased need for food and the expansion of aquaculture, as well as their impact on the environment at both the local and global level. The aim was to gain a fresh perspective on future developments. The consortium organised a workshop to create a group to review completed and ongoing research in the areas of environment and aquaculture.

Findings by the SAMI writing group were integrated into the environmental requirements of the EU's Common Fisheries Policy (CFP). Project partners also considered views and inputs from other stakeholders, including industry and non-governmental

organisations (NGOs), when drawing up future scientific actions.

Results from the project helped clarify the effect of aquaculture on marine ecosystems and provided a better understanding of water quality models used in the EU's Water Framework Directive (WFD). The WFD regulates aquaculture and other human activities in coastal areas and encourages sustainable development.

Project partners and stakeholders discussed possible future solutions to preventing genetic interaction between farmed and wild fish, and examined alternatives to fishery-derived feedstock. The initiative also investigated other factors affecting the aquaculture



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industry, such as economic development, social issues, the attitude of consumers and legislation. Past developments in the economics of the aquaculture industry were analysed and used to predict future trends.

The SAMI project has played a valuable role in identifying possible future threats from an expanded aquaculture industry. The consortium's findings can help in supplying the nutritional needs of Europe's population while safeguarding marine ecosystems and

the livelihoods of the people who depend on them for a living.

The project was coordinated by the University of Southern Denmark in Odense, Denmark.

1 'Synthesis of aquaculture and marine ecosystems'.

Funded under the FP6 programme
'Research for policy support'.
<http://cordis.europa.eu/marketplace> >
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A new, more comprehensive European Fish Index

The European Union's Water Framework Directive (WFD) aims to safeguard water quantity and quality for all. While the focus is often on humans, the directive also has fish in mind. A new, pan-European indicator will make assessment and comparison of the marine ecosystems they call home much easier than before.

The number and variety of fish present, known as a fish assemblage, is a common measure of the health of a particular lake, river or other body of water. Nature is, however, much more complex. For this reason, the EFI¹ project looked to build upon previous research to

develop an indicator applicable across a wide range of regions and ecosystems.

The first step involved identifying and resolving problems in the current European Fish Index (EFI). For example, the initial formulation of the EFI was based

on data collected primarily in northern Europe. It was therefore necessary to expand the database with studies from southern Europe, in particular the Mediterranean.

During the project, an attempt was also made to incorporate variables relevant to large floodplains, since this aspect had previously not been taken into account. Furthermore, the new EFI integrates output from statistical models that simulate the negative impact of human pressure on these highly sensitive ecosystems.

In the end, two alternative EFIs were designed, each representing an average of several different parameters. Software was developed and made available online free of charge to assist researchers and decision-makers in calculating the new EFIs.

The feedback after initial trials with the new EFIs was positive. Not only can the step of calibration be avoided, but more accurate comparisons between regions and countries are now possible.

Use of the new EFIs will help Europe map the status of its vast and varied water resources in line with the WFD, and consequently contribute to improving wildlife management.

The project was coordinated by the Universität für Bodenkultur in Vienna, Austria.

1 'Improvement and spatial extension of the European fish index'.

Funded under the FP6 programme
'Research for policy support'.
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ENVIRONMENT AND SOCIETY



Preserving mangrove ecosystems for future generations

Mangrove ecosystems have considerable economic as well as environmental value, with many local populations exploiting these natural resources to make a living. European experts travelled to South-East Asia to learn how to reconcile these competing demands in a sustainable fashion.

Mangrove trees have an unusual ability to survive the extreme heat, salinity and wind found in coastal areas in tropical regions. The ecosystems that develop around these trees are equally unique, supporting a variety of wildlife and activities. Pressure from urban sprawl is threatening these habitats, and consequently the livelihood of many of their inhabitants, whether human or otherwise.

European funding was used to develop guidance for countries that are home to mangrove ecosystems. The research took place in the context of the Mangrove¹ project.

Three test sites were selected in South-East Asia, namely Indonesia, Thailand and Vietnam. The Mangrove research team visited the ground at all three sites to collect information about local

communities, mangrove ecosystem products and current levels of management and regulation. Indicators were instrumental in making comparisons between sites possible.

The issue of conflicting interests among the various stakeholders was evident at all three locations. The Mangrove team subsequently employed bio-economic models to determine which best management practices (BMPs) would be most effective. These initiatives were then set in motion and the results were monitored closely.

Feedback from these trials was used to tailor the BMPs to each specific region and situation. The Mangrove findings indicate that a multi-functional approach is essential. In addition, direct involvement of the local communities and strict enforcement of



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regulations are also key factors for success.

The strategies developed during Mangrove can and should be applied to other mangrove ecosystems throughout the region in order to ensure the future of these unique habitats for generations to come. A comprehensive dissemination effort is helping to spread the word.

This project was coordinated by the University of Essex, Colchester in the United Kingdom.

- 1 'Mangrove ecosystems, communities and conflict: developing knowledge-based approaches to reconcile multiple demands'.

Funded under the FP6 programme
'International cooperation'.
<http://cordis.europa.eu/marketplace> >
search > offers > 7830



Food and economic security from ancient grain type

Food security is a growing problem, particularly in hostile climates with large populations. EU-funded researchers evaluated a pseudo-cereal grain, high in protein and resistant to drought and heat, to be used not only as a food but as a crop that can generate income for vulnerable regions of the world.



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Amaranth is a type of invasive plant, high in protein and gluten-free, which was the main source of food in Mexico and South America thousands of years ago. It is particularly hardy, easily flourishing in the hot and arid climates of these regions, and more than 50 species are known today. Although interest in amaranth has been strong, only with the recent advent of more modern technologies has it been possible to study the properties of the various species with the goal of targeted breeding of new varieties.

The Amaranth:Future-Food¹ project was conceived by 11 international partners to provide a basis for effective and sustainable exploitation of amaranth, both for food security and for sale by vulnerable populations.

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The Amaranth:Future-Food team demonstrated that selective breeding of amaranth can successfully produce desired characteristics and that it is easily cultivated under a variety of soil and climate conditions. In addition to being used in its plant form as food for humans or feed for livestock, amaranth oil is particularly attractive to the pharmaceutical industry for

its potential as a nutrient supplement and to the cosmetics industry for use in various hair and body products; thus, its commercial value as a crop is also quite attractive.

In summary, modern technology enabled EU-funded researchers on the Amaranth:Future-Food project to manipulate and characterise amaranth as a crop for food and

industrial exploitation by vulnerable populations in hot and arid regions. The project outcomes support the potential of this high-protein invasive plant to once again provide food and economic security to Central and South America as well as to other similar regions of the world.

This project was coordinated by the University of Aarhus in Denmark.

- 1 'Adding value to holy grain: Providing the key tools for the exploitation of amaranth, the protein-rich grain of the Aztecs'.

Funded under the FP6 programme
'International cooperation'.
<http://cordis.europa.eu/marketplace> >
search > offers > 8096

Values affecting majority-minority interactions

As Europe's borders continue to grow and welcome people of diverse cultures and backgrounds, research and policy development are hard-pressed to understand the dynamics contributing to conflict and cohesion. A new approach considering the role of religious, minority and gender values contributed to enhanced knowledge and understanding of the factors at play.

The WAVE¹ project took a novel approach to the study of how the complex relations between religion, minorities and gender act to influence social change and cohesion in a growing and diverse Europe. It is at the point where these three meet that some of the biggest transitions in value systems take place.

WAVE worked on the assumption that 'cultural identities' and 'values' belong to a set of intangible concepts best understood upon examination of how they are expressed and developed in practice. As such, the EU-funded team investigated the interaction of diverse value systems in the context of welfare provision and

demand as critical markers of the values of any given community. Tied to this are questions of if and how religiously informed values influence conflict or cohesion between majorities and minorities across Europe.

The outcomes of WAVE research pointed to most majority-minority interaction in the domain of welfare lying in a grey area, somewhere between conflict and cohesion. Resource factors including money, space and time are operative in majority-minority interaction; more everyday factors include the role of the media, immigration and employment policies and the role of professionals administering welfare policies.

Project partners also uncovered different dimensions of conflict or tension and of cohesion. In the first case, there may be differences between minority groups or between different generations of the same groups. Furthermore, WAVE research delved into the basic notions of conflict and cohesion, seeking to identify complex relations between the two. For example, conflict may constitute a step on the path towards longer-term cohesion. As such, through case-study reports, the project succeeded in offering indications of situations in which religiously informed values may lead to solidarity or tension. Many times, there is a conflict of interests rather than of values.

Other important developments bring into question uncertainty regarding preservation of diversity and promotion of integration.

