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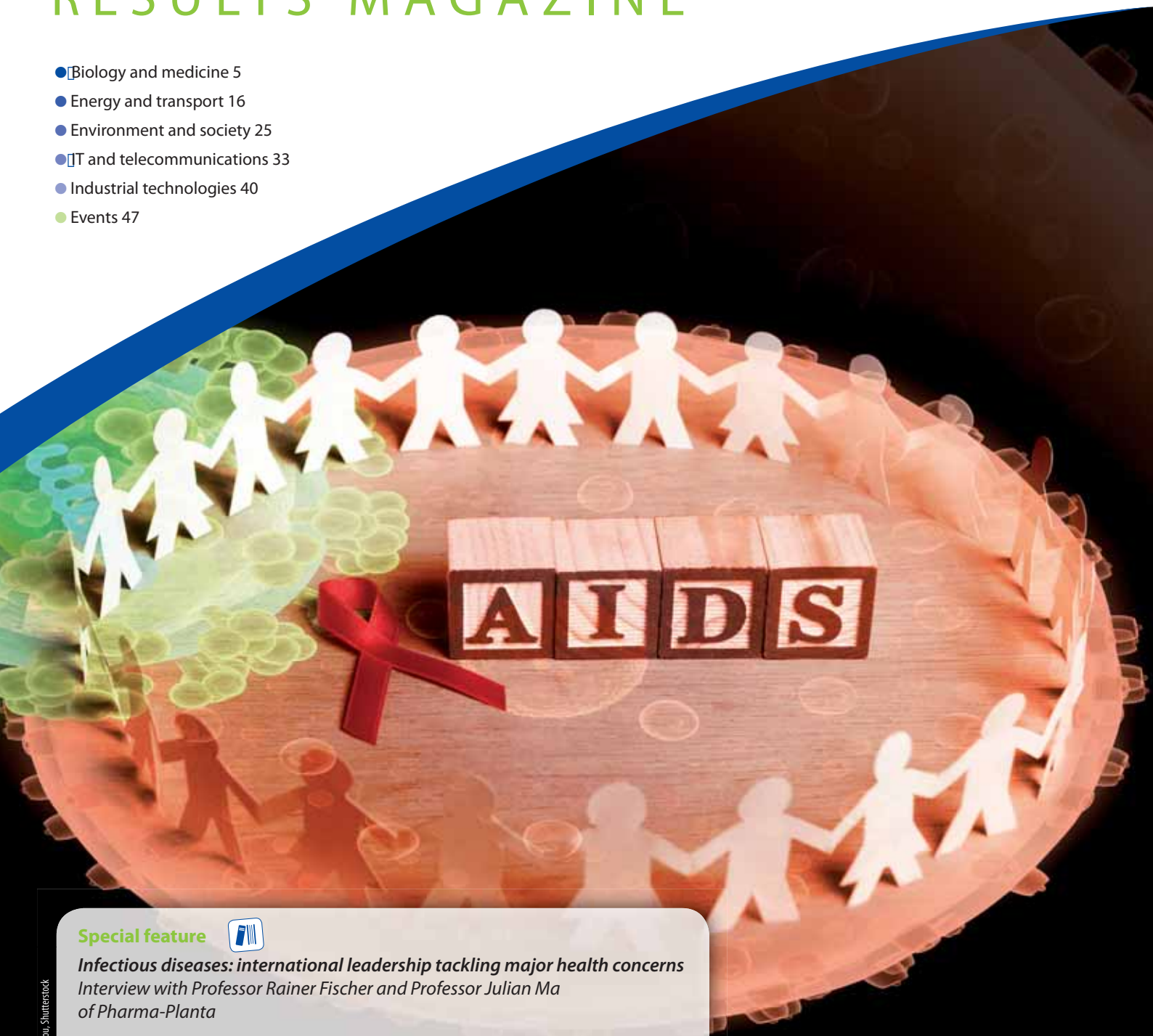
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RESULTS MAGAZINE

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Special feature



Infectious diseases: international leadership tackling major health concerns
Interview with Professor Rainer Fischer and Professor Julian Ma of Pharma-Planta

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Gyn Nilsson

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Our common cause

The black plague that ravaged most of Europe in the 14th century is thought to have killed between 30 to 60 % of its population. The exact cause of the disease and its number of victims is still in dispute.

But its impact on society, reflected in art, history and story has not diminished. Today, deadly infections — many of them preventable — continue to claim lives all over the world. Many of those who suffer from such afflictions as malaria and AIDS are deprived of basic medical treatment.

On 1 December, World AIDS Day reminds us that over 50 000 people are diagnosed every year with HIV in the EU and neighbouring countries. While effective treatment of the human immunodeficiency virus (HIV) exists there is still no cure, nor preventive vaccine.

But incredibly, after decades of research, there is a perhaps a renewed sense of hope. The EU-funded 'Recombinant pharmaceuticals from plants for human health' (Pharma-Planta) project is developing pharmaceutical proteins made in plants to produce affordable medicine on a massive scale. They created an antibody that neutralises HIV and human clinical trials are already under way. We speak to Professor Rainer Fischer and Professor Julian Ma, two Pharma-Planta researchers who discuss the science behind the project and its possible worldwide implications.

*Indeed, the extraordinary research conducted in the EU against such infections is the reason why we dedicated this issue of research*eu results magazine to 'Infectious diseases: international leadership tackling major health concerns'.*

But first we start off the issue with an article in the biology and medicine section on a new approach to tackling malaria through protein synthesis.

The energy and transport section leads with an article on how new technology could turn olive oil production waste into efficient biofuel.

Next in the environment and society section we take a closer look at how the world views Europe and its role on the world stage.

In our IT and telecommunications section, EU researchers are developing mobile technology to support HIV treatment in India.

The industrial technology section leads with a story on a project that aims to develop enhanced tools to better diagnose tumours.

The issue then ends with a list of events and upcoming conferences in the field of research and technology.

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

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- Thank you to Professors Rainer Fischer and Julian Ma of the Pharma-Planta project for their contribution to the 'special' dossier in this issue

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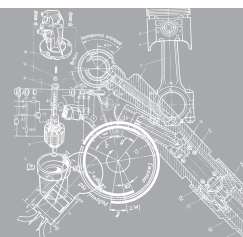
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Watch this space!

Coming up in issue 8 of *research*eu results magazine* a special dossier on 'Components, systems and engineering'.





New approach to take the bite out of malaria

Malaria kills some 1 million children under age five annually. Bringing the disease under control is an economic necessity but presents socio-political and scientific challenges.

The negative effects associated with malaria infection are considered to be a major obstacle to the development of the African continent. So research in this area endeavours to offer a solution in the form of enhanced knowledge that can be transferred for health benefits. Specifically, studying the genetic code in *Plasmodium* can provide new and important information on the parasite's biology and open new leads for the development of novel anti-malarial drugs.

The EU-funded Mephitis ⁽¹⁾ project's goal is to study essential features of *Plasmodium falciparum* — the main parasite responsible for causing malaria. The project is studying protein synthesis, which although a vital biological process and well-known target for antibacterial compounds, has not been deeply investigated in searches for anti-malarial therapies.



Mephitis is working to extend knowledge from model organisms to the study of protein synthesis in *P. falciparum*, and develop initiatives for discovering drugs and identifying new compounds that can block protein synthesis in *Plasmodium*.

Advances have been made in the areas of molecular biology and computational and structural analysis, but the main focus has been on drug development. New inhibitory molecules have been discovered and existing drugs re-examined, revealing promising results in animal tests.

Early efforts to analyse, design and create new anti-malarial compounds have succeeded in generating the first families of compounds able to selectively inhibit certain active enzymes — apicoplastic ARSs — found in the malaria parasite. To date, four research articles have been published and more publications are being prepared.

In the meanwhile, new lines of research include examining protein synthesis during the liver stages of *Plasmodium*. This holds promise as a stage of intervention as it comes before blood infection. Mephitis continues work aimed at designing and testing chemicals with anti-malarial potential to eliminate malaria.

The Mephitis project coordinator is based at the IRB Barcelona — Institute for Research in Biomedicine in Barcelona, Spain.

(1) 'Targeting protein synthesis in the apicoplast and cytoplasm of *plasmodium*'.

Funded under the FP7 specific programme Cooperation under the theme Health.
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Malarial agents must not gain access to the liver

Malaria is holding steadfast to its status as one of the world's most severe infectious diseases. And with increasing resistance to anti-malarial drugs, research is hard pressed to find a solution to the problem.

The EU-funded Polarityandinfection ⁽¹⁾ project aimed to provide a better understanding of how the body contributes to the growth and development of *Plasmodium* parasites after they enter the liver. The project's insights into the basic biology of the *Plasmodium* parasite, the causative agent of malaria, are expected to enable development of new strategies against infection, treatment and perhaps even eradication.

When bitten by an anopheline mosquito, *Plasmodium* sporozoites enter the blood stream and rapidly progress to the liver. There are no symptoms at the liver stage. The liver-stage is believed to

represent an ideal point for anti-malarial intervention. But sporozoites continue through to the liver, going on to invade hepatocytes.

Hepatocytes act as blood detoxification centres and are of major importance in metabolic events. The Polarityandinfection project noted that the organisation of their highly polarised epithelial cells plays a central role in the routes taken by proteins as they move to and from the plasma membrane of the cell, through which sporozoites originally enter.

Once inside, the sporozoites stabilise and begin to grow and divide. Now

termed merozoites, thousands can form in just two days and then be released into the bloodstream where they invade red blood cells. At this point, malarial infection enters the symptomatic or clinical phase.

The study reported that sporozoites can invade any cell type, but they have only been found to generate infectious merozoites in the environment provided by hepatocytes. The research could contribute to the important knowledge about critical processes involved in *Plasmodium* growth and development.

Polarityandinfection's project coordinator is based at the Instituto de Medicina Molecular in Lisbon, Portugal.

(1) 'The role of hepatic type cell polarity during *Plasmodium* liver stage infection'.

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

From plants to HIV-neutralising antibodies

HIV continues to claim victims throughout the world. In Europe, 850 000 people live with the disease according to estimates from the European Centre for Disease, Prevention and Control. Many are unaware they have contracted HIV and so pass it on to unsuspecting partners.

In sub-Saharan Africa, over 10 million are infected. Compounded by poverty, many rely on international organisations and government-funded programmes to treat the disease using an expensive cocktail of antiretroviral drugs. The costs are astronomical. In 2009, the WHO and UNAIDS estimated that at least 14.6 million people were in need of antiretroviral therapy. Therefore cheaper and sustainable alternatives are urgently required to help the people that need therapy the most.

For the past seven years, the EU-funded project 'Recombinant pharmaceuticals from plants for human health' (Pharma-Planta) has been working to find an inexpensive and versatile method to create monoclonal antibodies that neutralise HIV and rabies. Pharmaceutical proteins made in plants are not only inexpensive, they can be scaled-up and mass produced. The hope is to ensure that everyone, everywhere, has access to affordable medicines for such diseases. The current industry standard is mammalian cells. The process is expensive high-tech equipment is required, and the drugs cannot be produced on a scale to match global demand.

Pharma-Planta has moved beyond the proof of concept by developing candidate products for clinical evaluation in humans. Human testing started in the UK this year. It is Europe's first monoclonal antibody drug product candidate derived from a plant using a production system approved by the regulators.

To help explain the process, the technology and implications behind the research, we speak to Professor Rainer Fischer and Professor Julian Ma, who initiated and implemented the project supported by 38 partners from 11 EU countries. Prof. Fischer is the Pharma-Planta coordinator and senior executive director of the Fraunhofer Institute for Molecular Biology and Applied Ecology

IME, which has sites in Chile, Germany and USA. He is also a professor at the RWTH Aachen University. Prof. Ma is Pharma-Planta's scientific coordinator. He is also professor of Molecular Immunology at St George's, University of London.

Pharma-Planta is developing pharmaceutical proteins made in plants to produce affordable medicine on a massive scale. Can you explain the technology behind this research and why you decided to focus on developing monoclonal antibodies against HIV and rabies? Can this be expanded to other diseases?

[Rainer Fischer] The Pharma-Planta technology platform is conceptually similar to the industry standard method for producing recombinant pharmaceutical proteins like antibodies, in that it involves transferring the genes coding for those proteins into a foreign host cell, which acts as a production factory. The protein is then purified and formulated into the final pharmaceutical product.

Mammalian cells are the current industry favourite because they are very productive and the whole regulatory framework has developed around them. However, they also have many disadvantages — they are very expensive to cultivate, there is an ever present risk of contamination with viruses and other undesirable agents, and production is slow and very expensive to scale up.

Plants avoid many of these issues because they do not support the growth of viruses that infect humans, they are not expensive to cultivate, and scaling up is rapid and, in principle, limitless. But regardless of these advantages, we had struggled to get plant-based pharmaceutical proteins off the launch pad because there was no regulatory framework supporting the concept, which meant no clinical development



Prof. Rainer Fischer

and therefore no interest from the pharmaceutical industry.

We had to get the technology platform approved by showing the pharmaceutical proteins made in our plants were equivalent in quality to those made in mammalian cells. Now we have succeeded in developing a production process that meets all the industry quality criteria (which is known as good manufacturing practice or GMP) and this has allowed us to start clinical development, beginning with the pivotal phase I clinical trial of the HIV-neutralising antibody P2G12 which was completed in October 2011.

[Julian Ma] We focused on monoclonal antibodies against HIV and rabies because we wanted to show that plants are suitable for the production of proteins that might not be economically viable in other platforms. The key advantages of plants are the low cost, scalability and product safety. The purpose of HIV-neutralising antibodies is to prevent the spread of HIV, so large amounts must be administered by large numbers of at-risk people, especially in developing countries where HIV is most prevalent. The costs of manufacturing antibodies using mammalian cells is prohibitive even for niche populations, but we are talking about vast swathes of people in sub-Saharan Africa many of whom have less than a couple of dollars a day to live on. Plants are the only platform that offers the economy and scalability to meet the demand of large populations of the world's poor

for inexpensive but high-quality and safe pharmaceuticals. It's similar for rabies, which kills more than 60 000 people every year in developing countries, because the antibodies for post-exposure prophylaxis are too expensive.

[Rainer Fischer] But these are only examples of target diseases that best demonstrate the advantages of plants. In principle, any pharmaceutical protein could be produced in plants, although in practice we find that some proteins are expressed better than others and we will probably find that some proteins are expressed better in mammalian cells and others in plants depending on the intrinsic quality of the protein.

Interestingly, while Pharma-Planta focused on a small number of 'fast-track' products which were pushed through GMP towards clinical development, there was also a large amount of work going on to optimise protein expression and develop new approaches to increase protein yields and quality,

e.g. by getting the protein to accumulate in different parts of the plant cells. We found that proteins vary in their physical and chemical properties and the best expression strategy needs to be determined case by case.

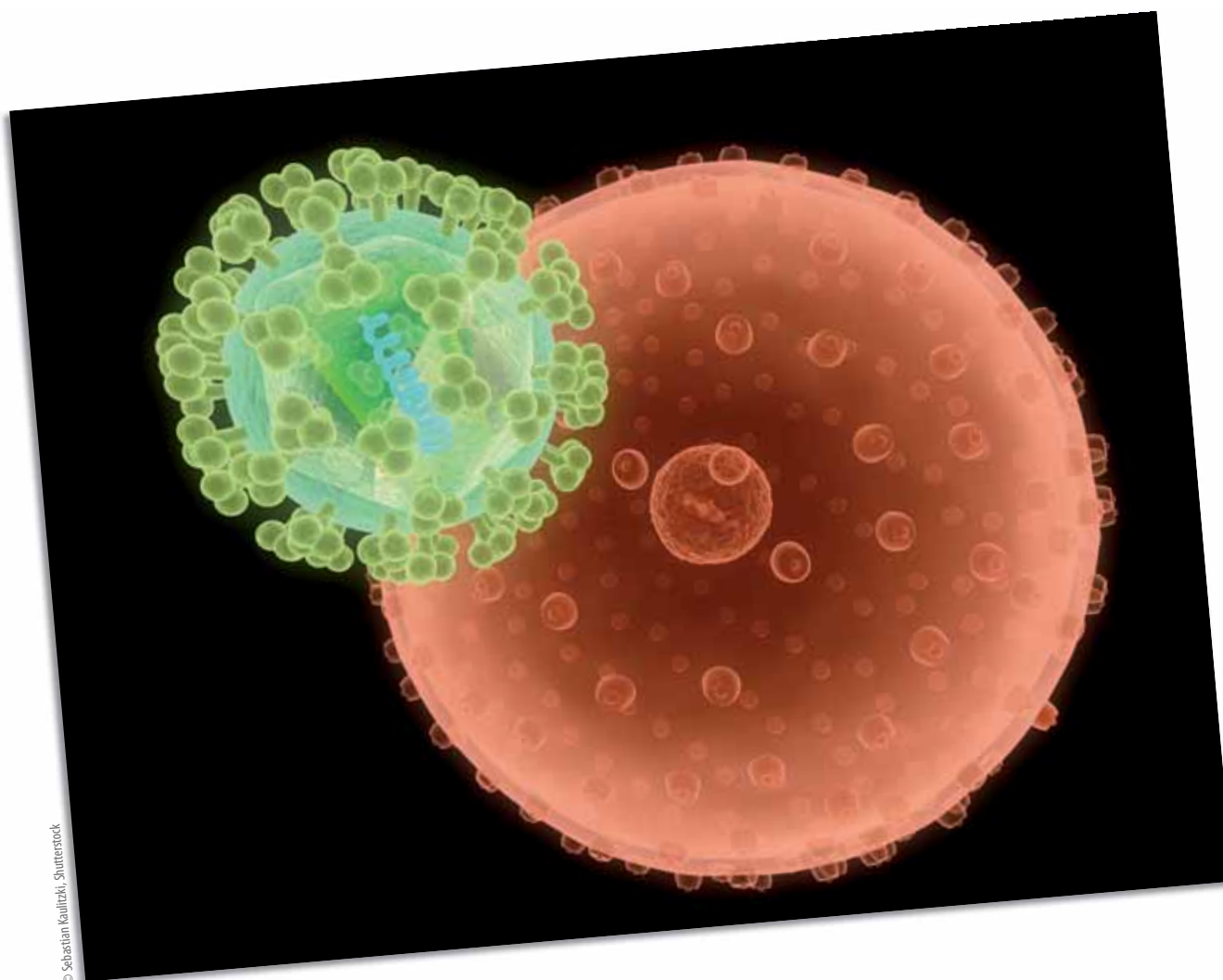
Viruses like HIV are notoriously tough to combat. How does the antibody that you produced, currently in trials, actually neutralise HIV? How is it different from what others are doing/other drugs or treatments?

[Julian Ma] P2G12 is a broadly-neutralising anti-HIV antibody which means it recognises a part of the virus which is conserved across many different variants, which we call 'clades'. This antibody has already been produced in mammalian cells by one of the partners in the Pharma-Planta project so the antibody itself and its mechanism of action are not novel. What is novel is the scale and low cost of production, which will allow many more people to be treated much more effectively.

Researchers have found that one HIV-neutralising antibody is effective for a while, but after time the virus mutates in such a way that the antibody no longer has an effect — these are known as 'escapes'. However, a mixture of two or more different antibodies recognising different parts of the virus can delay or even prevent escapes. Inevitably, however, producing three different antibodies costs three times as much as it does to produce one, and since the costs of one antibody are already astronomical, it is unlikely such 'cocktails' of antibodies would ever be made available. The use of plants as the production system makes it much more likely that microbicides containing multiple antibodies will be developed in the future.

Is this finally the breakthrough to prevent HIV/AIDS?

[Julian Ma] Pharma-Planta has not made a breakthrough that will prevent HIV/AIDS but we have developed a production platform that will reduce the cost



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of medicines and allow affordable cocktail formulations to be produced. In this way, microbicides that help to prevent the spread of HIV could eventually be made available to more people and this may contribute along with other intervention measures to turn the tide against this disease. It is important to remember, however, that the Pharma-Planta platform technology is open, i.e. it can be used to produce any recombinant protein including vaccines. It could therefore make an impact on many different diseases in time and enable their production in the region for the people that need it the most.

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

[Rainer Fischer] The project benefited from generous European funding, which helped to develop the technology platform from first principles and move beyond proof-of-concept into

pre-clinical development. Positive aspects included the focus for innovation and the support for basic research looking at diverse aspects of the technology such as different host plants and systems, and different strategies to achieve high expression levels.

As well as its successful GMP process and clinical trial, Pharma-Planta has spun off additional technologies such as novel expression systems that have become successful in their own right and have been licensed commercially. We did experience a number of challenges perhaps not surprising given the ambitious aim of the project to develop a new regulatory pathway for plant-derived pharmaceuticals, including unexpected charges levied by the regulators with whom we were working which held up the project for a considerable time, more so the closer we got to the clinic.

Therefore, if we could suggest one way to improve European funding policy

it would be to cover the entire value chain, not just the early research phase. There is a lack of funding for translational medicine which means many valuable pharmaceuticals produced in publically-funded projects could be held up early in the pipeline. In the end, we added several million euros of funding from alternative sources to ensure the GMP process development was completed successfully and the clinical trial could begin.

It is also important to emphasise that the technology could have an important humanitarian impact, because plants could be grown locally so that communities could produce and extract their own drugs. For this purpose, each member of the Pharma-Planta consortium signed up to a humanitarian use statement that guarantees that technology from the project will be transferred to developing country settings and IP will be donated for humanitarian purposes.





Herpes infection increases HIV susceptibility in women

Herpes simplex type 2 infection is one of the most common sexually transmitted (STD) viral diseases, but it also makes one more prone to human immunodeficiency virus (HIV) transmission.

Infection and inflammation of the genital tract by an STD such as Herpes simplex virus type 2 (HSV-2) upset the mucosal layer of the vagina. Blisters or ulcers on the genitalia are the most frequently noticed symptoms. This vulnerable state increases the expression of HIV receptors and co-receptors on the surrounding cells affected by HSV-2.

The EU-funded APO-HSV-2/HIV ⁽¹⁾ project set out to discover how programmed cell death (apoptosis) during HSV-2 infection contributes towards upsetting the delicate balances in the vaginal environment, and how this can influence the outcome of combined HIV-1/HSV-2 infection. Apoptosis is a necessary process for the regular renewal of vaginal epithelium or tissue. Fas, a regulatory protein that activates apoptosis, has been shown to play a role in maintaining vaginal epithelium.

The project aimed to determine if HSV-2 infection can lead to apoptosis and changes in vaginal mucosa, and how Fas and other receptors contribute to genital lesions during HSV-2 infection. Importantly, researchers wanted to examine how HSV-2 infection increases risk of HIV-1 infection.

Two mouse models were used. The *in vitro* model of HSV-2 epithelial infection showed a moderate level of apoptosis during infection, and the *in vivo* herpes genitalis model showed the presence of apoptotic HSV-2 infected and uninfected cells. In assessing the role of Fas in the development of lesions during HSV-2 infection, results showed that a Fas and 'Fas ligand' (FasL) deficiency led to increased apoptosis and development of bigger vaginal lesions.

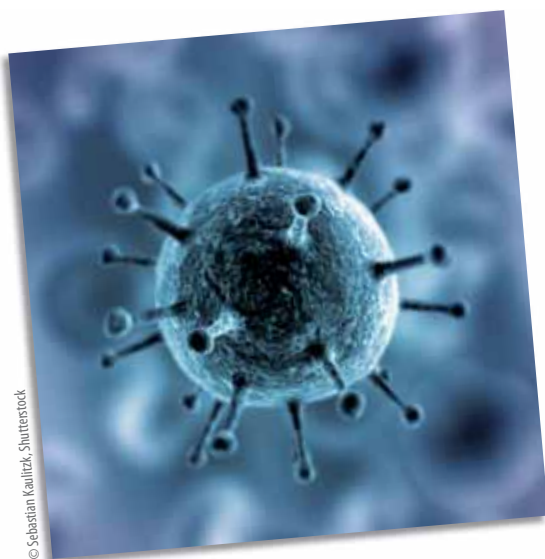
Project members concluded that HSV-2 infection leads to heightened processes of apoptosis and inflammation. However, Fas/FasL-induced apoptosis helps regulate the inflammatory response early on in HSV-2 infection and thus helps maintain the balance in vaginal mucosa. This is an important finding for the development of microbicides, topical antiviral agents that can protect against STDs.

APO-HSV-2/HIV's project coordinator is based at the Karolinska Institutet in Stockholm, Sweden.

(1) 'Double infection by HSV-2 and HIV: how does HSV-2 infection facilitate for HIV infection?'

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New combination therapies combat fungal infection

In recent decades the number of patients suffering from a weakened immune system has increased as a result of receiving a transplant, contracting cancer, AIDs or other immunodeficiencies. This has led to a rise in the frequency of infection by invasive filamentous fungi.

Despite antifungal therapy the mortality rate remains high. Difficult-to-treat mould infections often require surgery to remove infected tissue. Researchers from the EU-funded *In vitro* PKPD system ⁽¹⁾ project have taken an alternative approach based on antifungal combination therapy using two or more antifungal agents.

Researchers have developed a laboratory-based pharmacokinetic (PK)/pharmacodynamic (PD) system for filamentous fungi. Pharmacokinetics

involves the action of drugs on the body, including the method and rate of excretion and the length of the effect, whereas pharmacodynamics considers the mode of action, and the effects of the medicine.

The system simulates the micro-environment at the site of the infection that influences drug-host-fungus interactions. This approach has used different fungi with a range of microbiological attributes in order to test differences in virulence, growth rates and susceptibility to drugs.

Project partners conducted preliminary experiments to study how well the PK of antifungal drugs could be simulated in the laboratory and whether it was possible to reliably measure fungal PD. For PK studies, a range of bioassays were assessed to determine the levels of different antifungal drugs using different nutrient media and susceptible strains of yeast and mould.

Scientists have developed a system comprising an internal compartment made of semi-permeable cellulose membrane that selectively allows the diffusion of molecules. The inside of the internal compartment was inoculated with the fungi *Aspergillus conidia* and antifungal drugs added to the internal and external compartment. This model allows two drugs with different flow rates through the membrane to be used, thereby enabling the study of drug combinations.



The new laboratory-based system successfully simulates human PK of antifungal drugs and highlights important PD differences in their activity which cannot be shown using conventional tests. The results from the experiments have been compared with published data obtained from animal models using the same strains of *Aspergillus*. They show that the new PKPD system developed by project partners can be used instead of animal experimentation.

Results obtained from simulated human doses can be used to improve the effectiveness of antifungal drugs for treating *Aspergillus* infections by determining the optimal dosage. The findings provide support for the commencement of clinical trials using doses found to be effective by the new system.