There appears to be only a fine line between the two; pressure to conform to the national status quo appears to exist even in the most 'progressive' of contexts with regard to openness to difference. Linked to this, research offered insight into whether minority networks function in an integrating or segregating capacity.

WAVE members generated a list of policy recommendations applicable at local, national and EU levels, and engaged with stakeholders — exchanging views and informing them about project activities and outcomes. Project partners also held the WAVE International Final Conference which contributed to dissemination of results and objectives of broad impact. Research findings have the potential to drive a new approach to minority studies, the dynamics of majority-minority relations, and welfare provision and demand in a growing Europe.

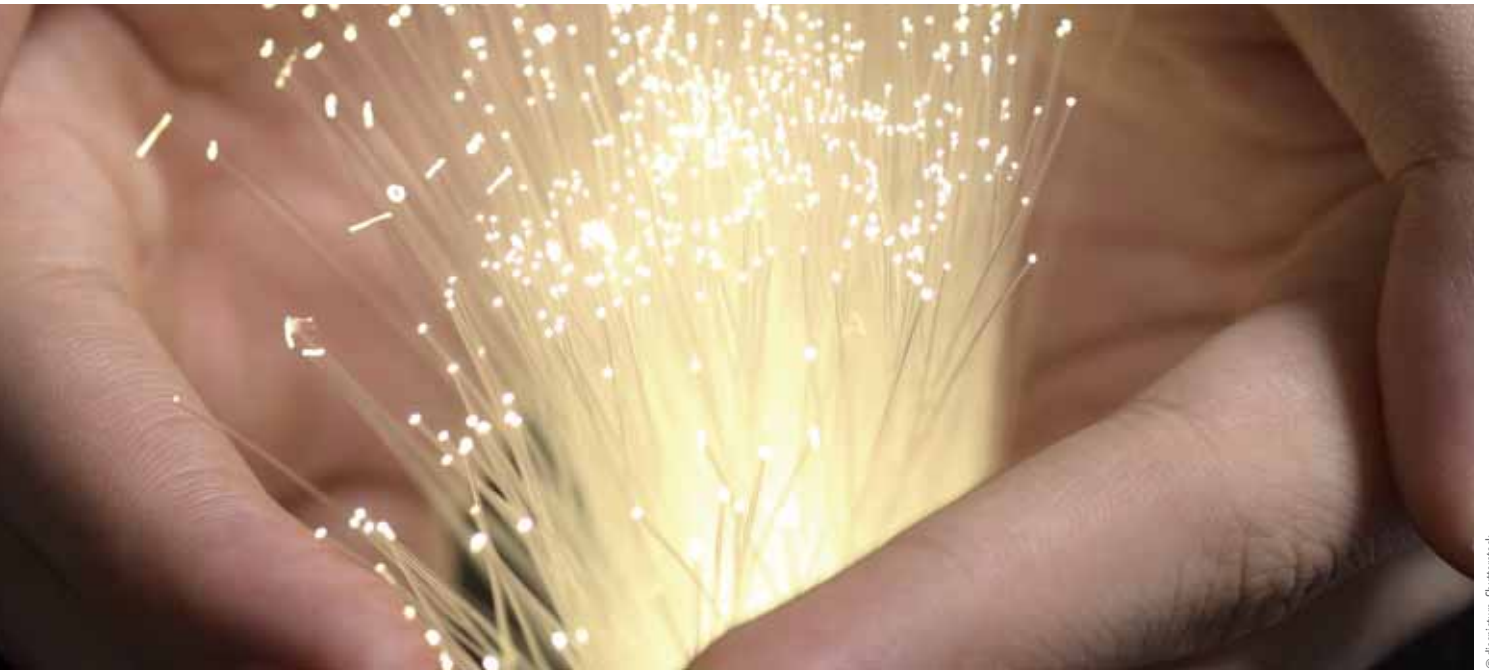
The project was coordinated by the Uppsala Universitet, Sweden.

- 1 'Welfare and values in Europe: Transitions related to religion, minorities and gender'.

Funded under the FP6 programme
'Citizens and governance in a knowledge-based society'.
<http://cordis.europa.eu/marketplace> >
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IT AND TELECOMMUNICATIONS



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A cheap and fully optical solution for ultra-fast Internet

Blisteringly fast Internet speeds, more robust connections and a big increase in network capacity at little extra cost, even in rural areas? It is the sort of fantasy that keeps telecommunication company executives and bandwidth-hungry Internet users awake at night... until now. Ground-breaking fibre-optic technology recently developed with EU-funding is promising all those things and more.

A consortium of universities, research institutes, equipment vendors and one telecom operator joined forces in the Sardana¹ project to develop pioneering techniques to dramatically improve the scalability and robustness of the fibre-to-home networks that already serve millions of European Internet users. Supported by EUR 2.6 million in research funding from the European Commission, the project not only demonstrated connection speeds of up to 10 Gigabits per second (Gbps), around 2 000 times faster than most Internet users experience today, but the researchers showed that such speeds can be achieved at relatively little extra cost using existing fibre infrastructure and off-the-shelf components.

Though still in the experimental stages, the fully optical technology, if deployed commercially, would mark a giant leap forward in fibre network performance, directly addressing one of the biggest challenges currently facing service providers and consumers.

According to some estimates, yearly global Internet traffic will need to be measured in Zettabytes (1 trillion Gigabytes) within the next three years, a four-fold increase from today and the data equivalent of all the movies ever made passing through operators'

networks every five minutes. Streaming video from sites such as YouTube and Netflix will account for most of the traffic, alongside more widespread use of similarly bandwidth-demanding video conferencing and telepresence applications.

European network operators have been warning in recent years that in order to meet this ever-rising demand for more bandwidth and capacity they will be forced to invest billions in new infrastructure and that the cost will have to be passed on to end-users.

The Sardana researchers believe they have found a viable alternative.

'We are proposing a new access network architecture using fibre to the home that provides new functionalities and extended performance,' says Professor Josep Prat, a researcher in the Optical Communications Group (GCO) at the Universitat Politècnica de Catalunya (UPC) and the scientific coordinator of the Sardana project.

Conventional fibre-to-home networks, also known as 'Passive optical networks' (PONs), have a tree-like structure with the telephone exchange central office at their root. 'Passive' refers to their use of optical splitters which

do not require additional power. From there a thick main trunk of cables spreads out into smaller branches to homes and businesses. Conventional tree PONs use 'Time division multiplexing' (TDM), a multiplexing method in which signals are transferred apparently simultaneously as sub-channels in one communication channel, but are actually physically taking turns on the channel. In practice, this means that a 5 Gbps connection at the central office can turn into a 30 Mbps downstream connection by the time it reaches someone's home, with upstream bandwidth usually a mere fraction of that.

From trees to rings

The Sardana researchers are proposing a different and totally new approach, enabling not only much faster connections, but more capacity and robustness. Instead of a single big tree, they are proposing multiple smaller trees branching out to end-users from a main ring. The ring transmits signals bidirectionally from the central office using 'Wave division multiplexing' (WDM), a multiplexing technology that enables different signals to be carried simultaneously on the same optical fibre by using different wavelengths of laser light. At 'remote nodes' along the ring, the signals split off onto single fibre trees to homes and businesses using TDM technology.

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The bidirectional ring approach improves network robustness because if the cable is broken at any location on the WDM ring the signal will still reach end-users from the other direction. It also results in massive increases in connection speed.

'Using WDM on the ring means we can multiply bandwidth by 40 wavelengths so individual users can enjoy 1 Gbps: not just in one direction, but in both directions, both upstream and downstream,' Prof Prat says. 'This could open the door to entirely new applications that are simply not possible today, such as high-definition video conferencing.'

Laboratory tests by Finnish equipment vendor Tellabs were followed by a field trial near France Telecom-Orange's facilities in Brittany, France, and a demonstration at the Fibre to the Home Council (FTTH) in Milan, Italy.

Using emulation technology combined with real-world infrastructure, the tests showed that the network is able to serve between 1 000 and 4 000 users within 20 kilometres of the main ring with symmetric Internet connections at speeds of around 300 Mbps. Separately, the researchers also demonstrated that the technology could be used to transmit optical signals up to 100 kilometres from the central office in order to provide up to

250 homes with asymmetrical 10 Gbps downstream and 2.5 Gbps upstream connections.

Crucially, from a commercial point of view, such improvements can be achieved at little extra cost and the technology maintains network transparency, supporting the use of the same infrastructure by multiple service providers.

'Our approach uses existing infrastructure or involves changing components that can be cheaply upgraded,' Prof Prat notes.