Increased effectiveness of antifungal therapies for difficult-to-treat infections will result in better clinical outcomes, reduced mortality and shorter

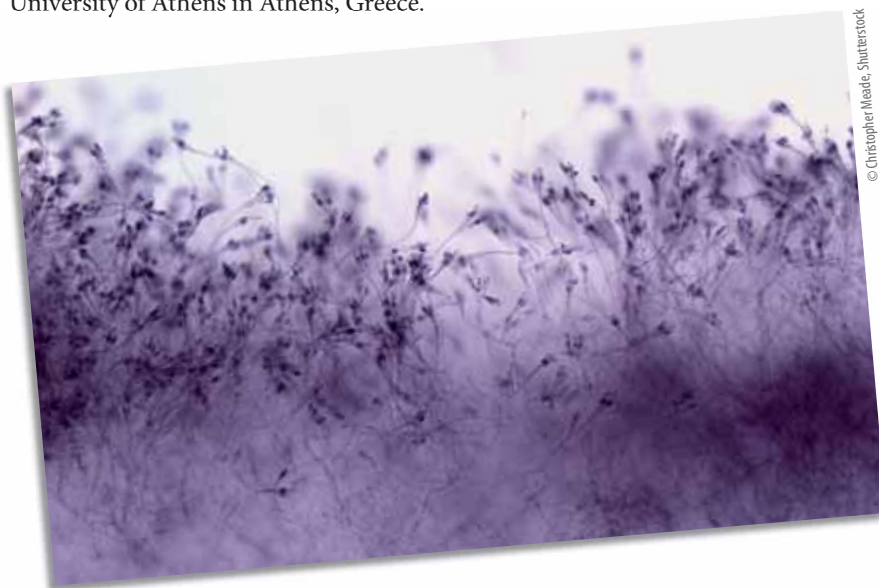
periods of treatment. The project's results could lead to cheaper treatments and improved quality of life for those suffering from fungal infections.

The *In vitro* PKPD system project is based at the National and Kapodistrian University of Athens in Athens, Greece.

(1) 'In vitro pharmacokinetic/pharmacodynamic system for antifungal combination therapy against filamentous fungi'.

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Multi-range approach to tackle spreading infection

Bacterial infections are increasing rapidly in both developing and developed countries. Many of these are resistant to current medical therapies.

Bacteria classified as either Gram-positive or Gram-negative are essentially differentiated on the basis of structural differences in their cell-wall makeup. Despite a promising line-up of antimicrobial drugs effectively targeting Gram-positive bacteria, those falling in the Gram-negative group are for the most part multidrug-resistant. To tackle

this problem, the EU-funded Antipathogen⁽¹⁾ project has set out to discover new antimicrobial drug targets in certain Gram-negative bacteria.

The approach uses computational biology, interactome discovery (uncovering the whole set of molecular interactions in cells), *in vivo* protein-blocking and structural biology techniques. The aim is to compare and analyse the molecular processes at play in the development of infectious diseases, drug resistance, cell division and/or growth of selected pathogenic Gram-negative bacteria.

Antipathogen is mainly focusing on *Escherichia coli*, *Helicobacter pylori*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, but is also targeting *Vibrio cholerae* and *Stenotrophomonas maltophilia*. Ongoing work is identifying and validating targets and describing their biochemical and structural properties, screening extracts and

compounds, and evaluating the current pharmaco-epidemiological situation. Antipathogen also intends to identify new anti-bacterial compounds acting against already confirmed targets.

The consortium brings together a university, research centres and small and medium-sized enterprises to ensure knowledge is expanded at both a basic and applied research level. The first will contribute to what is known about biological processes and mechanisms related to infection in Gram-negative bacteria. The second aims to discover new drug targets or combinations of targets in Gram-negative bacteria and potential drugs. Ultimately, the study will offer results enabling the development of a new class of anti-infective drugs against Gram-negative bacteria.

Antipathogen's project coordinator is based at the Universitat Autònoma de Barcelona in Barcelona, Spain.

(1) 'Identification and validation of novel drug targets in Gram-negative bacteria by global search: a trans-system approach'.

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New tuberculosis strains need new drug development

Tuberculosis (TB), caused by Mycobacterium tuberculosis (Mtb), is no longer a disease of the past. It has reappeared as a threat with the emergence of multi-drug-resistant and extensively drug-resistant strains.

There is an urgent demand for innovative new drugs to combat TB caused by Mtb. The rapid emergence of strains characterised as multi-drug resistant (MDR) and extensively drug resistant (XDR) is further intensified by a dangerous connection with the human immunodeficiency virus (HIV).

The EU-funded 'New approaches to target tuberculosis' (NATT) project, bringing together research scientists from Europe and India, aims to develop drug candidates able to take on forms of TB that are either latent or active. The latter will include MDR and XDR strains. With expertise covering the development field from chemistry to in vivo evaluation, the consortium will develop novel inhibitors targeting unexplored as well as validated Mtb and host cell proteins.

The project spans four scientific work packages. These cover target validation,

interaction with the host cellular machinery, design and synthesis of new inhibition and in vitro and in vivo screening of drug candidates, and a management work package. Two approaches were implemented during the first 18 months of this three-year project. The first focused on the bacterial machinery involved, while the second targeted the host cellular machinery to enhance bacterial killing.

The Indian partners, one of which is a small to medium-sized enterprise, have taken on a major part of the drug development and assessment against drug-resistant Mtb.

NATT's project coordinator is based at the Katholieke Universiteit Leuven in Leuven, Belgium.

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

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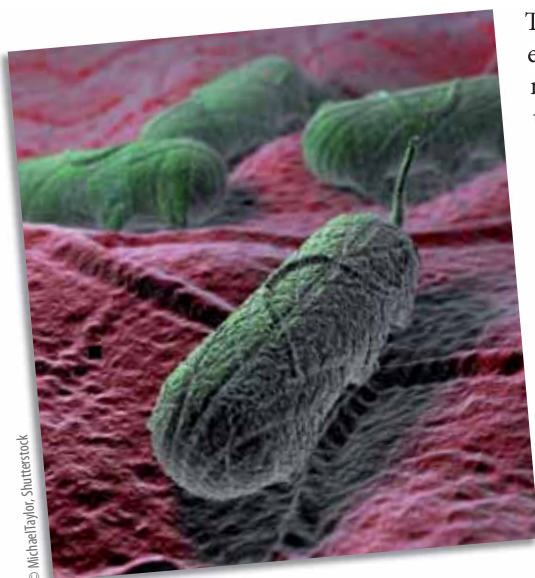


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Attacking bacteria on their own ground

Certain infectious diseases remain a major cause of death despite advances in antimicrobial medicine. A new approach has to attack drug-resistant bacteria at the most basic level.



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The threat of infectious diseases and the emergence of multi-antibiotic resistant bacteria call for a fresh approach to drug discovery programmes and the development of novel antibiotics. The EU-funded Nabatavi (¹) project is working on new strategies to identify and validate novel targets for antimicrobials. It is using the *Pseudomonas aeruginosa* and *Burkholderia cenocepacia* as model organisms to do this.

The project combines research on resistance at the molecular level and

host-pathogen interactions with clinical resources facilitating the identification and validation of novel drug targets. The nine-member consortium's small and medium-sized enterprises (SMEs) will provide the resources and ensure the rapid transfer of suitable targets to drug development.

Nabatavi has already made significant headway in achieving its main goals. During the first 18 months work on identifying targets included the development of a genomic target database (GTD). The listed targets are genes involved in virulence and antibiotic resistance. New genomic screenings have been conducted and drug target data have been collected.

The GTD presently has 211 drug targets available for validation tests. The target genes have been scored following validation by comparative genome



analysis and sequence. A map of target conservation relative to *P.aeruginosa* is now being constructed.

As the study progresses, attention is on quorum-sensing systems. These coordinate gene expression and could be used to replace or augment traditional antibiotic treatments. Researchers are also studying cellular processes with an emphasis on the bacterial cell wall, the structure of which makes it a favourable

target for antibiotics. The team has identified a novel drug target, LptD, in this area of work.

One of the project's major achievements was identification of the novel compounds POL7001 and POL7080. These have been shown to be potent antibiotics against Gram-negative *Pseudomonas* and active against *P.aeruginosa* multi-drug resistant clinical strains.

Nabativi's project coordinator is based at the Università Vita-Salute San Raffaele in Milan, Italy.

(1) 'Novel approaches to bacterial target identification, validation and inhibition'.

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

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Single-system device to simplify influenza diagnosis

The rapid detection of influenza is crucial in the fight against this major threat to human health. A portable device able to take samples, test for and diagnose the virus will make this possible.

The objective of the EU-funded Portfastflu (1) project was to develop and confirm an on-site, rapid diagnostic test for influenza. To be used as a point-of-care (POC) instrument in both

developed and developing countries, the novel, single-system device combines all those procedures necessary to extract, diagnose and classify the influenza virus. This can be done with clinical samples as well as with those collected on-site.

The portable machine used to do this is called an integrated diagnostics platform (IDP). The approach uses a lab-on-chip (LOC) cartridge for direct extraction and testing of the relevant genetic information. Portfastflu, during its first two years, made strides in processes aimed at

extracting and testing for the influenza A matrix gene. The project achieved integrated influenza virus detection protocol in a new LOC micro-device cartridge. It has also built and demonstrated a prototype of an integrated hybridisation and read-out IDP.

In 2010, the final year of the project, Portfastflu worked on bringing together the various elements of a fully automatic integrated machine. They also validated the influenza diagnostics performance on human samples at the Hospital Donostia in Spain as well as on animal samples in a field environment at the Agricultural Research for Development (CIRAD) in France.

Portfastflu's project coordinator is based Genewave S.A.S in Evry, France.

(1) 'Portable automated test for fast detection and surveillance of influenza'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6133



Zooming in on disease genes

A newly compiled database of genes is revealing specific interactions involved in infections and associated diseases. This adds invaluable support to finding cures or treatments for diverse ailments.

Faulty regulation of cell-signalling protein molecules in genes (known formally as cytokine gene expression) is the root cause of many diseases, such as infections and chronic inflammation. Many of these diseases are hereditary

and can cause discomfort, often emerging in early middle age.

In recent years, various molecular biology and biochemistry research tools have enabled the study of direct protein

interactions involved in the regulation of cytokine genes. These novel technologies and statistical tools have made use of translational genomics (the study of large sets of genes and proteins) to understand overall genetic systems, rather than isolated components. This will advance molecular biology and help shed light on implicated diseases.

The EU-funded 'Antagonists of protein-protein interactions' (APPI) project has

combined the regulation of cytokine genes with translational genomics and chemical biology to do exactly this. Cytokine receptor genes that may affect gene expression and protein structure linked to these diseases have been isolated from a newly developed gene database. In particular, numerous cytokine genes implicated in diseases such as diabetes, gastric cancer, impaired kidney function and gastritis have been identified.

This initiative involved biostatistics, data visualisation techniques and complex biomedical and clinical research in inflammatory and infectious diseases. It also involved data management systems for known protein interaction patterns, used to simulate complex biological systems.

The initial phase of this research project focused specifically on gastritis and gastric cancer caused by *helicobacter pylori*, as well as chronic kidney disease. However, the database has been designed to support much more research related to a broad range of diseases. With such a sophisticated database and a host of tools perfected during this project, medical science may expand its base knowledge on disease.

Appi's project coordinator is based at the Helmholtz Centre for Infection Research in Braunschweig, Germany.

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

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Tropical viruses are not so exotic

By cross-referencing novel genetic discoveries with lifestyle and environmental data, scientists may be on to something very important. The results could one day help develop new cures for diverse conditions.

The dengue virus, a major cause of viral hemorrhagic fever, has traditionally been localised in tropical and sub-tropical regions. However, the threat of infection now presents a potential medical problem for Europe.

No specific treatment is available for dengue virus infection. This is mainly due to a lack of knowledge of the

molecular mechanisms involved in the development of the dengue virus 'Capsid protein' (DVCP). The EU-funded Dengue virus capsid (1) project is working to fill this gap by studying the role of lipid membranes in dengue viral assembly.

It is known that lipids play a role in DVCP-mediated viral RNA assembly and encapsidation, and that this probably occurs via interaction with intracellular lipid droplets. A capsid is the coating of a protein that has enclosed the nucleic acid core of a virus. Encapsidation is the process whereby this enclosing takes place. Lipid droplets are cellular subunits generated and used by viruses for replication.

So far, work has focused on molecular details of the interaction between the DVCP and lipids, using lipid droplets directly isolated from hepatic cell lines. Biophysical techniques such as 'Nuclear magnetic resonance' (NMR) were used for the studies.

Main results show that on DVCP interaction with lipid droplets, there is a minor drop in alpha-helical content. An alpha-helix is a secondary protein structure that is spiral in form. As NMR results indicate, this decrease is consistent with interactions in alpha-helical regions. Based on a simulation of binding of the DVCP protein to model membranes, the project has been able to identify two possible sites where interaction is initiated. Following this 'activation', conformational rearrangements take place, likely prompting the viral RNA to bind the protein. Researchers believe this advances the dengue virus assembly and encapsidation process.

Having identified the DVCP lipid droplets interaction sites as putative targets for drug or vaccine development, the Dengue virus capsid project expects to show that by blocking this interaction, the viral assembly and encapsidation process can be halted and the viral load reduced within the organism.

The Dengue virus capsid project's coordinator is based at the Instituto de Medicina Molecular in Lisbon, Portugal.

(1) 'The role of lipid membranes in dengue virus assembly.'

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

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Dog model provides insight into canine and human epilepsy

Brain disorders exert the heaviest disease burden on the European community in terms of societal and economic costs. A recent study ⁽¹⁾ indicates that at least 38 % of the European population suffers from some form of brain disorder.

Though many of these disorders overlap, typically, they can be divided between psychiatric, which include schizophrenia and insomnia, and neurological, which include epilepsy and stroke. Researching the brain and its afflictions is an unravelling field with major discoveries poised to be made due to rapid advances in technologies such as genomics and imaging.

In addition to adapting new technologies, brain research is much advanced by studies conducted in animal model systems. Given its unique properties, such as a less complex genome architecture and the spontaneous occurrence of diseases with similar pathologies as in humans, the dog represents the best model system to study the genetic and molecular basis of human disorders.

The Epilepsy workpackage of the EU-funded LUPA ⁽²⁾ project led by Professor Hannes Lohi from the University of Helsinki has identified a novel player in the pathology of juvenile epilepsy. Epilepsies constitute one of the most common neurological disorders in children and dogs. Given its various complex

pathologies, it has been difficult to elucidate the underlying genetic pathway of the disease.