For example, all end-users would need the same 'Optical network unit' (ONU), a device that converts laser signals into electronic signals. In the trials, the Sardana team employed ONU chips developed by Alcatel-Thales, which do not require additional wavelengths to carry out the conversion and return an upstream signal — ensuring the entire network remains fully optical. Similarly, the remote node connections between the WDM ring and the TDM trees are also fully optical, drawing additional power from pump lasers at the central office.

'The architecture is completely passive — it can be buried entirely underground and doesn't require any maintenance,' Prof Prat emphasises. 'Much of the infrastructure is already there: rings exist in metropolitan areas and trees are widely used, though they currently

work with very different transmission technology. Our approach turns this infrastructure into a fully optical passive solution.'

The project partners are continuing to develop the technology, which has already elicited interest from operators in Europe, the United States and China. They are also contributing to several standards bodies, including the International Telecommunication Union (ITU) group NG-PON2, with a view to commercial deployments in the near future.

Sardana, which received research funding under the European Union's Seventh Framework Programme (FP7), was awarded the Global Telecoms Business Innovation Award last year in recognition of innovations that 'will make a difference to the communications sector.'

The project was coordinated by the Optical Communications Group (GCO), Universitat Politècnica de Catalunya (UPC) in Spain.

- 1 'Scalable advanced ring-based passive dense access network architecture'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
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Detecting hidden people and objects

The ability to identify and locate hidden persons or hidden objects using advanced imaging techniques is critical to search and rescue operations as well as to maintaining security and safety. An EU-funded research initiative gave a boost to four European small and medium-sized enterprises (SMEs) involved in commercial development of related technologies, enabling them to compete with the very few organisations in the world that provide such products.

The Radiotect¹ project was conceived to provide support to four European SMEs with knowledge and expertise in 'Ultra wideband' (UWB) technology, thus enhancing Europe's utilisation of its human capital.

The SMEs were active in the area of maximum-length binary-sequence technology. However, they required the research and technological development support of leading universities to develop the best algorithms for data analysis, as well as hardware for speed

and accuracy, in order to produce competitive through-wall and through-dress imaging products.

Radiotect project outcomes included successful development of high and ultra-high resolution radar hardware as well as imaging techniques and algorithms. The SMEs established transnational collaborations and significantly improved their competitiveness. Only a handful of organisations in the world produce ultra wideband imaging products, most of



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which are based in the United States. The Radiotect project outcomes will most likely add a few European organisations to that small and selective list in the near future.

The project was coordinated by the Technische Universität Ilmenau in Germany.

- 1 'Ultra wideband radio application for localisation of hidden people and detection of unauthorised objects'.

Funded under the FP6 programme 'SME activities'.
<http://cordis.europa.eu/marketplace> > search > offers > 8018

IT AND TELECOMMUNICATIONS

Enhanced brain-computer interface promises unparalleled autonomy for disabled

In the 2009 film Surrogates, humans live vicariously through robots while safely remaining in their own homes. That sci-fi future is still a long way off, but recent advances in technology, supported by EU funding, are bringing this technology a step closer to reality in order to give disabled people more autonomy and independence than ever before.

From wheelchair-bound victims of car accidents to people suffering full-body paralysis or locked-in syndrome, millions of Europeans have some form of motor disability that restricts their ability to move, interact or communicate with others.

In recent years, a variety of technologies have been developed to help people with such disabilities live more independent and autonomous lives. Now these technologies are being improved and combined into an innovative hybrid system that will enable users to operate a robot with their thoughts alone, interact in virtual environments, remotely control lighting, heating and other devices in their homes, and more easily communicate with friends and family.

‘Our aim is to give people with motor disabilities as much autonomy as technology currently allows and in turn greatly improve their quality of life,’ says Felip Miralles at Barcelona Digital Technology Centre, a Spanish ICT research centre.

Mr Miralles is coordinating the BrainAble¹ project, a three-year initiative supported by EUR 2.3 million in funding from the European Commission to develop and integrate a range of different technologies, services and applications into a commercial system for people with motor disabilities.

The BrainAble team are working on advanced ‘Brain-computer interface’ (BCI) systems, ambient intelligence (AmI), virtual reality (VR) and other technologies that individually offer important benefits to people with disabilities, but which, when used in combination, promise unprecedented autonomy.

By combining BCI and other assistive technologies, the researchers have developed an application so that a user can remotely control a robot with telepresence features. They can manoeuvre the robot around the house, perform different actions and even communicate with people, all while remaining in bed. Similar technology also enables the user to

operate an avatar in a virtual-reality environment, either to train them to control a wheelchair or robot in a real environment, or for social interaction.

Referring to the BrainAble project specifically, European Commission Vice-President Neelie Kroes pointed out last December: ‘Can you imagine the difference [this technology] could make? A new opportunity to regain independence, to express yourself, and once again be able to do the tasks that most of us take for granted.’

For example, in the case of people suffering from severe forms of paralysis and locked-in syndrome, BCI technology is often the only way they are able to communicate and interact. BCI systems use implants or headsets fitted with sensors to measure electromagnetic waves generated by the brain. Users are trained how to generate electroencephalography (EEG) signals that the system can translate into actions. With a BCI system, someone who may otherwise only be able to move their eyes can type a message to communicate, remotely turn on a light, ask for assistance, control a wheelchair or robot in the real world or an avatar in a VR environment.

Beyond BCI

Despite considerable progress in the BCI field in recent years, BCI

systems remain slow — performing a single action can take several seconds. The BrainAble researchers are overcoming this drawback by embedding intelligence into their platform, so that the system understands the user’s context and habits and can react proactively.

‘If someone normally turns on the TV at 7 pm, then that option will be made available to them in a simplified way on the interface so they can access it more easily at that time. The system learns from users’ habits and tries to understand the context in which they are using it,’ Mr Miralles explains. ‘In addition, we are integrating ambient intelligence so we can passively monitor the EEG signals to determine how tired or alert someone is. If they are tired, then the interface can automatically be simplified so it is easier to use.’

For someone who has some motor abilities, BCI can be used in combination with other assistive computer interface technologies such as eye-tracking or electromyography (EMG) switches that respond to the electrical signals generated by even the smallest muscle movements.

‘For example, a person in a wheelchair might use BCI to control the movement of the chair and then use a switch to open a door,’ the project coordinator explains. ‘This hybrid system offers a greatly enhanced user experience. The aim is to have an adaptable system that is fully customisable to the needs of each user. Some technologies are more useful to people with certain types of disability than others, and as people’s circumstances change so too do their needs.’

The BrainAble platform also includes middleware that enables simplified access to social networking platforms such as Twitter and Facebook, which are becoming increasingly important tools in helping disabled people overcome social isolation.

‘The regular Twitter or Facebook interfaces are too complicated to



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use with assistive technologies such as BCI. So we have written a layer between the assistive technology and the social network interface to facilitate use of the most important functionalities,' Mr Miralles says.

The BrainAble team are combining all the technology and services in a prototype smart home that will showcase the full potential of their work. Crucially, they are closely adhering to smart home standards so that incorporating a new device or service — whether a heating controller or a social networking application — is as simple as plug and play.

The smart home demonstrator will in turn serve to promote the BrainAble results commercially.

'There is a lot of interest in this field of research, and I can envision competitive, mainstream products being on the market within five to seven years,' Mr Miralles says.

Austrian project partner Guger Technologies is planning to incorporate the research results into its BCI products, including adding Aml features to create much more integrated systems. Meanwhile, Meticube, a Portuguese software firm and another Brainable partner, is interested in incorporating BCI and Aml features as a way to improve interaction with devices and services in smart homes, not just for people with disabilities but also for older people and other groups.

'There is a huge market out there for these sorts of technologies, not only people with severe motor disabilities. The elderly, in particular, stand to benefit from this research, and even gamers could use it once BCI technology becomes reliable and fast enough,' the BrainAble coordinator explains.

BrainAble received research funding under the European Union's Seventh Framework Programme (FP7). The project was also selected to be an exhibitor at the recent Innovation Union Convention in Brussels.

BrainAble is being followed up by a new EU-funded project called BackHome, also coordinated by Barcelona Digital. BackHome will

focus on using BCI technology not just for autonomy but also for rehabilitation and the remote monitoring of people with neurological disorders.

The project was coordinated by the Barcelona Digital Technology Centre in Spain.

1 'Autonomy and social inclusion through mixed-reality brain-computer interfaces: connecting the disabled to their physical and social world'.

Funded under the FP7 specific programme Cooperation under the theme 'information and communication technologies'.
<http://cordis.europa.eu/marketplace> > search > offers > 8113



Tracking and tracing for enhanced beef safety

An EU-funded project has proposed a system for tracking and tracing emerging risks in beef production. Based on 'geo-communication' technologies, better information sharing will also facilitate the management of livestock and boost food security and safety.