The truffle-hunting dog breed Lagotto Romagnolo is commonly affected with remitting juvenile epileptic seizures. Genome-wide association studies in a well-characterised cohort demonstrated that a mutation in the LGI2 gene is responsible for causing the disease. The identified protein-truncating mutation prevents protein secretion and subsequent interaction with neuronal receptors. This protein complex is essential for the modelling of a synaptic network that is resistant to electrical seizures.

Canine LGI2 is a homolog of human LGI1 which is a known disease gene for a group of epilepsies characterised by partial seizures and acoustic or visual hallucinations. Both genes interact through the same family of neurological receptors. However, results of Lohi's group showed a key difference in the timing of their expression and led to a novel insight in the construction of brain networks. During brain development, stabilised neural networks are

formed through the establishment and pruning of synapses. The onset and recurrence of juvenile epileptic seizures is correlated with the synapse pruning process.

LGI1 is expressed during the mid- and late pruning phase and its associated epilepsy onsets and recurs during the equivalent age period. In contrast, LGI2 is dominantly expressed earlier, i.e. during the immediate post-natal phase and until the intermediate pruning phase, but its associated epilepsy onsets only during the pruning phase age period. Intriguingly, this suggests that processes during the pre-pruning phase, in which LGI2 plays an important role, are important in preventing occurrence of epileptic seizures at a later stage. In line with this, LGI2 should be considered as a candidate gene for many yet uncharacterised juvenile epilepsies.

This work was conducted within the collaborative research project LUPA (2008-11). Funding from the FP7-Health programme enabled the establishment of a critical network of veterinary clinicians and genetics scientists across 12 EU countries and 22 partners. In the true spirit of collaborative efforts, collection of phenotyped samples and data analyses were conducted by groups in Finland, Sweden and Switzerland.

Through its achievements LUPA has demonstrated the multidimensional benefits of utilising the dog model together with advanced genomics technologies for biomedical research. The work of Lohi et al has identified the first canine idiopathic epilepsy gene which is also potentially a novel candidate gene for the equivalent human disorder. The development of a canine epilepsy test (available through Genoscoper Oy Ltd) enables accurate disease diagnosis for the benefit of pet owners and pet breeders alike.

(1) Wittchen et al. 2011. Eur. Neuropsychopharmacol. 21: 655-679.

(2) 'Unravelling the molecular basis of common complex human disorders using the dog as a model system'.

Promoted through the EU-funded LUPA project.



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Important step towards early detection of breast cancer

Breast cancer is the most common form of cancer in women and the second leading cause of death.

European researchers have developed a clinical 'Positron emission tomography' (PET) system with the highest resolution and sensitivity in the market, specifically dedicated to breast cancer detection in early stages. The EU-funded 'Mammography with molecular imaging' (MAMMI) project developed a device that will allow doctors to start treatments one or even two years earlier than usual and also evaluate the patient's response to chemotherapy.

Coordinated by Dr José María Benlloch, researcher of the Spanish National Research Council (CSIC) and co-director of the Institute for Molecular Imaging Instrumentation (I3M), the MAMMI project was created by a multidisciplinary team of eight European research institutions and companies, ranging from medical oncology and pharmacokinetics research to molecular imaging instrumentation, advanced image processing software and integrated electronics-circuit design.

The device is currently installed in the National Cancer Institute in Amsterdam, the Netherlands and was previously set up at the clinic of the Technical University of Munich, Germany where they have completed the clinical research and examined over 50 patients. The new system will shortly be installed in the Provincial Hospital of Castellón, Spain and other international hospitals have shown their interest in purchasing it.



The most striking novelty of the mammogram is the way it captures the image. The patient lies face down on a special table, and enters a breast in one of the openings. Beside the stretcher, the specialist positions a trolley that incorporates the detection system based on a gamma ray sensor.

The picture is taken without compressing the breast thanks to the ring shape of the detector that surrounds the pendant breast. "This significantly improves the visualisation and diagnosis because sometimes there are tumours that are very close to the base of the pectoral muscle," said Dr Benlloch.

This new mammogram also provides greater patient comfort. In this sense, the Biomechanics Institute of Valencia (IBV) assessed the company Oncovision in the design, manufacturing, and mechanical tests of the stretcher, and applied user-friendly design methodologies and ergonomic criteria. For example, lifting columns were added to the table to facilitate its use by the elderly and disabled.

The PET system

The other major innovation is the technique used. The traditional mammogram is an X-ray of mammary glands. MAMMI, however, is based on the PET technique for the diagnosis of breast cancer, which offers numerous advantages.

In the first stages of a cancer, the malignant cells replicate in an uncontrolled way and, after one to two years, cause a lesion that is visible with the current techniques. After that, the lesion extends and takes about another year until it can be felt.

While current diagnostic equipment is based on morphological images and does not recognise the cancer until there is a lesion, the MAMMI PET measures the metabolic activity of the tumour by locating the high glucose uptake of the cancer cells. This allows the specialist to detect the disease much earlier

and numerous studies have confirmed that early detection reduces mortality by 29%.

Until now, whole-body PET scans were indicated for breast cancer patients or for people with a high risk of suffering the disease. However, the result is a low resolution image and therefore does not detect small tumours. "Our device, however, is devoted exclusively to breasts so the detectors are very close to this part of the body and show tumours in early stages," explains Luis Caballero, head of the project in Oncovision.

In comparison, MAMMI can see lesions as little as 1.5 mm, while the best of the systems that currently exist offers a resolution of 5 mm. The system generally improves the diagnosis of all patients, but it is especially effective for women with breast implants or young women whose breast density has always made obtaining a clear image difficult.

Assessment in later stages

The mammography device marketed by the Valencian company can also monitor whether the treatment the patient with breast cancer is following actually works. "By showing the uptake of glucose, the PET technique is the only one able to reveal whether there are still cancer tissues after an operation, since with the other techniques it is impossible to distinguish tumour tissue from the scar left by the operation," said Dr Caballero.

Also, the PET reveals whether the therapies of radiation and chemotherapy are effective or need to be modified. As MAMMI is a more precise PET instrument, it ensures a better assessment of tumour activity and its response to therapy.

The innovative mammography will be manufactured at the Polytechnic City of Innovation, Science Park of the Universitat Politècnica de València, Spain at the headquarters of the company Oncovision (GEM-Imaging SA).

This project was partially funded by the Sixth Framework Programme (FP6) in the area of Life science, genomics and biotechnology for health.

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

Olives for energy

Olive oil production uses enormous amounts of water and produces too much waste. New technology may be able to save on energy and also make biofuel from olive by-products.

Countries in southern Europe like Greece, Spain, Italy and Portugal are proud of their olive oil sector and its contribution to the economy. However, the production process uses a lot of energy and generates polluting waste that is toxic to the environment. Better waste processing is needed to save on water used, reduce toxicity, and reuse the useful compounds in olive residue.

The EU-funded En-x-olive ⁽¹⁾ project is turning olive oil wastewater into energy through innovative bioreactor technology and extracting olive oil industry by-products. It hopes to treat olive wastewater and solid waste through anaerobic digestion, transforming biomass into biogas, and at the same time extracting valuable products such as polyphenols.

These polyphenols are antioxidant compounds that can be used in the pharmaceutical and nutraceutical (nutritional and pharmaceutical) sectors. They represent one group of waste apart from the proteins, fibre, oil and sugars that come out of olive oil.

As a response to this challenge, the project is developing a scalable bioreactor to extract and purify the polyphenolic

compounds from the liquid and solid wastes. Both solid and liquid systems are being combined for more efficiency, along with an electronic system control.

The project team visited different olive oil industries to identify the waste generated according to different olive oil manufacturing processes. Since olive oil processing differs from one country to the other, physical and chemical properties of the waste differ as well, influencing their storage. Potassium and sulphate were identified as the most critical parameters for the biogas production.

Several methods for extracting polyphenols were studied, concluding that the drying process at 400 °C produces low degradation of the antioxidant compounds. In addition, different project members are working on improving the biogas production process aiming at high biogas production rates and high methane yields. All these processes are being fine-tuned, including software for electronic control of the new equipment.

Once this is completed, an industrial plant will be designed to obtain biogas and antioxidant products, as well as fertilisers and water for irrigation. The process and equipment will then be tailored to the olive oil market in each country.

The project is set to have profound implications on recycling water for irrigation and reducing costs for disposal of wastewater. It will create new sources of revenue for secondary businesses such as recovery and purification of polyphenols, as well as production of biogas.

By strengthening the sustainable competitiveness of the olive oil sector, En-x-olive can contribute to the economic stability and growth of the rural areas based on olive oil production. It will comply with European water and energy directives, improving quality of life, reducing pollution and providing new employment possibilities. As current management costs will be lowered considerably and the revenues from valuable by-products will surpass the operational costs of the new process, the sector is set to benefit tremendously.

En-x-olive's project coordinator is based at the Tecnologías Avanzadas Inspiralia in Logroño, Spain.

⁽¹⁾ 'Supporting SME driven olive industry to comply with EU directives'.

Funded under the FP7 programme Capacities
under the theme 'Research for the benefit of SMEs'.
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Furthering the promise of renewable energy

By creating a model of cooperation between two regions — one in France and one in Italy — on renewable energy, an EU-funded project has encouraged other EU regions to do the same.

With rising oil prices, instability in many oil-producing nations and growing concern for the environment, Europe is looking to renewable energy to advance transport, industry, environment and quality of life. France and Italy have joined forces to create a transnational platform that facilitates exchanges between different various stakeholders in renewable energy located in both countries. The EU-funded PITER ⁽¹⁾ project encouraged

research and technological development as well as joint political and economic actions under renewable energy. PITER helped to implement EU directives on better and more efficient use of alternative sources of energy as well as reduction of CO₂ emissions at local and national levels.

The project was coordinated by the Rhône-Alpes region in France and the Piedmont region in Italy, plus the two technological parks or clusters (one from each country) and a French consulting group. Under this consortium, PITER developed a joint action plan on renewable energies to define a systemic approach covering environmental, economic, technological, political and social factors. It mapped research and development (R&D) in the area, and also incorporated related industrial and institutional competencies to design the action plan.

PITER focused on research, and technological and industrial development to reduce CO₂ emissions, while

strengthening the emerging renewable energy market. Its main objective was to encourage clean technologies and improve quality of life by creating new jobs and reducing health problems while advancing the economic development of Rhône-Alpes and Piedmont regions.

In addition, the project promoted and strengthened cooperation between the two regional clusters involved. The French cluster was represented by Technologies Énergies Nouvelles Énergies Renouvelables Rhône-Alpes, Drôme, Isère, and Savoie (Tenerrdis). The Environmental Park in Torino represented Italy's cluster. PITER compared how these two clusters operated and encouraged common learning based on transfer of best practices.

At an international seminar in Brussels on the 'Role of regions in implementing European energy R&D activities', PITER communicated its project results and initiatives to other European regions. In summary, the PITER partnership was a valuable example in setting up more such initiatives across Europe and can advance the adoption of renewable energy.

PITER's project coordinator was based at the Rhône-Alpes regional council in Charbonnières les Bains, France.

(1) 'Platform for integration of trans regional energy R&D activities'.

Funded under the FP7 specific programme Capacities under the theme 'Regions of knowledge.'

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Solar power and desalination in the Med

There is a growing energy and water demand in the southern and eastern Mediterranean region. Hybrid solar/fossil thermal power plants with combined sea-water desalination based on concentrating solar power technology may offer a cost-efficient solution.

The economies in the southern and eastern Mediterranean area increasingly need affordable and efficient energy and water for sustainable development. EU researchers in the MED-CSD ⁽¹⁾ project have investigated how hybrid solar/fossil thermal power plants can help.

The scientists examined the technico-economic potential of concentrating solar power (CSP) technology for electricity and desalination in the Mediterranean. Hybrid solar/fossil operation offers a smooth transition from the fossil fuel to a solar economy according to project researchers. The new system

could supply a firm power capacity to the grid, with up to 8 000 full load operating hours per year.

MED-CSD researchers carried out feasibility studies of combined concentrated solar power and desalination plants in five locations: Cyprus, Egypt, Gaza Strip, the Italian islands, Morocco, and the West Bank.

These studies included a complete review of technology options, an assessment of water demand and deficit as well as of electricity demand,



and subsequently market potential scenarios for CSP desalination and electricity generation. Also included was an overview of the socio-economic impact of a broad dissemination of CSP water desalination.

MED-CSD's project coordinator was based at the Observatoire Méditerranéen de l'Energie in Nanterre, France.

(1) 'Combined solar power and desalination plants: technico-economic potential in Mediterranean partner countries'.

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

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Europe welcomes greener greenhouses

A new concept for a green greenhouse could take Europe's horticulture industry by storm. It demonstrates that technology can help minimise the input of valuable resources while at the same time maximising output in terms of productivity.

Raising plants in greenhouses, referred to as protected horticulture, is an important industry in Europe, but it is also resource-intensive. The ecological footprint is generated from the use of energy, water and chemical inputs such as fertiliser as well as from waste products.

The challenge of creating a new generation of greener greenhouses was taken up during the EU-funded Euphoros ⁽¹⁾ project. The key was to supplement traditional operational and financial design requirements with environmental criteria.

Funding from the EU was used to develop new types of crop covers that protect against pest infestation. In addition, glass panel coatings were modified to optimise the trade-off between light absorption and thermal insulation. Field tests have been carried out in three different climatic zones across Europe.

With respect to energy use, a prototype was developed that stores waste heat when cooling the greenhouse in the summertime and vice versa in the winter.

The potential of solar and wind power to replace fossil fuels was also evaluated, but depends strongly on the geographic location of the greenhouse.

Water use can be curbed by recycling irrigation water, though care must be taken to avoid the build-up of salts to levels that can harm the plants. Simulation and monitoring of temperature, relative humidity and ventilation help reduce problems with fungus. An 'electronic nose' created by Euphoros has also proved useful in the early detection of pests and disease. Finally, with an eye to the full



life cycle of the greenhouse, the reuse of spent materials such as perlite was investigated and viable options were identified.

A complete financial assessment was undertaken that uncovered significant potential for cost savings, in operating

costs for example, by reducing fertiliser requirements. This will help ensure that green greenhouses are a sound investment in these troubling financial times.

Euphoros project coordinator is based at the Wageningen ur Greenhouse

Horticulture in Wageningen, Netherlands.

(1)'Efficient use of input in protected horticulture'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.

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Needs of pan-European electricity grid examined

In order to create a truly pan-European electricity grid that is fit for purpose in the 21st century, researchers are examining how best to run the system.

The challenges facing the European Transmission Network (ETN) have multiplied in recent years and are set to increase as the network has to cope with greater amounts of energy from renewable sources plus potential structural changes such as interconnectors with non-EU countries like Turkey. It is therefore necessary to examine the system's mode of monitoring and its control, and develop tools to support its day-to-day operation.

The Pegase project ⁽¹⁾ is a four-year EU-funded project that aims to define

the most appropriate state estimation, optimisation and simulation frameworks and their performance and dataflow requirements to achieve an integrated security analysis and control of the ETN. They will use advanced algorithms and create software prototypes to help them meet these goals taking into account that ETN is run by multiple transmission system operators (TSOs).

The project also wants to remove current knowledge barriers and provide all TSOs with a synchronous display of the

state of the ETN very close to real time — typically every 5 to 10 seconds. To date, the different European TSOs have been running state estimations regionally or nationally, using measurements collected in their own systems. At best, some have exchanged external data in real time with neighbouring TSOs, but past incidents have demonstrated that this is insufficient. Wider visibility is required for the proper operation of the ETN.

Pegase's project coordinator is based at Tractebel Engineering S.A. in Brussels, Belgium.

(1)'Pan-European grid advanced simulation and state estimation'.

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

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Safer hydrogen fuel handling

Scientists in the Netherlands carried out a study to improve the delivery, handling and use of hydrogen, methane and air mixtures.

Adding hydrogen to natural gas, the main constituent of which is methane, allows for cleaner combustion at lower temperatures. However, hydrogen-containing fuels exhibit specific behaviour — so called preferential diffusion effects — caused by the high diffusivity of hydrogen. The EU-funded Strela ⁽¹⁾ scientists examined how these effects influence the propagation and extinction of fuel-lean methane-hydrogen-air (hythane-air) flames.

After carrying out a series of experiments, the scientists found that for all hydrogen-containing mixtures, the lean flammability limits were much wider than the minimum fuel concentrations at which adiabatic planar flames could propagate. Moreover, unexpectedly, a variety of qualitatively different regimes were observed for ultra-lean flames as researchers varied the parameters of the experiments.

An important outcome of the Strela project was the design of a prototype burner which allowed researchers to stabilise ultra-lean sub-limit flames. This burner could be used in further studies to examine the fundamental preferential diffusion effect. 'Such studies would be of significant potential value for the better understanding and correct modelling of lean combustion of hydrogen-containing fuels in practical devices,' said a project scientist.

In the meantime, the researchers noted that the results of this project could be used to establish safety standards for the production, storage, delivery and distribution of hythane-air blends.

Stela's project coordinator was based at Eindhoven University of Technology in Eindhoven, Netherlands.

(1) 'Stretch effects on hydrogen/methane/air laminar flame propagation and extinction'.

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

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Harmony in transport

By unifying protocols and systems for different guided transport modes — from tramways to trains — an EU-funded project will enhance safety and security beyond current practice.

For the most part, European cities boast sophisticated guided public transport systems such as light rail, metro, trams and commuter trains. These modes of transport operate on very different systems and standards, making it challenging to develop a unified safety strategy and protocol.

The EU-funded Modsafe ⁽¹⁾ project wants to unify safety and security aspects in guided public transport with cost-effective innovations, products and solutions. The project is helping to streamline and normalise all activities related to guided land transport within the EU to improve interoperability, interchangeability and cross-acceptance. This will harmonise the sector and strengthen it, promoting safety and security considerations in particular.

A thorough survey of the relevant types of transport and how they operate was undertaken, forming a strong base for the rest of the project. Subsequently, a preliminary analysis of hazards was conducted, shaping the way for a coherent hazard analysis strategy. Previous

studies were also brought together, and their results have been processed and analysed thoroughly using novel techniques. In an important development, the project completed a review of existing means and measures for security systems. It also investigated hazard scenarios related to different security aspects.

In conjunction, a website for Mod-safe was developed, featuring a public area featuring detailed information



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about the project's progress as well as informative newsletters. This information is also of great value to operators who want to join the project and form a network under the International Organisation of Public Transport (UITP). The latter, involving all stakeholders, from public transport authorities to the supply and service industries, is a platform for worldwide cooperation, business development and the sharing of know-how among 3 400 members from 92 countries.

Upon completion, the project will provide solid guidance on how to deal with the diversities of various transport systems in order to establish a common European strategy. The project's activities will help to create common safety and security methods across the EU, resulting in common safety standards. The networks and connections of operators, urban rail suppliers and transport research institutions developed for this project will help to establish ongoing discussions in the field. This will reveal

their common goals and encourage a better understanding of different European procedures and needs.

Modsafes's project coordinator is based at the Tuv Rheinland Intertraffic GMBH in Cologne, Germany.

(1) 'Modular urban transport safety and security analysis'.

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

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The future of urban transport

Intelligent transport systems are set to dot European cities in the near future, but a system is needed to recommend the best investments and assess the viability of these projects.

With environmental concerns and quality of life at stake, European municipalities need better ways to improve their urban transportation systems. The Conduits⁽¹⁾ project is an EU-funded initiative that developed ways and measures to facilitate best practice among municipalities regarding their experiences with 'Intelligent transportation systems' (ITSs). The project also linked ITS performance by developing telltale indicators with the current traffic situation in the cities.

The project consortium involved transport authorities from five European cities (Brussels, Istanbul, London, Paris,

and Rome) as well as three universities (Imperial College London, UK; Technical University Munich, Germany; and Technion from Israel). Through its efforts, Conduits outlined the most promising areas for urban ITS where research efforts should be directed. It helped in building international standards for quantifying benefits, enabling better and faster decision-making by policy-makers. At the same time, the project stimulated more private high-tech investment by lowering the risk and uncertainty associated with ITSs.

This fits perfectly with the project's objectives of sustainable transport, future

city planning, comparisons with other cities, facilitation of technical exchange and overcoming barriers to better transport systems.

In its first year, Conduits formed a network of 34 cities in Europe plus five other international cities. It articulated the future needs of ITS applications and considered different scenarios, analysing the ITS landscape in cities around the globe. It also launched an engaging website to report on its progress and inform the public on ITSs.

The project's main outcomes included a thorough review of ITSs in European cities today, with respect to future ITS investments. Secondly, a picture of ITS development in European cities tomorrow was developed to understand the role and possibilities for ITS deployment in the future. Since the evaluation of ITSs must be based on performance, the project team had to develop a set of key performance indicators to assess ITS projects. This is truly an excellent example of how the EU is working to create model cities and a better quality of life behind the scenes.

The Conduit's project coordinator was based at the Istituto di Studi per l'Integrazione dei Sistemi in Rome, Italy.

(1) 'Coordination of network descriptors for urban intelligent transportation systems'.

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

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Pre-empting transport trouble

More cost-effective monitoring technologies for corrosion and fatigue in railroad cars, trucks and ships will ensure safer transport and uninterrupted operation for other important sectors within the economy.

Many sectors of the economy, such as shipping, trade, industry, agriculture and tourism, are based on transport. Vehicles such as trucks, ships and railway wagons have to be properly maintained to ensure that these sectors function seamlessly.

The EU-funded Corfat ⁽¹⁾ project is developing monitoring equipment to assess fatigue and corrosion in all types of heavy-duty vehicles, based on a technology called acoustic emission testing. By monitoring the kind of sound wave that fatigue, friction and corrosion create, it becomes easier to detect faults and repair them before they become serious. Implementing 'Acoustic emission' (AE) technology in maintenance and inspection increases safety and decreases costs.

The project gathered all the experiences and knowledge on mechanisms and effects of corrosion and fatigue on transport from Corfat's project partners. Based on international inspection rules, established standards, partner expertise and test results, the team was able to develop requirements for hardware and software to elaborate the new monitoring instruments.

Specific lab tests related to corrosion and fatigue were developed and validated by different Corfat project partners. Corrosion and fatigue cracks were induced in specimens for testing, and relevant data from these were stored in a database of results and observations. The tests were very successful in differentiating between AE — or noise — caused by corrosion or fatigue from background noise.

One of the main benefits of AE monitoring is being able to quickly identify hot spots where most of the degradation takes place. This feature and the new technology could help minimise downtime during inspection, which saves costs and makes transport more efficient. By keeping the wheels of the transport sector properly oiled, figuratively speaking, the other sectors that depend on it will run more smoothly. This creates a positive domino effect on the economy and industry in general while also enhancing safety.

Corfat's project coordinator is based at TUV Austria Services GmbH in Vienna, Austria.

(1) 'Cost effective corrosion and fatigue monitoring for transport products'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6551



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European researchers driving road safety

The EU-funded ADOSE ⁽¹⁾ project conducted research that could make vehicles more secure and safer. The project partners developed an inexpensive optical sensor system for the windshields of small and medium-sized cars. This driver-assistance system could help reduce the number of accidents on the roads.

This latest system gives cars the intelligence they need to respond to their surroundings. For instance, the system can differentiate between fog and darkness. Led by the Centro Ricerche Fiat Società Consortile per Azioni in Italy, the ADOSE consortium included research and industry experts from Austria, Belgium, Finland, Germany, Italy, Norway and Sweden.

The project partners pointed out that the number of traffic fatalities in Germany, for instance, has dropped in recent years. Based on data obtained in various studies, novel driver-assistance systems are increasingly reacting more quickly to critical situations than

humans. These systems not only have the capacity to identify risks, but they can also warn drivers of dangers and help them deal with critical situations. A case in point is radar sensors that scan surrounding traffic conditions, monitoring the car's blind spot or maintaining a safe distance from the car up ahead. Infrared detectors give night vision a boost, while fatigue sensors sound an alarm if a driver becomes drowsy. The downside of these systems is that they are available only for high-priced vehicles. This is where the ADOSE system comes in.

'Our multifunctional system consists of an entire camera, two sensors equipped

with Fresnel lenses to detect light signals, and an infrared LED (light-emitting diode),' explained Dr Henning Schroeder, ADOSE partner and group manager of Fraunhofer Assembly and Packaging Technologies for Microsystems (IZM) in Germany.

'Because fog and darkness can exhibit optically identical spectra, it is difficult to distinguish between these two light phenomena. That's why the infrared LED emits light waves that are scattered back in fog, but not in conditions of darkness. It's particularly difficult to capture the light signal from a broad aperture angle, to bundle the signal and pass it along the circuit board to the four corners of the camera chip because the middle of the chip is reserved for recording the camera image,' he added.

The researchers developed lightpipes in a hot stamping procedure to make this possible. The lightpipes are hollow, mirrored tubes capable of deflecting a light signal by as much as 90 degrees. While optical fibres were used to transmit these signals up to this point, they are vulnerable to snapping at even low bending radii. They are also costly and must be mounted in place manually and with great care.

'With the lightpipes, we have succeeded in making the optical signal transmission more efficient, making the entire system smaller and reducing costs as a result,' said the Fraunhofer IZM researcher.

A number of optical channels are produced in a single pass during the hot stamping method. This process effectively makes the assembly much easier to perform. A prototype of the sensor module is now available, and Centro Ricerche Fiat is already performing initial tests in the field.

ADOSE was funded under the 'Information and communication technologies' (ICT) theme of the EU's Seventh Framework Programme (FP7) to the tune of EUR 6.1 million.

(1) 'Reliable application specific detection of road users with vehicle on-board sensors'.

Promoted through the Research Information Centre.

<http://ec.europa.eu/research/infocentre> > search > 22433



Researchers set sights on overhauling air traffic communication across Europe

Making skies safe for travellers is a key objective of Europeans. In order to do this, communication systems that are up to 50 years old must be replaced. The information exchanged between traffic controllers and pilots, mainly verbally, will be upgraded with automated data available for more people in a new air traffic security Internet.

A European team of researchers is currently working on restructuring air traffic across the region to meet the challenges head on. Jointly-funded by the Norwegian Research Council and the Norwegian ATM Industry, the Secomas ⁽¹⁾ project is part of the European initiative's technological and operational dimension called 'Single European sky ATM research' (SESAR). SESAR is funded in part by the European Commission with a whopping EUR 700 million. Industry and the European Organisation for the Safety of Air Navigation (Eurocontrol) support SESAR with another EUR 2.1 billion. Eurocontrol is an intergovernmental organisation composed of 39 member states and the European Community.

'Current communication systems have been in use since the 1960s and 1970s,' says Jan Erik Håkegård of the Norwegian research institution SINTEF and project leader at Secomas. 'They will not be able to deal with the pressing need for greater capacity.' Secomas is targeting the development of new air traffic communication technology.

Current systems oblige pilots and air traffic controllers to communicate verbally. But this new technology would generate digitalised information, giving multiple user groups like ground crews access to information.

'In the future, information will be largely digital and stored in an Internet cloud, and communication will function like an intranet,' explains Dr Håkegård. 'Travellers will probably not notice the changes much which is exactly what we intend. Passengers may even see prices drop a bit, and find that their journeys take less time overall, but by and large these factors won't have a major impact on their experience. By contrast, if we didn't carry out this upgrade, they would really feel it — the

increased flight activity would mean sky-high prices and a large number of delays.'