The OTAG¹ project was a Specific Support Action (SSA) focused on future Community research and technological development policy activities. Dedicated to intensive beef production, these included activities related to monitoring and assessment of food safety and security — in the context of Southern Cone Countries (the southernmost nations of the South American continent) and EU policies.

OTAG partners worked on developing a sustainable, easily understood system for tracking and tracing emerging risks in beef production. Monitoring cattle through their environment — via electronic collars — offers a means of managing regional pasture use as well as the spread of diseases. With this in mind, the project sought to deliver a 'geodecisional' system operational under controlled conditions and using the latest geospatial and geocommunication technologies.

The computational architecture supporting the OTAG prototype has four layers, with the first relating to data collected from electronic devices in the paddock. The information generated is sent via computer to the farm headquarters, where the second layer is responsible for storing data. The data from each farm in the OTAG system is then sent to the third layer through web-service technology. This gathering of data makes it possible to analyse information, at the fourth layer, regarding animal movement within and between farms, using techniques popular for dealing with geo-referenced information.

The logic behind such an approach is best understood in reference to a standing example of where the OTAG system could work. In the case of an outbreak of 'Foot and mouth disease' (FMD), being able to track animal interactions can help localise contaminated



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animals, assist the actions of sanitary authorities, isolate better-producing regions and minimise the impact and spread of the outbreak.

Results of the OTAG project have led to a subsequent project proposal inviting private sector partners to expedite the commercialisation of the proposed prototype technologies. Public-private partnerships can go a long way in efforts to disseminate technological innovations. As such, plans are in place for the OTAG collar technology developed in France to be exported to Argentina and Brazil.

The project was coordinated by the Centre National du Machinisme Agricole, du Génie Rural, des Eaux et Forêts, based in Antony, France.

1 'Operational management and geodecisional prototype to track and trace agricultural production'.

Funded under the FP6 specific programme 'Food quality and safety'.
<http://cordis.europa.eu/marketplace> > search > offers > 8133

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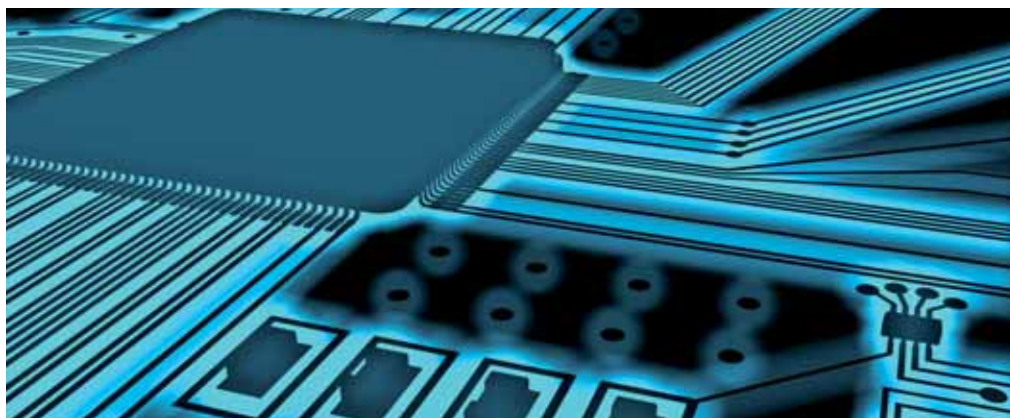
A groundbreaking, waterless approach to microchip-making intelligence'

The tiny, high-speed computer chips found in every modern electronic device bear little resemblance to their bulky, slow ancestors of decades ago. Different materials, new designs and new production techniques have ensured successive generations of integrated circuits offer ever more performance at lower cost. Ground-breaking EU-funded research is helping to continue the trend.

Moore's Law — the observation by Intel co-founder Gordon E. Moore that the number of transistors on a chip, and as a consequence the processing power, doubles

modern microchip. Specifically, the Copper team developed a process that enables reactive metals to be used directly as a barrier between copper interconnects and the

Until the mid-1990s, aluminium was the metal of choice to fill the interconnect 'vias', the small trenches in the silicon that carry electrons between the transistors.



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approximately every two years — has been accurate for more than half a century. Today, we carry more computing power in the mobile phones in our pockets than could fit into a house-sized computer back then. But in order to squeeze more transistors into a smaller space — and ensure Moore's Law continues to hold true — chip developers have to be increasingly innovative as chip components are shrinking into the 'nano' scale.

Sometimes they have to think completely outside the box. That was the approach taken by the Copper¹ project, in which researchers from eight organisations — companies, research institutes and universities — in four countries solved a key problem of chip manufacturing. In the process, they have opened the door to an entirely new field of research in the semiconductor industry.

Supported by EUR 3.15 million in funding from the European Commission, the researchers focused on the methods and materials used to interconnect the billions of tiny transistors on a

silicon wafer of the chip by using non-aqueous solvents instead of water-based ones — a world first in the semiconductor industry.

'As the number of transistors on a chip increases, so too do the lengths of interconnects between transistors. Because interconnects have a certain resistance, this increase in length causes an increase in the time delay in communication between transistors — it's an impediment to chip performance,' explains Professor Jan Fransaer, a researcher in the Department of Metallurgy and Materials Engineering (MTM) at the Katholieke Universiteit Leuven in Belgium.

If the interconnects can be made smaller, chip performance improves. But now that chip features have reached the 22nm scale — around 3000 times smaller than the width of a human hair — there are new obstacles to further reductions in length.

The problem in a nutshell

In grossly simplified terms, the problem goes something like this:

Aluminium was sufficiently conductive to meet the performance requirements of the transistors — then numbered in the millions on each chip — and unlike other more conductive metals such as copper, silver and gold it did not diffuse into the silicon, a process that over time would ultimately destroy the circuitry.

But as chips got smaller and their transistor counts increased toward the billions, faster interconnects were needed. A more conductive metal had to be used. Hence, semiconductor manufacturers switched to copper as an interconnect material. This in turn required that they do something to prevent the copper diffusing into the silicon, a problem they solved by adding something known as a 'diffusion barrier', a layer of another metal that protects the silicon from the copper. The diffusion barrier of choice is a metal called tantalum.

So far, so good: the tantalum diffusion barrier now protects the silicon from the copper in the interconnect vias.

The deposition of the copper interconnects is carried out by a process called 'electrodeposition' in which an electric current is passed through a solvent solution to coat metal ions on to the vias. An aqueous (i.e. water-based) solution is the usual solvent.

But there is another problem: tantalum oxidises immediately in water, so until now manufacturers have had to first coat the tantalum diffusion barrier with copper — a so-called seed layer that protects the tantalum from the water just as the tantalum protects the silicon from the copper.

The seed layer is applied using a 'Chemical vapour deposition' (CVD) process.

'Why can't we just use the seed layer for the interconnects? Because CVD is a line-of-sight process: it lays down enough copper to coat the tantalum but not enough to make continuous interconnects. So we still have to do electrodeposition on to the copper seed layer to fill the vias with enough copper to make the interconnects,' Prof Fransaer explains.

In essence, chip manufacturers have been playing 'Russian dolls' at the nanometre scale.

'It sounds stupid — solving one problem generates another problem — but this fix has worked okay until now,' Prof Fransaer notes.

So what has changed? Scale. The copper seed layer is 5nm to 10nm thick, so at scales of less than 22nm that layer — which serves no other purpose than to protect the tantalum diffusion barrier from oxidation during chip production — ends up taking up way too much space.

The answer? 'Change the solvent,' says Prof Fransaer.

Solving the solvent issue

Instead of using water, the Copper project team developed an innovative process using

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non-aqueous solvents such as liquid ammonia and ionic liquids. These do not cause tantalum to oxidise, hence allowing electrodeposition to occur without the need for the copper seed layer. The result is that because the interconnect vias can be smaller, chip size can be further reduced, transistor count increased and chip performance greatly improved.

'Electrodeposition using liquid ammonia and ionic liquids has been done before, but this is the first time that this process has been used in the semiconductor industry,' Prof Fransaer says. 'This technique will certainly help enable a continuation of Moore's Law at least for a few more generations.'

To develop the process, the team studied different wafer materials and electrolyte ingredients for the non-aqueous solution, investigated their physical properties and used analytical and simulation

techniques to determine the best approach. They then used micro-modelling of the process before building a proof-of concept demonstrator.

'We were really delving into *terra incognita*. It was totally uncharted territory, as prior to the Copper project not a single paper had been published on using non-aqueous solutions in the semiconductor industry,' the project manager notes.

Unsurprisingly, the project generated considerable interest from chip makers when the team presented their results at international conferences.