Switching to digital services is a wide-ranging effort with strict requirements governing the new communication technology, according to the researchers.

'A set of digital services for pilots has already been developed,' Dr Håkegård says. 'The system will give them information about the status of their aircraft, the location of other aircraft, what kind of weather to expect, and where they can fly to increase air traffic efficiency.'

The upshot is that shorter flight times, fewer delays and a better flow of information between airline and airport personnel will result.

Boosting efficiency and expanding capacity are also important for Europe. By reorganising all aviation traffic across national borders, both efficiency and capacity would increase. Making the necessary changes to the structure would enable aviation experts to deal with future air traffic, safety and environmental issues.

'Europe's airspace is very fragmented today,' Dr Håkegård points out. 'Once we implement integrated management, we will have greater control over flight activities and be able to fly more direct routes more often than what is currently possible.'

This sophisticated technology will be mass produced and gradually installed in two years' time.

(1) 'Spectrum efficient communication for future aeronautical services'.

Promoted through the Research Information Centre.
<http://ec.europa.eu/research/infocentre> > search > 21793



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What does the rest of the world think of Europe?

What does the rest of the world think of Europe and how do they perceive its global role? These questions have been answered by the EU-funded Eurobroadmap ⁽¹⁾ project, which has been established to produce a non-Eurocentric view of Europe.

Eurobroadmap has gathered information from students and migrants located inside and outside the EU. Undergraduates from 18 different countries completed a detailed questionnaire to determine their perception of Europe.

A number of different techniques were used in the questionnaire, including the drawing of maps, open questions and rankings. Comparisons were made between foreign students living inside the EU, those living in neighbouring countries and those from Africa, Asia and South America. Researchers also studied differences in perception according to gender and the students' academic fields.

Migrants from Asia and sub-Saharan Africa were interviewed to determine their views on Europe. Interviewees were also selected according to different stages of the migration process. Some were potential migrants; others were illegal immigrants living in camps at the border of the European Union, and there were also legal and illegal migrants living in Europe. A number of former migrants, who had returned to their country of origin, have also been interviewed.

A view of Europe about itself has also been produced and compared with the perspective from abroad. This has been achieved by analysing a number of representative bodies with particular attention paid to any maps of Europe they have produced. This has involved the study of websites, teaching materials in the fields of history and geography, national foreign offices, and international economic data.

Findings from the Eurobroadmap project show that students living within the EU have mainly described its economy and institutions. Students living abroad have tended to describe the luxuries available in Europe and its high level of development, but also its domination of the world and racism. Despite this, the results confirm that Europe is the most attractive place in the world for students. Migrants, however, have a more ambivalent attitude.

Europe's view of itself has revealed some divisions amongst the visions of the EU Member States and some divisions between the Member States and EU institutions such as the European Commission. This can become a source of misunderstanding with regard to certain external relations issues.

The project has two main potential impacts. The first is to provide EU citizens and decision-makers with a more accurate view of their position in the world. The second is to contribute to improved international relations through a better informed dialogue between different peoples around the globe.

The Eurobroadmap project coordinator is based at the Centre National de la Recherche Scientifique in Paris, France.

(1) 'European Union and world seen from abroad'.

Funded under the FP7 specific programme Cooperation under the theme Socio-economic sciences and the humanities.
<http://cordis.europa.eu/marketplace> > search > offers > 6512



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The right way to go global

More accurate funding for globalised research and development is a must if Europe is to grow and stay competitive. Opportunities must be tackled before they are missed.

A value chain is generally defined as a series of activities that firms, departments or workers bring to a product from its conception to its end use. This includes design, production, marketing, distribution and consumer support. These activities can be confined to one firm or spread among different nations, becoming a global value chain (GVC).

The wealth of nations is increasingly generated through GVCs and is spreading beyond product chains to research strategies and research and technological development (RTD). As research benefits and impacts become more widely dispersed, they also become more difficult to quantify and detect. As a result, EU financial RTD support may gravitate to other locations and markets than originally intended or desired, scaring European funding agencies away.

The EU-funded Gloval⁽¹⁾ project wants to promote RTD support policies that achieve the best possible national and regional results for the investment. The project is outlining policies that help enterprises, research organisations, universities and others that are deeply-rooted in GVCs or that are looking to network or operate on a global scale. In addition, the project is investigating policies that can make national or regional research environments

attractive to GVCs. With economic growth as the ultimate mission, the outputs from Gloval will offer RTD policy-makers practical tools for appraising public RTD investments where a significant GVC dimension exists.

Through analyses and case studies, the project is achieving a clear understanding of GVCs in relation to the needs of RTD policy-makers. GVC-related project proposals are frequent and sometimes problematic for RTD managers, often resulting in suboptimal funding or refusal of projects altogether. In a drive to promote important future RTD projects, Gloval is convincing RTD policy-makers of the need for thorough consideration or reconsideration of GVC-linked projects to avoid missing valuable opportunities.

In light of this, Gloval is preparing a report on the impact of GVCs on the economic activity in EU countries as related to RTD policy practice. It is also reporting on the mismatch between RTD policies and GVCs. Workshops in northern, central and southern Europe have been organised to explore GVC issues. These workshops are validating the project's findings

and raising awareness regarding the challenges posed by GVCs for RTD policy, involving policy-makers in the process as well.

In summary, Gloval will help improve the efficiency of RTD policy practice by reducing the chance of inadequate public assistance. It will help better exploit the opportunities of globalisation and GVCs by giving RTD policy-makers tools for better understanding and appraisal of these opportunities.

Gloval's project coordinator is based at the Swedish Agency for Innovation Systems in Stockholm, Sweden.

(1) 'Global value chains as an emerging challenge for national and European RTD policies'.

Funded under the FP7 specific programme Capacities under the theme 'Regions of knowledge'.
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The EU prepares to understand ageing

The ageing process can only be understood when an individual is observed over an extended period of time and at different points over its course. This is now crucial for improved economic and social frameworks for an ageing European population.

The European Strategy Forum on Research Infrastructures (ESFRI) has chosen the Survey of Health, Ageing and Retirement in Europe (SHARE) to stand as one of the European Research Area's 35 crucial pillars. The EU-funded Share-prep⁽¹⁾ project prepared a major upgrade of SHARE for all EU-27 Member States as well as Israel and

Switzerland, so as to establish a biannual panel survey over the course of the 2010-20 decade. In the acceding states, ageing presents a special challenge as populations are ageing before their social and health institutions have a chance to reach the same level of maturity as in the EU-15.

SHARE built a micro database to better understand individual and societal ageing as a process strongly influenced over time by pension, health care and labour market regimes and respective reforms. Designed by and for researchers, the infrastructure brings together economics, medicine and the social sciences. The research will serve as feedback in support of EU policy development and in response to the challenges of population ageing across the EU.

Share-prep set out to fill in knowledge gaps in individual and population ageing found in the SHARE prototype.

It reassessed financial, legal, governance and technical maturity levels. This called for a two-pronged approach. Firstly, SHARE's time range extended up to 15 years in order to assess subjects and their reactions to changes in their social and economic environments. Secondly, SHARE was expanded to include all EU Member States.

Share-prep's most significant outcome is a memorandum of understanding that supports the sustainable cooperation of the stakeholders and the statutes of the Share European Research Infrastructure Consortium.

(1) 'Upgrading the Survey of Health, Ageing and Retirement in Europe — preparatory phase'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6444



Improving human capital boosts international efforts

Enriching human capital can go a long way in boosting a country's research efforts. It can also serve as a successful repatriation tool.

The EU-funded Ecogene⁽¹⁾ project is working to improve the research capacity of the Estonian Biocentre (EBC), especially as related to the Seventh Framework Programme. The approach focuses almost exclusively on establishing a strong human capital base.

In efforts to enhance intellectual capacity, the project offers grants aimed at uncovering hidden, underused and potentially lost intellectual capital. One work package (WP) has issued open calls for six women in science (WIS)

grants (of EUR 10 000 each) for female scientists returning from maternity leave. Another WP seeks to repatriate promising young and experienced researchers of Estonian origin doing their research abroad.

The project promotes the transfer of knowledge through short- and medium-term outward mobility of EBC researchers. In the first two years, this has resulted in one published joint research paper. Junior and experienced researcher positions have been opened to the European academic community, and there are plans to introduce and reinforce twinning actions by two-way study visits and brainstorm meetings. To date, 17 study visits and two brainstorm meetings have been financed, with another 20 being planned.

Practical courses and training seminars highlight locally developed know-how and boost international cooperation. Such gatherings along with a series of international conferences (e.g. Geneforum) and the 2009 Human Genome Variation Meeting (HGV2009) also serve to increase public awareness.

Ecogene's approach towards deeper integration of the EBC into the European research community also aims at measurable results in the form of published research papers and jointly prepared EU grant applications. Already having a positive effect on the Estonian research community, the collaboration between the EBC and the Estonian Genome Project (part of the Biotechnology Department of Tartu University's Institute of Molecular and Cell Biology in Estonia) has been awarded status as one of seven national centres of excellence in research.

Ecogene's project coordinator is based at the Eesti Biokeskus in Tartu, Estonia.

(1) 'Unlocking the European Union convergence region potential in genetics'.

Funded under the FP7 specific programme Capacities under the theme 'Research potential of convergence regions'.
<http://cordis.europa.eu/marketplace> > search > offers > 6443



People power

Industry, technology and the economy on the whole are depending increasingly on human assets and knowledge rather than physical assets. Understanding this dynamic can help support the economy in novel ways.

Increased competition and globalisation are putting pressure on companies and the regions that depend on their success. Traits such as flexibility, the ability to immediately adapt to market developments, and being proactive are needed to overcome these challenges.

Physical assets and equipment, which are more readily available than ever before, are no longer the key requirements as economic drivers. Instead, the intangible assets of human capital and knowledge are becoming the principle drivers behind the economy. These assets are of increasing interest from academic, policy and corporate perspectives, particularly their impact on economic processes. They are the non-material factors which contribute to providing goods and services that generate future economic benefits to the entities or individuals controlling them.

Intangible assets contribute to production and productivity within the firm through human and organisational capital, intellectual assets, brand name, etc. They equally contribute to production outside the firm through the legal and institutional framework, education system, property rights protection, social capital, and other means.

The EU-funded project IAREG ⁽¹⁾ analysed the role of these assets in regional economic growth. It focused on assets that can be readily studied through statistical information, such as knowledge capital, human capital, social capital and entrepreneurship capital. IAREG investigated their main characteristics and effects on regional economic growth, as well as the overall effects on the location of firms.

To achieve its aim, the project developed new indicators for improving

the measurement of intangible assets. It identified how knowledge is gained and spread by focusing on the role of intangible assets in this process. IAREG also analysed the role that knowledge, human, social and entrepreneurship capital have on regional economic growth and productivity. Examining how these assets affect the choice of a firm's locale was also an important part of the project's tasks. Another important task was to see how external factors generate intangible assets and affect economic performance.

All this helped IAREG extract policy guidelines for public administrators. The project results will eventually be communicated to policy-makers at European, national and regional levels. Fitting neatly within the Europe's 2020 Strategy, the IAREG project's results could create value by improving education and training to increase productivity, and by firmly basing growth on knowledge. The results have the potential to empower people in inclusive societies, advancing the concept of flexibility for employees and employers. A new industrial policy in Europe could also emerge from IAREG, one that emphasises innovation capacity, skills and entrepreneurship, putting people power at the centre of the equation.

IAREG's project coordinator was based at the University of Barcelona in Spain.

(1) 'Intangible assets and regional economic growth'.

Funded under the FP7 specific programme Cooperation under the theme Socio-economic sciences and the humanities.
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Relationships factor into adolescent turmoil

Adolescence is a time of turmoil and transition to adulthood. Aggression and depression during this time can negatively affect children and their families.

The EU-funded Psychopathology ⁽¹⁾ project is investigating the development of aggressive and depressive symptoms during adolescence. Working within the framework of developmental psychopathology, the objectives are to identify adolescents exhibiting distinct or combined problems of aggression and depression, investigate

how risk and protective factors relate to these problems and identify differential outcomes of normal and ill-adjusted development.

To investigate co-occurrence of aggression and depression during adolescence, a longitudinal model is being used for four years in grades 7 through

10 consecutively. Data will be analysed with the longitudinal person-oriented methodology known as general growth-mixture modelling.

Children were recruited from 17 schools spread over three cities in Cyprus, and data collected from 2 356 in the first reporting year and 1 348 in the second year. Identical questionnaires were administered both years and the statistical package for the social sciences computer program was used for data analysis from each reporting year.

The study gives evidence of the existence of pure depressive and aggressive problems as well as co-occurring problems. Various results suggest that positive relationships with parents and teachers are associated with less aggression and depression. However, positive relationships with peers are positively associated with aggression but not with depression.

Scorings of callous-unemotional traits showed impulsivity and narcissism to be positively associated with aggression. Children with low aggression scores but high impulsivity scores appear more likely to experience depression. Other data analysis suggests that adolescents exhibiting pure aggressive behaviour more often had positive peer relationships, compared to depressed adolescents and those presenting both problems.

Other Psychopathology study results point to impulsivity being a common risk factor for both aggressive and depressive problems, while high self-esteem and supportive social relationships seem to act as protective processes. Adolescents exhibiting high and continuous levels of co-occurring problems reported higher levels of delinquency, substance use and social problems.

The participating middle school students will be followed for two additional time points. The study is expected to have significant social impact and provide evidence of how and why aggressive and depressive problems co-occur in children.

Psychopathology's project coordinator is based at the Panepistimio Kyprou in Nicosia, Cyprus.

(1) 'The development of aggressive and depressive problems during adolescence'.

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

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The bioethical imperative

Are the medical and biotech companies behaving ethically when they develop new products and applications across the world? One global initiative, with EU backing, wants to help ensure that they are.

As medical science and biotechnology advance, there is a need to address ethical considerations and outline policies to preserve them. This can be accomplished under the discipline of bioethics, which concerns itself with the philosophy and ethics of abortion, euthanasia, genetic engineering, organ donation, biological hazards, and more.

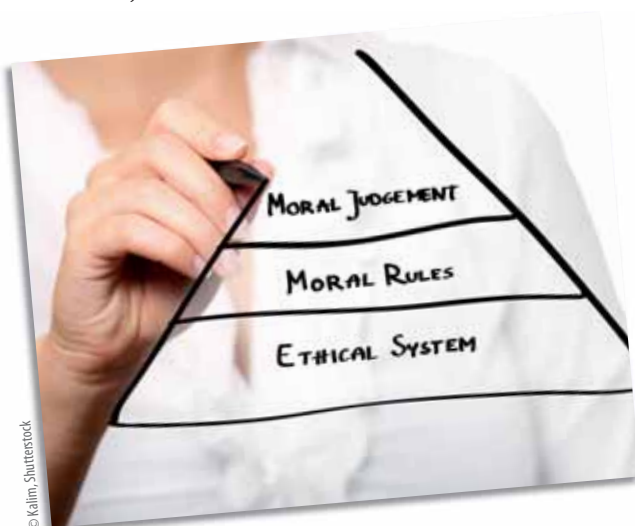
In November 2009, the European Community and the United Nations Educational, Scientific and Cultural

Organization (Unesco) hosted the EU-funded JACOB ⁽¹⁾ conference. The conference helped build the professional and administrative capacities of the newly established National Bioethics Committees (NBCs) in developing countries. It promoted an international ethics network that brings together newly created NBCs from Africa, the Caribbean, Latin America, and other regions together with experienced committees from Europe.

as well as finding ways to improve collaboration in the future.

The main objective of the conference was to facilitate working linkages for knowledge and experience sharing among NBCs from around the world. This represents a major step towards reinforcing bioethics capacities of countries that have recently established or will establish such national bioethics bodies. JACOB has already made important contributions to increasing national bioethics capacities of countries worldwide. The contributions have enabled these nations to be at the forefront of protecting human rights against threats or challenges posed by scientific and technological advances.

Numerous experts were invited to the conference to share knowledge regarding best practices in running NBCs. They encouraged the development of procedures and policies for bioethics committees and promoted effective engagement in policy-making. In selecting the participants of the conference, special attention was paid to find a balance between experienced and the newly established committees. This ensured that the latter benefit fully from the experiences that senior NBCs have accrued, including working methods, problems identified and lessons learned.



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Held in Mexico City, the event brought together more than 100 participants representing national bioethics bodies, as well as regional and international organisations in the field of bioethics. The participants made great strides in sharing knowledge on establishing and operating NBCs,



Conference debates revealed that bioethics is increasingly prominent on the political agenda of governments around the world. In addition, the conference summarised the ideas generated during the sessions in end reports, where participants reaffirmed the indispensable role that national bioethics committees play in shaping and guiding bioethics discourse and practices at national level. Many of the findings and

presentations are published on the conference website.

Unesco is also in the final stages of publishing a compilation of papers, submitted by the participants based on their presentations. These represent a substantive volume of information covering the major themes of the conference. By empowering NBCs to adopt innovative policies and procedures, JACOB

has promoted the health and well-being of nations worldwide through better ethical practices within the medical and biotech industries.

(1) 'EC-UNESCO conference: joint action for capacity-building in bioethics'.

Funded under the FP7 specific programme Capacities under the theme Science in society.

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Social sciences powerhouse

European institutions along with global organisations and national statistics bureaus from across Europe will share their data with a new large social sciences library currently under construction. The benefit to researchers and students will be especially noteworthy.

The Council of European Social Science Data Archives (Cessda) is an umbrella organisation for social science data archives across Europe. Since the 1970s, its members have worked together to improve access to data for researchers and students. Its research and development projects as well as expert seminars enhance exchange of data and technologies among data organisations.

The EU has identified a need to modernise and upgrade the council, a goal which is being realised through the EU-funded Cessda-PPP (1) project. This preparatory phase project aimed to transform Cessda from an informally managed group of disparate data archives into a broader, more inclusive data infrastructure for social sciences and humanities.

While the new organisation will not be a data archive itself, it will fulfil central tasks to build, develop and sustain a fully-functioning European data infrastructure. Data management, distribution and user support will continue to be undertaken nationally via a network of resource providers such as those of the existing Cessda membership.

The project identified known weaknesses in the existing organisation, addressing both internal issues relating to membership and external issues such as gaps in data collection currently available to researchers. To overcome these issues, the project undertook surveys and consulted experts to determine

what improvements will allow existing Cessda members to participate fully in the upgraded infrastructure. It also established direct contact with external organisations for their support. Meetings among the coordinator, national funders and representatives of non-Cessda archives in Eastern Europe and the Balkans determined these regions' interest in joining the infrastructure, also taking into account their existing national services and funding requirements.

Cessda-PPP introduced a number of important data producers to the enhanced infrastructure, including national statistical institutes, organisations such as the World Bank and Organisation for Economic Co-operation and Development (OECD), and the EU's Directorate-General for Research and Innovation. A conference to address the lack of availability of European qualitative material also took place.

Once all the information was collected, the project teams collated and analysed the results, summarising the current state of the Cessda and prioritising activities needed to create a truly European data infrastructure. The team's reports outlined recommendations

in a series of documents including conditions of membership, as well as business and financial plans, required for the next phase of the infrastructure's development. This initiative is expected to transform Cessda into a much more solid archive platform with growing European influence and a more formal or legal status. Researchers, students and academic institutions stand to benefit greatly from this project.

CEDESSA's project coordinator was based at the University of Essex in Colchester, UK.

(1) 'Preparatory phase project for a major upgrade of the council of European social science data archives (Cessda) research infrastructure'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6424



Trans-Atlantic team dig deep into earth

Researchers in the EU and the US are working together to investigate three aspects of global seismic tomography.

The EU-funded GST⁽¹⁾ project, composed of scientists from the US and France, will look at the merging of seismic data in different frequency ranges. This includes travel times and amplitudes of phases that do not satisfy the assumptions of geometrical optics, otherwise known as 'finite-frequency tomography'. It will also study the expansion of the acquisition of seismological data to the oceans by equipping underwater floats with hydrophones. And finally, it will explore the incorporation of wavelet expansions into the tomographic inversion.

The funding from the EU will help the GST project to successfully jumpstart

an active research programme in global seismic tomography. The funding will enable the team to acquire an apex float. This float will be tested as an undersea robot that will record seismic waves in the oceans.

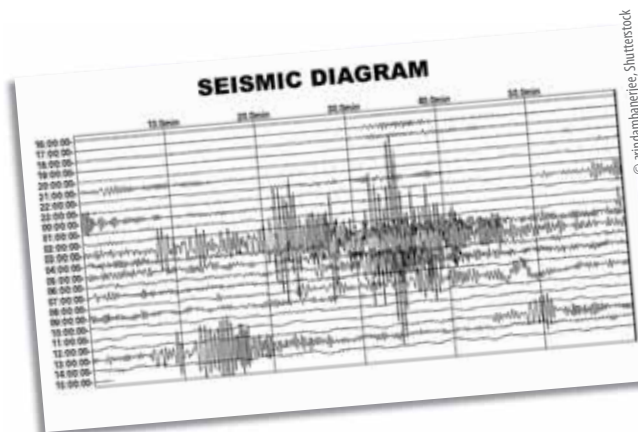
Moreover, it will allow the researchers to organise an international workshop to discuss data sharing and coordinate the development of new algorithms based on compressed sensing. The funding will also help train students in

modern data acquisition techniques and finance their participation in conferences.

(1) 'Global seismic tomography'.

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

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Corals reveal secrets of ocean carbon-cycling

Scientists may have resolved a longstanding mystery concerning the storage and release of carbon dioxide (CO₂) by the Earth's oceans. And the answer lies among the coral deep in the Southern Ocean.

The amount CO₂ in the atmosphere varied long before mankind arrived on the scene. It is well known that the oceans play an important role in the uptake and cycling of carbon. It is thought that oceans may release large amounts of stored CO₂ when the conditions are right, while at other times they may absorb and store it in deep reservoirs.

This theory is being put to the test using sediment cores from the Atlantic Ocean. Unfortunately, this technique doesn't work everywhere. But a new approach using corals found deep in the Southern Ocean is being developed with EU-funded Deepoceanglacial CO₂⁽¹⁾ project.

Coral samples were collected during a research cruise in the Southern Ocean and dated using special radioisotopes. Measurements of the coral's growth rate at different times in the past have provided feedback regarding the amount of CO₂ in the water. This enabled the research team to construct a time series of dissolved CO₂. In addition, information about the origin of the water sheds light on aspects of global ocean circulation.

The new methodology shows promise and work is already underway to further refine it. Unlocking the secrets of how the oceans regulated atmospheric CO₂ concentrations in the past will help scientists better understand what will happen in the future as anthropogenic emissions complicate the picture.

The Deepoceanglacial CO₂ project coordinator was based at the University of Bristol in Bristol, UK.

(1) 'Using deep-sea corals to test the role of the deep Southern Ocean in ocean circulation and the regulation of atmospheric carbon dioxide'.

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

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Why the straw broke the camel's back

Researchers in Hungary have investigated the mathematical theories behind sudden changes in physics, biology and society.

Using topological methods, scientists are a step closer to understanding the mathematical theories of sudden changes such as the proverbial phrase 'the straw that broke the camel's back'.

By applying the governing notion of global singularity theory, namely Thom polynomials, in various settings, the EU-funded Equitop in algegeo⁽¹⁾ project set out to get a clearer picture of sudden changes. They examined this phenomenon in physics (where, for example, water suddenly boils, or ice melts), in biology (looking for instance at population models and cell growth), and in human society (using changes in stock markets, for instance).

Under the Equitop in algegeo project, the researchers extended their expertise in this area from topology to modern geometry and related geometric and algebraic combinatorics. For example, they studied the global properties of singularities and found several hitherto unknown infinite sequences of Thom polynomials.

The researchers said that a key conclusion of the project was a better understanding of sudden changes caused by a smooth alteration of parameters.

The Equitop in algegeo project coordinator was based at the Alfréd Rényi Institute of Mathematics, Hungarian



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Academy of Science in Budapest, Hungary.

(1) 'Equivariant topology in algebraic geometry'.

Funded under the FP7 specific programme People (Marie-Curie actions).
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EU-funded scientists tackle Iwasawa theory gaps

Researchers in Turkey are attempting to shed light on various problems in number theory and arithmetic geometry.



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Galois representations have become one of the central objects of study in number theory and arithmetic geometry. Despite great achievements in this area in the last decade, many important questions in this area of research remain open, such as the main conjectures of Iwasawa theory in various contexts.

Scientists at Koç University in Istanbul are exploring how to plug some of these gaps via the EU-funded Iwthegar⁽¹⁾ project. The aim is to study Euler and Kolyvagin systems attached to Galois representations and to their

Iwasawa theoretical deformations, as well as related themes within the Euler system theory.

In addition to paying for the research team to resolve various mathematical problems, the EU funds are being used to train the lead researcher for the transfer of knowledge and to help him integrate into the European scientific community.

The researcher made use of the funds to visit several European research institutes and deliver lectures in Germany, Poland, Turkey, and the UK. He also financed scientific trips to Chile, Japan and the US to maintain ties with research groups in these countries. Moreover, he acted as host to several important researchers in Istanbul to give the local mathematics community an opportunity to interact with some of the leading researchers in arithmetic algebraic geometry and number theory.

(1) 'Iwasawa theory of Galois representations'.

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

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Mobile tech to support HIV treatment

The HIV epidemic in India is impacted by widespread differences in social, cultural, religious and sexual practices. But in the interest of public health, adherence to treatment regimens is a must regardless of class and lifestyle.

The EU-funded Hivind ⁽¹⁾ project is active in two of India's HIV high-prevalence provinces, Karnataka and Tamil Nadu. As the antiretroviral therapy (ART) programme gains momentum, keeping to the treatment module is a key issue.

To achieve this, mobile telephones will be used to promote adherence in ART-naïve, HIV+ Indian patients. Besides offering adherence support through the mobile telephone interface and assessing the effect of intervention in keeping to the regimen, the study will also provide data on Indian patients with a resistance to ART.



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The intervention will be compared to existing conventional treatment to determine if it influences failure, adherence and other outcomes. New, simpler and inexpensive biochemical techniques will be used to avoid the high costs of monitoring treatment by viral load. Using an affordable load test such as the enzyme-linked immunosorbent assay (ELISA) will help detect infection and intervention failure earlier on, thus lessening public health implications.

The six-member consortium held their project steering committee meetings in February 2009. So far, ethical clearances have been obtained from all partner institutions, and the trial has been registered. The website and a functioning project office have been set up. Project partners have developed all trial instruments and standard operating procedures, and trial staff has been trained.

However, although the detailed trial protocol has been written up, submitted to the Indian Council of Medical Research and even published in the open access journal *Medical Research Methods*, clearances from the government of India are still pending.

Hivind project coordinator is based in Stockholm, Sweden.

(1) 'The antiretroviral roll out for HIV in India — strengthening capacity to promote adherence and patient follow-up in the context'

Funded under the FP7 specific programme Cooperation under the theme Health.
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A stronghold for strong viruses

A coordinated European archive of viruses, with research centres located in several countries, will help promote viral research.

The EU-funded 'European virus archive' (EVA) project aims to build a readily accessible European virus reference library to enable the exchange of knowledge related to virus research, with the hope of furthering science's understanding of these infectious agents.

Due to its size and complexity, such an archive must be housed in several places, i.e. facilities of recognised centres of excellence in virology within Europe. Currently, the EVA laboratory network holds approximately 50% of the 500 recognised human pathogens within its

collection. The ultimate aim of EVA is to coordinate these collections to produce the largest library of available quality-controlled viruses in the world.