'There was definitely a lot of interest, though we can't say for sure if anyone has used our research as a basis to use this process commercially. Nonetheless, I think it's only a matter of time before non-aqueous solutions start being used now that we've shown it can be done,' Prof Fransaer says.

Although ammonia — which needs to be pressurised to stay in liquid form — or ionic liquids are less abundant and more expensive than water, the cost of using them is a 'non-issue' for the multi-billion euro semiconductor industry, Prof Fransaer points out.

'Moving from aqueous to non-aqueous solutions would have only a miniscule impact on cost in the grand scheme of things,' he says.

Perhaps even more significantly, the team's research has opened people's eyes to other possibilities, not just with tantalum but also other metals and not just for semiconductor applications.

For example, members of the project consortium are planning a follow-up project using elements of the Copper project's research to work on improving heat dissipation for power electronics, of the sort that will be needed in the smart

electricity grids now being rolled out in Europe and elsewhere.

'A lot of elements — among them all the so-called noble metals — can be electroplated from water, but a lot cannot: aluminium, silicon, germanium, etc. We have shown that by using a non-aqueous solution, some of these can also be electroplated. That opens up a whole new range of applications that probably weren't thought possible before,' Prof Fransaer says.

Copper was coordinated by the Katholieke Universiteit Leuven, Belgium.

1 'Copper interconnects for advanced performance and reliability'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
<http://cordis.europa.eu/marketplace>search>offers> > 8196



Better data and analysis for more effective fisheries

European national and regional authorities have expressed their interest in developing tools and methodologies resulting in more efficient and cost-effective fisheries management. EU-funded researchers developed a prototype information management system together with a proposal for policy implementation at the fisheries management level that could be just what authorities were seeking.



The ISTAM¹ project set out to coordinate scientific activities related to data management and monitoring for better fisheries management on the part of national and regional authorities.

The ISTAM team evaluated numerous national monitoring systems and their users to understand current management problems and then designed a prototype information system fully compatible with currently existing international programmes. The prototype incorporated fish stock assessment, as well as resource allocation and resource dynamics evaluation, together with a database of geographic layers.

The researchers also created an online atlas with automatic geostatistical estimation of parameters of interest as well as a policy implementation plan to be used by those involved in fisheries management.

In summary, the ISTAM project responded to the need expressed by national and regional authorities

for better scientific information to be used for better fisheries management. The project team delivered a software tool addressing the major limitations of national monitoring systems that promises to provide a more accurate picture of a fisheries' fish stock situation and facilitate better resource allocation, resulting in enhanced sustainability and profitability.

The project was coordinated by the Institut de Recherche pour le Développement, based in Paris, France.

1 'Improve scientific and technical advice on fisheries management'.

Funded under the FP6 programme 'Research for policy support'.
<http://cordis.europa.eu/marketplace>search>offers> > 8090

IT AND TELECOMMUNICATIONS

Maintaining Europe's competitive edge in wireless communications

Ever since the roll out of the GSM mobile phone standard, Europe has been a world leader in mobile and wireless communications. But European academia and industry cannot afford to rest on their laurels. In order to maintain Europe's competitive edge, EU-funded researchers are working on technologies that go far beyond the next generation of wireless and mobile communications.

'European industry faces something of a chicken-and-egg situation in the wireless and mobile communications sector,' argues Marco Luise, a professor of telecommunications at the University of Pisa in Italy. 'Companies have put a lot of time, money and effort into developing applications and technologies that can quickly be brought to market and they have benefited from this. But their focus on the short term has come at the expense of fundamental research for the long term: the result is a slow decline in product innovation.'

transmission, and are the first capacity-achieving codes to be successfully decoded. Developed by Erdal Arıkan of Bilkent University in Turkey, one of the Newcom++ partners, the work was recognised with a Best Paper Award from the Information Theory Society.

'Bandwidth is a key issue: if you have a wireless one megabit (Mb) Internet connection today you will want a 10Mb connection tomorrow and a 100Mb connection the day after that,' Prof Luise, the technical manager of Newcom++, explains. 'Therefore

A large-scale collaborative research initiative supported by almost EUR 5 million in funding from the European Commission, Newcom++ continues the work of a predecessor project, Newcom, which helped plant the roots for widespread collaboration among European researchers in wireless and mobile communications.

The project team also helped train young researchers in the field, set up an online collaboration platform and database to share knowledge, and produced a series of books and publications that analyse in depth future needs, challenges and solutions. Over the coming years, the results of their work promise to play a key role in everything from providing cheaper, faster and more secure wireless Internet access to expanding the capacity, range and functionality of mobile networks.

'The technologies we developed go beyond the LTE 4G standard now being deployed for mobile communications... they are not next-generation technologies, but rather "after-next-generation" technologies,' Prof Luise explains. 'By working on them, we hope to help Europe regain its prominence in the field of wireless and mobile communications.'

'A lot of this research — dealing with capacity, bandwidth, localisation and security, for example — could be implemented for the next generation of smart phones after 4G, but some of it goes beyond that, even touching on abstract areas such as information theory,' he notes.

Training a new generation of researchers

The Newcom++ team's long-term approach has also been evident in another key aspect of the project: the training of young researchers in the mobile and wireless communications field. Over the three-and-a-half years that the network was formally in operation, a series of winter and summer schools were held in different cities across Europe. At each school, between 40 and 50 students had the

chance to learn first-hand from some of the leading researchers in the field.

'If we want Europe to remain a leader in communications technology in the long term, we need to ensure that there are new researchers and new ideas to drive innovation,' Prof Luise says.

Many of the researchers involved in the 'Network of excellence' are continuing to use a collaborative online platform called the 'Virtual center of excellence on wireless communications' (VICE-WiCom), that was set up by the partners to enhance knowledge-sharing and collaboration among universities and research institutes. The platform has even been used for a PhD distance-learning course.

Other tangible outcomes of the cooperative attitude towards research are two books, 'The NEWCOM++ Vision Book: Perspectives of Research on Wireless Communications in Europe' and 'Satellite and Terrestrial Radio Positioning Techniques', that have been published by different teams involved in the project.

The partners have also established a Belgium-headquartered non-profit group, the European Association for Communications and Networking (Euracon), to focus primarily on education, training and event organisation in the mobile and wireless communications field.

A follow-up project, aimed at establishing a network of European laboratories focused on further developing wireless technologies, is also planned.

Newcom++ was coordinated by the University of Pisa, Italy.



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Less innovative products and technologies — from smart phones and other mobile devices to wireless protocols and data-transmission systems — puts Europe at risk of losing its competitive advantage in the field amid the rise of competing products and technologies, particularly from Asia.

'It's an endless slope that is very hard to get off of once you're on it,' Prof Luise explains.

But now European researchers have stepped in to stop the slide. For more than three years, 18 universities and research institutes in 14 countries have cooperated on fundamental research as part of the Newcom++¹ project.

Breakthrough technologies for beyond 4G

Among many technological breakthroughs to emerge from the 'Network of excellence' is a new class of channel codes for the reliable transmission of data over wireless networks. So-called 'Polar Codes', they hold the promise of a large increase in bandwidth, allowing mobile devices to dramatically increase the speed of data

technologies that can do more with the bandwidth and channels available are very important.'

The project partners worked on a range of technologies that go far beyond the current state of the art in mobile and wireless communications. For example, Newcom++ researchers at the Polytechnic University of Turin, Italy, worked on advanced decoding algorithms for 'Multiple-input and multiple-output' (MIMO) technology in which both the transmitting and receiving devices have multiple antennas to improve communications.

New 4G 'Long-term evolution' (LTE) smart phones already make use of MIMO technology, but the Newcom++ researchers developed techniques to further improve the performance of multiple-antenna systems at low cost. Other work focused on so-called cooperative communication, which allows a MIMO mobile device to cooperate with other mobile devices in the vicinity to connect to a base station — a multiple-hop approach that not only extends the area of coverage but also increases transmission speed.

1 'Network of excellence in wireless communications'.

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Infant eye movement and cognition

Interactions between infants and their environment are limited because of infants' poor motor abilities. So investigating infant cognition is no easy task. Which sensory event is the result of an infant's own motor action and which is not? Researchers from the Frankfurt Institute for Advanced Studies and from Goethe-Universität Frankfurt am Main in Germany may have found the answer.

Their research was funded in part by the IM-Clever¹ project, which is supported under the 'Information and communications technologies' (ICT) theme of the EU's Seventh Framework Programme (FP7) to the tune of EUR 5.9 million.

Despite the challenges to studying infant cognition, one approach is to observe eye movements as these become quite accurate and precise early in life. In this latest study, presented in the journal *PLoS ONE*, researchers used real-time eye-tracking to put six- and eight-month-old infants in direct control of their visual surroundings. This allowed the team to evaluate the problem of discovery of agency, which experts define as the ability to infer that some sensory events are triggered by one's own actions.

Their results show that infants quickly learn to perform eye movements which control the appearance of new stimuli. Infants, therefore, have the capacity to discover new ways of controlling their environment.

'In contrast to previous paradigms for studying infant cognition, based on looking behaviour, our paradigm gives infants direct control over the physical environment, allowing them

to change what is "out there" with their eye movements,' the authors of the study write. 'Such gaze-contingent paradigms based on eye-tracking have been explored with adult subjects before, but only recently has it become possible to apply eye-tracking to infants. The ability of infants to quickly discover new ways of controlling their environment, which we demonstrate here, paves the way for truly interactive new paradigms for studying infant learning and cognition, and may provide a basis for novel training and medical intervention strategies.'

Infants can discover novel forms of agency, according to the team. These babies learn to manipulate their environment by using their eyes in a gaze-contingent paradigm. This occurs when the infants select fixation targets that generate specific sensory outcomes. They also have the ability to quickly anticipate the outcomes of their actions.

'Previous approaches to studying instrumental conditioning in infants were limited by the comparatively crude and stereotyped motor skills that they considered, including sucking and leg kicking,' the authors write. 'The central advantage of the gaze-contingent paradigm is that it taps into a large repertoire of discernible actions

(eye movements to various objects or locations, or possibly eye blinks) that infants can perform.'

The team says gaze-contingent paradigms based on eye-tracking technology could be beneficial in comparison to classic non-eye-tracking paradigms for investigating infant learning and cognition.

The team writes: 'First, they extract very rich and detailed behavioural data. Second, they allow studying various aspects of infant cognition in an interactive fashion, giving young infants, who are very restricted by their language and motor abilities, the possibility to communicate with and act on the outside world. Third, by putting infants in control of their environment, gaze-contingent paradigms are likely more engaging and satisfying for the infant.'

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

¹ 'Intrinsically motivated cumulative learning versatile robots'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.
Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 24153

INDUSTRIAL TECHNOLOGIES

Manufacturing of the future is here now

Although automation in manufacturing has become relatively commonplace, its potential for further development is great and was recently demonstrated by EU-funded researchers. The researchers created a software platform enabling active decision-making, self-diagnosis and repair, as well as dynamic reconfiguration, in a way that promises to revolutionise the field of manufacturing as a whole, significantly enhancing European competitiveness.

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The INT-MANUS¹ project was initiated to address many of the problems faced by today's manufacturers and to dramatically enhance production processes.

The researchers developed the 'Smart-connected-control platform' (SCCP) — incorporating a learning agent and virtual reality system — together

with so-called mechatronics, the synergistic integration of mechanical and electrical engineering with intelligent computer control.

The resulting prototype SCCP was capable of proactive maintenance, self-calibration, dynamic reconfiguration and self-diagnosis and healing. Human operators were integrated seamlessly into the maintenance and diagnostic process via augmented-reality systems and hand-held computers. The workers were able to overlay important data with real parts and machines in the production process and to provide valuable information not easily available from the sensors. Intelligent robots moved goods throughout the plant on routes determined 'just in time' and customers designed their own products in the virtual environment with specifications again implemented 'just in time'.

In summary, the INT-MANUS project delivered a fully functional prototype SCCP that could easily be applied to any manufacturing plant and that promises to revolutionise the way production plants are run in the very near future, with the potential for enhancing the competitiveness of European manufacturing.

The project was coordinated by the Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung e.V., based in Munich, Germany.

1 'Intelligent networked manufacturing system'.

Funded under the FP6 programme 'Information society technologies'.
<http://cordis.europa.eu/marketplace> >
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Advancing processes for plastics manufacturing

EU-funded researchers have optimised the process of injection moulding and identified the software requirements for improving its efficiency. Accurate three-dimensional (3D) prediction of moulded shapes will be beneficial for the plastics industry.

Injection moulding is one of the most common plastics manufacturing processes, producing polymer parts for a range of applications. As a result, the demands for process control, stability and properties insurance are quite high. Furthermore, the emerging use of injection moulding for micro products necessitates deep understanding of the physics of the processes involved.

The PIAM¹ project was designed to develop a new generation

of predictive tools for polymer injection moulding. As an initial step, researchers identified issues related to existing software packages and data acquisition processing. The potential of these software packages to be extended to other polymer systems was also examined, and the capabilities of new ones were specified.

Newly developed software offered reduced computation times with more than 1 million unknowns and improved 3D modelling of



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INDUSTRIAL TECHNOLOGIES

the injection moulding process. Project partners performed advanced physical investigations of thermoplastic polymers and more complex systems. Additionally, some new experimental devices were constructed allowing for measurement of crystallisation mechanisms and pressure-volume-temperature characteristics, as well as kinetics under severe conditions.

Introduction of these data into the 3D injection moulding software allowed project partners to master the various stages of the process and predict various parameters — including macromolecule and fibre orientation, as well as polymer crystallisation.

Project deliverables will advance current practices of injection moulding and could lead to

new applications for injection-moulded parts.

The project was coordinated by the Association pour la Recherche et le Développement des Méthodes et Processus Industriels, based in Paris, France.

1 'Polymer injection advanced moulding'.

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 > 8352

Groundbreaking nanotech for limitless applications

A new class of porous materials called 'Metal organic frameworks' (MOFs) has gained widespread attention over the last 5 to 10 years for its ability to store small and medium-sized molecules and even objects in its pores. EU-funded researchers made groundbreaking progress in broadening the fields to which these amazing nanomaterials are applicable.

The MOFs consist of organic ligands joined together by metal ions. The resulting molecular framework can be loaded with other binding molecules to produce physical and chemical transformations. In addition to their superior adsorption capacities, the MOFs are characterised by their capacity for modular and

rational design and construction, making their potential applications nearly limitless.

When the Surmof¹ project was initiated in 2005, MOFs were starting to receive more attention as having potential applications in hydrogen storage for electric automobiles. This particular

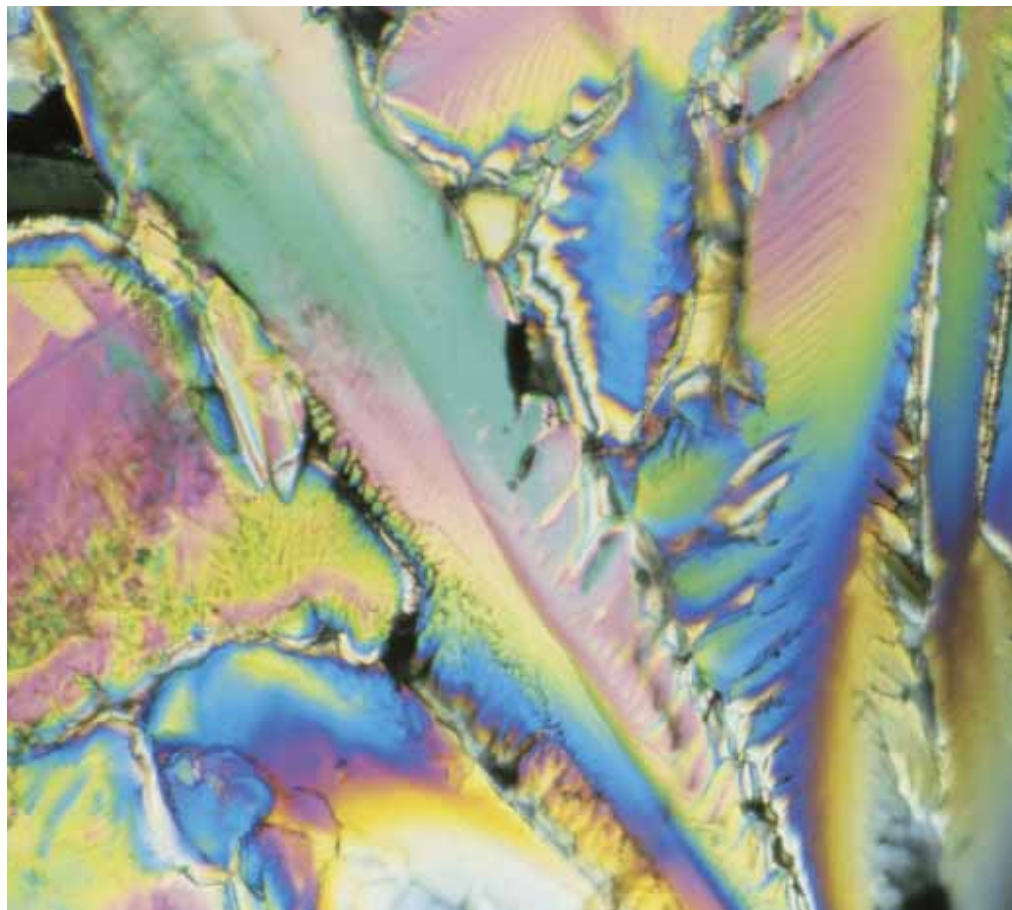
application was suitable for MOF materials in powder form. However, the foresight of the EU-funded researchers led them to propose the development of a methodology for deposition of MOFs on solid substrates, a technology non-existent at the time of the project proposal and

one that could open the door to numerous advanced applications.

By the end of the project, the Surmof research team successfully developed a layer-by-layer method known as 'Liquid-phase epitaxy' that is now the basis for MOF desorption on solid substrates. Nearly all work published on MOF deposition on substrates references work done by partners within the Surmof project.

The Surmof project team have provided state-of-the-art methodology that has become the recognised world standard for MOF deposition on solid substrates. Further research, and commercialisation of concepts based on the outcomes, could lead to significant advances in sensor technology and electronics, positioning the EU for a leading role in a very large sector, creating jobs and generating income for European citizens.

The project was coordinated by the Ruhr-Universität Bochum in Germany.



1 'Anchoring of metal-organic frameworks, MOFs, to surfaces'.

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 > 8295

INDUSTRIAL TECHNOLOGIES

Low-cost, high-performance capacitors

Wireless devices have become more and more complex over the last decade, spurring the need for ever smaller, low-cost and low power-consumption microelectronic system components. European researchers have developed new technology for the production of high-performance capacitors and demonstrated its performance by integration into a pacemaker.

Capacitors — electronic devices that store energy — are particularly important in electronic devices. For example, approximately 80% of

integration challenge, requiring more and more capability while using less and less space. The researchers set out to fabricate

manufactured and used as separate components).

The researchers investigated two types of ceramic materials in their search for the appropriate one with which to make thin ceramic films for high-performance capacitors. The materials of choice were 'Calcium copper titanate' (CCTO) and 'Lead zirconate titanate' (PZT). Although PZT capacitors are not regulated, given the health hazards of lead the researchers sought to optimise use of lead-free CCTO. The team conducted numerous experiments to characterise materials and deposition methods with a focus on producing a high dielectric constant, the value associated with the ability of a capacitor to store charge or, in essence, do its job.

The final outcome was the integration of high-dielectric capacitors into a pacemaker in collaboration with an industrial partner, demonstrating a novel low-temperature, high-dielectric material technology for future

high-density, or ultra-low profile, metal/insulator/metal decoupling capacitors.

In summary, the Camelia project contributed valuable knowledge and technology to the field of low-cost, high-performance thin-film on-chip capacitors. Given the ubiquity of capacitors in electronic devices, and the growing need for a new generation of capacitors such as those developed for the Camelia project, the outcomes could significantly enhance European competitiveness in the wireless electronic devices market.

The project was coordinated by University College Cork of the National University of Ireland.



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the surface of the integrated circuit of a mobile phone is devoted to single passive components, particularly capacitors.

The Camelia¹ project aimed to respond to the technology

thin-film capacitors on-chip (as part of the microchip) enabling the delivery of high-frequency decoupling capacitors with significant space savings and performance superiority compared to discrete chip capacitors (those

1 'Monolithic above in ultra high value capacitors for mobile and wireless communication systems'.

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 > 8106

Low-cost inkjet system for electronic circuit boards

The development of a novel, low-cost inkjet printing system for producing flexible electronic circuits has the potential to tremendously enhance the competitiveness of thousands of European small and medium-sized enterprises (SMEs).

Most people are familiar with the rigid 'Printed circuit boards' (PCBs) used in a plethora of electronic components. The plastic or fibreglass board itself is non-conductive. Conductive 'wires' typically made of copper are printed on to the board to connect the attached compon-

ents into a functional electric circuit.

The Flextronic¹ project was initiated in response to increasing competition from the Asian printing market for the European printing industry, in particular for European SMEs.



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INDUSTRIAL TECHNOLOGIES

EU-funded researchers set out to develop a novel and cost-effective laser-inkjet printing system enabling the printing of well-defined copper circuit tracks on flexible polymer and barium-titanate films.

Investigators successfully developed surface techniques for ultraviolet (UV) laser ablation of 10 different polymer and barium-titanate films using an excimer laser. Furthermore, they formulated materials with viscosities suitable for use in inkjet printing

and seeding on polymer films. Together with software control of the laser and inkjet printing head, the Flextronic project produced a novel laser-inkjet hybrid system capable of printing copper circuit tracks on flexible films.

Commercialisation of the results could have an important impact for European SMEs currently in the printing sector by enabling them to tap into the huge market for flexible printed circuits. In addition, many SMEs in the electronics sector could use the

technology to improve the quality and functionality of the circuits they currently manufacture.

Overall, Flextronic project outcomes have the potential to dramatically enhance the competitiveness of thousands of SMEs in the EU, while creating jobs and improving the quality, functionality and cost of consumer electronics.

The project was coordinated by Uvasol Ltd in Loughborough, the United Kingdom.

- 1 'The development of a novel laser-inkjet hybrid printing technology for additive printed, high resolution, mass customised conductive copper tracks'.

Funded under the FP6 programme
'SME activities'.
<http://cordis.europa.eu/marketplace> >
search > offers > 8349

New materials for renewing European bridges

An EU-funded initiative has enhanced the manufacturing process for various bridge components. The project's success with new materials and methods promises to boost the renewal of transport infrastructure.

The HP Future-Bridge¹ project set out to develop materials and technologies for bridge renewal based on the use of 'Fabric-reinforced polymers' (FRPs) as an alternative to concrete and steel. Researchers selected arched and girder bridges for further research after a preliminary review of the existing infrastructure in different countries.

The arch design significantly reduces the load on the beam elements and thus their material cost; in addition, it requires a flexible deck, well suited to the use of FRPs. Team members optimised the arch design in terms of geometry, support conditions, deck systems and manufacturing. Furthermore, they developed a special resin for use in the joint systems to obtain the required strength traditionally achieved with steel and concrete. Finally, the technical characteristics of the materials were evaluated.

In order to optimise technical performance and cost effectiveness of girder bridges using FRP, project partners evaluated a finite-element model of the beam designed for the girder bridge. They subsequently constructed two pilot girder

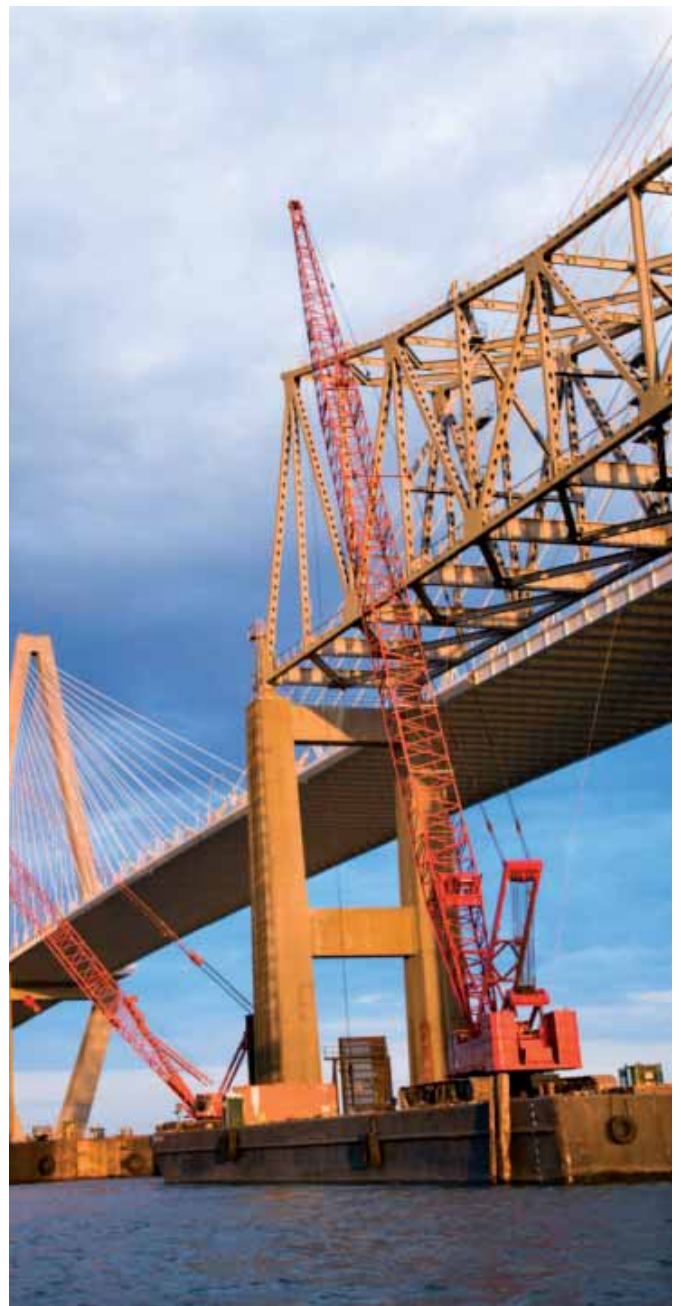
bridges. The reduced weight of the bridges' components permitted the placement of the beams using a simple truck-crane. The structures passed all required tests and were deemed operational.

HP Future-Bridge research has led to development and extensive testing as well as evaluation of new materials and technologies for rapid bridge renewal. Experimental results supported the technical feasibility of using FRPs for such renewal. Further research should help decrease manufacturing costs of the relevant materials and facilitate commercialisation of the technology.

The project was coordinated by Acciona S.A., based in Madrid, Spain.

- 1 'High-performance (cost competitive, long-life and low maintenance) composite bridges for rapid infrastructure renewal'.

Funded under the FP6 programme
'Sustainable development, global change and ecosystems'.
<http://cordis.europa.eu/marketplace> >
search > offers > 8285



EVENTS

‘Today’s science for tomorrow’s management’

An event entitled ‘Today’s science for tomorrow’s management’ will take place from 3 to 7 June 2012 in Venice, Italy.

For many years, society has relied on coastal and marine ecosystems, for food, recreation, transportation, and more. And yet, the overuse of these resources can upset the balance of the entire ecosystem if taken for granted. Recent decades have seen a range of issues emerge that could potentially have significant risks in the long term on the trajectory of coastal environments and the uses society makes of them. These issues have raised awareness, and in some cases, motivated investment of funding, research and management efforts.

The event will look at the fundamental natural and social sciences for estuaries, coasts and marine areas, and emphasise the links to integrated and sustainable management of these areas. The agenda will also examine the evidentiary basis, current data, and future predictions surrounding issues related to coastal areas.

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

Sixth International Conference on the Fundamental Science of Graphene and Applications of Graphene-Based Devices

The Sixth International Conference on the Fundamental Science of Graphene and Applications of Graphene-Based Devices will take place from 4 to 8 June 2012 in Delft, the Netherlands.

Graphene is an allotrope of carbon, with a structure of one-atom-thick planar sheets that are densely packed in a honeycomb crystal lattice. A growing number of experts are researching how graphene can be used in a variety of fields, with some calling it the next ‘miracle material’. Not only is graphene one of the thinnest possible materials, but it is also about 200 times stronger than steel, conducting electricity better than any material known at room temperature.

The conference will be an opportunity for researchers to discuss and exchange information on graphene’s physical properties, advances in its growth and chemical processing, manufacturing graphene-based devices, and emerging applications of this new material.

For further information, please visit: <http://www.graphene-week.eu/>

Week of Innovative Regions in Europe 2012 (WIRE2012)

WIRE2012 will be held from 4 to 5 June 2012 in Krakow, Poland.

The conference will focus on smart regional development based on knowledge and innovation. WIRE2012 will address the main current issues related to the effective implementation of the Innovation Union at regional level for the period 2014-2020, through three main thematic pillars:

Innovative regions in the Horizon 2020 programme will investigate the role of regions in smart specialisation, the role of cities as innovation hubs, and regional innovation ecosystems;

Stairway to Excellence will focus on the future of research and innovation at the regional level, on synergies between Horizon 2020 and the Cohesion Policy, and on smart specialisation in convergence regions and centres of excellence;

Networking for ERA at Regional Level will discuss the European Territorial Cooperation, networks of clusters, European Groupings of Territorial Cooperation, networks of research infrastructure and Multiregional Knowledge Partnerships (e.g. Danube, Baltic).

Participation in the conference is free of charge, but pre-registration is required.

For further information, please visit: <http://www.wire2012.eu/>

Infoday on ‘The Ocean of Tomorrow 2013’

An Infoday on ‘The Ocean of Tomorrow 2013’ will be held on 6 June 2012 in Brussels, Belgium.

The Infoday is for everyone interested in the research opportunities offered by ‘The Ocean of Tomorrow 2013’ cross-thematic call -- that means researchers and research institutions, universities, industry, small and medium-size enterprises (SMEs), civil society organisations and National Contact Points (NCPs).

The event is organised back-to-back with the Theme 6 ‘Environment (including climate change)’ Infoday (7 June) to facilitate the participation of all interested parties.

Registration will be possible through the dedicated Infoday website.

For further information, please visit: http://ec.europa.eu/research/bioeconomy/fish/research/ocean/index_en.htm

5th Familial Cancer Conference

The 5th Familial Cancer Conference will be held from 7 to 8 June 2012 in Madrid, Spain.

The conference will include learning objectives such as:

- To update recent advances in familial cancer;
- To better define the genetic profile of these cancers and the clinical management of families and patients;
- To analyse the impact of the new technologies and their contribution to familial cancer risk.

It will cover topics including:

- General concepts in familial cancer: genetic variants, variants of unknown significance; modifier factors; genetic counselling;
- Common cancers: breast cancer and the family of breast cancer genes; selection criteria and clinical management; new treatments; colorectal cancer and prostate cancer; genetic and clinical management;
- Other hereditary syndromes: Familial pheochromocytoma; pancreatic cancer; Birt-Hogg-Dube syndrome; familial melanoma;
- Rare tumours: Fanconi anaemia; Dyskeratosis congenita; genetic syndromes of the RAS/MAP pathway; Li Fraumeni syndrome;
- New technologies applied to familial cancer studies: integrative genomic analysis; cancer genome and personalised medicine; whole exome sequencing in the search of high susceptibility genes.

For further information, please visit: <http://www.eso.net/events-2.html>

20th European Biomass Conference and Exhibition

The 20th European Biomass Conference and Exhibition will be held from 18 to 22 June 2012 in Milan, Italy

For over 30 years now, the European Biomass Conference and Exhibition has combined a renowned international scientific conference with an Industry Exhibition. The European BC&E is held at different venues throughout Europe and ranks on top of the world's leading events in the Biomass sector.

It provides a high-level scientific programme and parallel events which attract participants from a wide-ranging background: researchers, engineers, technologists, standards organisations, financing institutions and decision-makers.

For further information, please visit: <http://www.conference-biomass.com/>

Industrial Technologies 2012

An event entitled 'Industrial Technologies 2012' will be held from 19 to 21 June 2012 in Aarhus, Denmark.

Industrial Technologies 2012 will offer integrated coverage of nanoscience and nanotechnology, materials, and new production processes.

The conference will highlight the knowledge of intensive products and processes driving European growth to 2020, identifying solutions to improve the framework conditions for innovation in Europe.

For further information, please visit: <http://industrialtechnologies2012.eu/>

Rio+20 Conference

The United Nations Conference on Sustainable Development (Rio+20) will take place in Brazil on 20 to 22 June 2012.

At the conference, world leaders, along with thousands of participants from governments, the private sector, NGOs and other groups, will come together to shape how we can reduce poverty, advance social equity and ensure environmental protection on an ever-more-crowded planet.

The event marks the 20th anniversary of the 1992 United Nations Conference on Environment and Development (UNCED), in Rio de Janeiro, and the 10th anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg.

The Rio+20 Conference will focus on two themes: a green economy, in the context of sustainable development poverty eradication, and the institutional framework for sustainable development.

For further information, please visit: <http://www.uncsd2012.org/rio20/>

The 'Energy and Materials Research' Conference (EMR2012)

EMR2012 will be held from 20 to 22 June 2012 in Torremolinos-Málaga, Spain.

The conference will bring together researchers and professionals from a broad set of science and engineering disciplines with the aim of sharing the latest advances in materials and processes involved in energy generation, transmission and storage.

For further information, please visit: <http://www.formatex.org/emr2012>

Final Marie Curie FP6 Conference: Marie Curie Actions shaping the European Research and Innovation Landscape

The final Marie Curie FP6 Conference will take place on 3 and 4 July 2012 in Brussels, Belgium.

The conference is intended as a celebration of the achievements of the more than 14000 Marie Curie fellows funded under the Sixth Framework Programme (FP6). It will provide a unique opportunity to showcase results and career successes. The event has been conceived in a modern and innovative way: a TED-style format focusing on mobility, research and innovation.

Through this event, the European Commission's Directorate-General for Research and Innovation intends to show the main results achieved and the main lessons learnt.

For further information, please visit: <http://ec.europa.eu/research/mariecurieactions/events.cfm>

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