To achieve this, the project appointed a quality manager in 2009 and drafted a quality policy as well as best practice guidelines, covering procedures for operation and for handling of viruses. EVA has also developed guidelines for partners for shipping viruses and derivative products, in response to pathogen access and biosafety issues and the need for strict safety protocols.

By July 2010, EVA had audited each partner and helped them outline objectives to help achieve the project's goals more quickly. It also launched a website, considered the main tool for advertising the project; it allows access to the different EVA database interfaces. The website contains a restricted area for members, i.e. scientists involved indirectly in the project, extending the EVA collection via worldwide collaboration. Delivery of viruses is being promoted extensively through different means, targeting pharmaceutical industries, biotechnology firms and research institutes, among others. All these steps have resulted in an operational database containing 18 sub-collections which include almost 200 viruses.



EVA plans to exploit its knowledge and scientific networks to attract other international laboratories with relevant virus collections. Agreements have already been signed with seven institutes worldwide. Potential new collaborations are also being pursued.

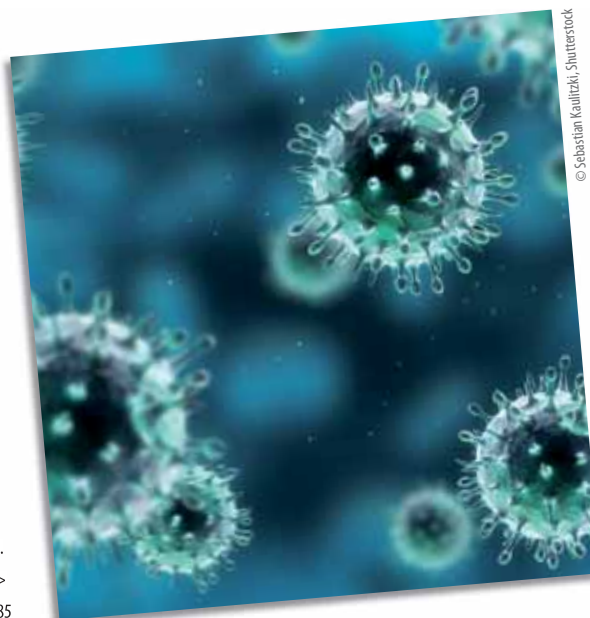
Recently, the coordinator of the EU-funded 'European research infrastructure for high security laboratories' (Erinha) project proposed an association with EVA to provide access to highly pathogenic viruses classed as biological safety level 4. This includes derived viral products for research and industrial development. Other networking associations are also on the horizon, making EVA an important

platform that provides improved access to researchers. Sooner rather than later, this virus archive could represent one of Europe's most important initiatives in the field.

EVA project coordinator is based in Marseille, France.

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

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EU-wide access to cancer intelligence

The volumes of information and data on cancer-related issues make EU-wide collaboration and health care difficult at best.

The EU-funded Eurocancercoms ⁽¹⁾ project is working to streamline resources and access to information for cancer health professionals, policy-makers and patients. Developing a functional system for the exchange and use of relevant knowledge will enhance and expedite the translation and implementation of research in Europe.

The two-year project, funded under the Seventh Framework Programme, aims to provide proof of concept for integrating cancer information on a unique platform in order to offer cancer intelligence. Such a model could

ultimately be applied to other areas of health care.

The initial focus of technical development is on building an open source multilingual platform to integrate existing content from a wide range of applications — documents, multimedia streaming, podcasts, etc. — in a seamless and user-friendly manner. Starting out with five languages, resources will ultimately be dedicated to patients, prevention, policy, cancer science and cancer management. New tools will be developed for visualising and personalising the multitude of cancer-related information.

Partnerships with patient organisations and various professional representational groups will help project partners focus on patient information, various areas of cancer health care (medical oncology, paediatric oncology, surgery and others) and cancer policy-makers in both the public and private arenas.

Eurocancercoms is conducting research for greater insight into the potential of new technologies, community needs and content types appropriate for a new e-cancer portal.

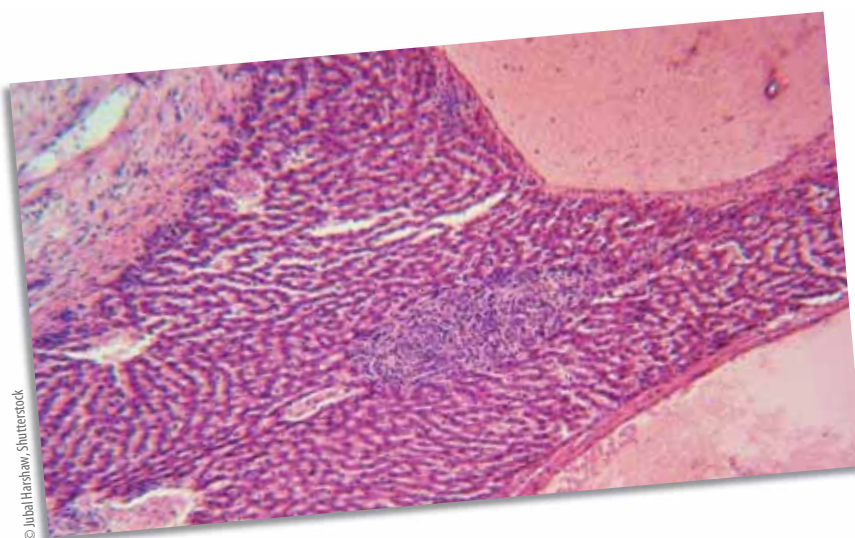
The Eurocancercoms website will publish a full listing of ongoing projects as activities proceed. Team members aim to attract wide-ranging community representatives for testing new concepts, content and approaches. At the end of the project, third or fourth quarter 2011, the project will have delivered novel analysis and a new virtual platform for cancer information in Europe.

Eurocancercoms project coordinator is based in Milan, Italy.

(1) 'Establishing an efficient network for cancer communication in Europe'.

Funded under the FP7 specific programme Capacities under the theme Science in society.

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The wireless revolution gets healthy

An EU-funded project can make health care much more accessible by enabling computers distributed to underprivileged regions of the world with wireless and health-monitoring capabilities.

Computer technology can be beneficial in third-world regions. For example, the 'One laptop per child' (OLPC) project initiated by MIT Media Lab in the US provides low-cost laptops to children to empower them through education. Closer to home, a new European initiative is building on the OLPC initiative to enhance availability of medical equipment in poorer and more remote areas of the world.

The EU-funded 'Cross layer algorithms for pHealth' (CLAP) project is developing a wireless sensor network (WSN) comprising sensors that detect vital signs for health care purposes, to supplement OLPC equipment. Such equipment is ideal for monitoring patient health, including blood pressure and cardiac function, in an outpatient environment such as a home or care centre.

CLAP is developing a prototype based on the OLPC concept, using low-cost, low-power wireless technologies that bring rural areas closer to governments and to more advanced technology. Known as personalised health (pHealth), this is a research field for personalised medicine that allows these laptops to interface with different medical wireless portable actuators such as respirators and infusion pumps.

An OLPC-interconnected community can help facilitate disease management and health status control within a larger

population by monitoring, processing and transmitting personal, ambient and environmental parameters. While today's pHealth systems assume an advanced technology environment, the project is developing technology to work under limited, third-world conditions. It is taking into account power consumption, network bandwidth and processing limitations.

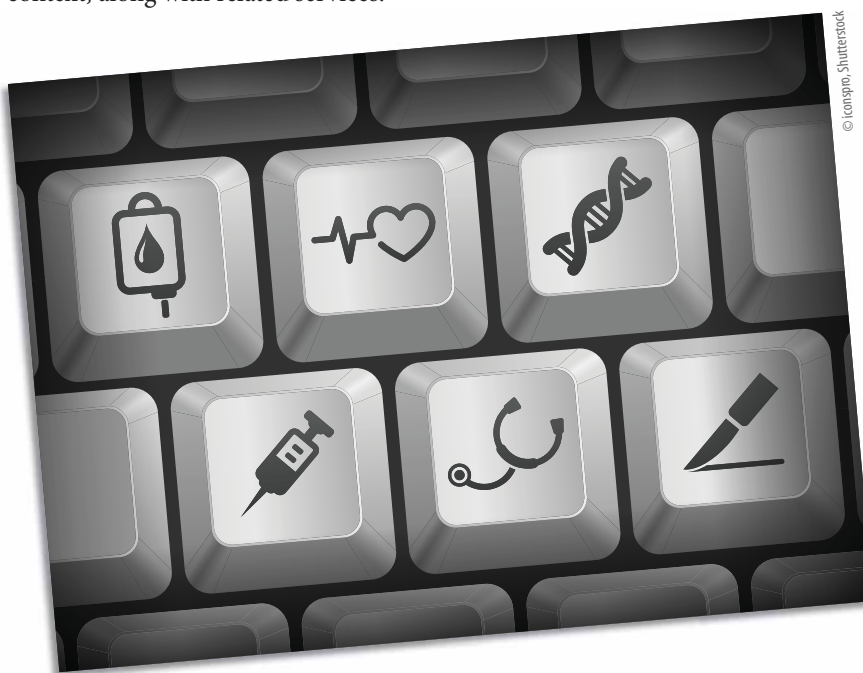
The CLAP project has already transferred knowledge on WSN trends and research from MIT. It also identified the required architecture and functionality of a WSN to work in the new pHealth context, along with related services.

In short, the definition and analysis of the project requirements, usage scenarios, system design and computational algorithms were all carried out. CLAP's initial results show promising potential, and the project is planning a pilot rollout of this novel system to test in a developing country. Different candidates are currently being reviewed, many of which are OLPC villages. If all goes well, medical technology may become much more accessible to the people who need it most.

CLAP project coordinator is based in Thessaloniki, Greece.

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

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Better future frameworks

Analysing EU Framework Programmes and the emerging pan-European networks will help design both better programmes and better networks, propelling the European Research Area to higher ground.

Over the past 20 years, numerous EU collaboration networks across the continent have taken research, development and knowledge sharing to an admirably high level. These networks have become almost as important as the scientific and technological results they produce. The EU Framework Programmes (FPs) have

been pivotal for transforming informal nation-based networks of research among academia and industry into formal collaboration arrangements between organisations at European level.

In this light, it is crucial to analyse these networks and their link to FPs,

enabling the EU to design even better networks and frameworks in the future. Do collaborative organisational links increase over time? Is it possible to identify optimal network structures by areas of research and funding instruments? Who are the key players in the FPs? A network analysis of the FPs is an important analytical tool for the overall evaluation of results and impact of research and development (R&D) policies in the EU. It helps answer these questions and many more.



The EU-funded study 'Centrality analysis in research networks' (CAIRN) has investigated these issues and thoroughly analysed the nature of networks under the different FPs. Its main objective was to advance understanding of transnational research networks and identify the role played by the most central organisations in these networks.

Overall, it found that FP success comes from integrating research teams from new Member States and small communities into wider networks, a setup

that strengthens the European Research Area (ERA). CAIRN outlined the type of networks involved and related industry clusters, analysing types of members (e.g. universities and companies), levels of collaboration and ability to expand. It found, among many important conclusions, that different kinds of networks represent different answers to the priorities of the ERA. These priorities include enhancing collaboration, advancing research, building expertise and disseminating knowledge.

Universities were seen as crucial in furthering excellence and contributing to cohesion of the ERA. Integrated projects and networks of excellence also strengthened the ERA by enhancing collaboration. They facilitated research agendas and integrated smaller research communities and new Member States. They also encouraged larger projects with more participants.

In addition, CAIRN discovered that the ERA could promote a stronger European market for research by enhancing research organisations and fostering knowledge sharing. Importantly, CAIRN also found that the energy and environment themes have promoted integration of new organisations. This reflects strong production and dissemination of knowledge that benefits the public good, highlighting the need for even more inclusive networks.

Monitoring the move towards the ERA is seen as crucial for the welfare of Europe. Beyond the analysis of publications and patents, projects like CAIRN have an important role in assessing FP effectiveness.

CAIRN project coordinator was based in Brussels, Belgium.

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

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Smart clothing that warms and cools itself

Scientists are aiming to develop temperature-regulating fibres using phase-changing materials that get warmer or colder depending on the temperature of the wearer.

Imagine being too hot and your clothes cooling you down, or freezing cold and your jumper warming you up. As part of the EU-funded Noterefiga⁽¹⁾ project, researchers in Sweden are investigating how they can develop technology to achieve these aims that will outperform materials presently available for thermal management in garments.

Clothes with built-in thermo-regulating properties allow a steady temperature to be retained in harsh environments and

during strenuous physical activity. According to the researchers, such smart clothing would reduce discomfort caused by the accumulation of sweat and moisture in clothing as well as stop the chills commonly experienced during varying activity levels and in ambient conditions. The temperature-regulating effect is achieved by incorporating large amounts of phase-changing materials (PCMs) in textile fibres.



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When the body temperature increases, the PCM melts and absorbs the heat from the body in the form of latent heat. Then, when the temperature drops, the PCM crystallises and the stored heat is released again.

The Noterefiga project will investigate the suitability of new bio-based fibres such as polylactide and conventional synthetic polymers for use in such garments. It will also examine a new concept that allows PCMs to be

incorporated in wet-spun cellulose fibres.

The scientists underlined that the project will be devoted to product-related research, led by the small to medium-sized enterprises involved in Noterefiga. They are particularly interested in creating value-added products for the underwear, sports, leisure and home textiles markets. The researchers believe the project will aid the transformation of the European textile and

clothing industry from a commodities market into specific, value-added high-tech products sector.

Noterefiga project coordinator is based in Moelndal, Sweden.

(1) 'Novel temperature regulating fibres and garments'.

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

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IT software to model nanostructures

Researchers in the Czech Republic are aiming to develop and implement computer software capable of modelling the electromagnetic response of nanostructures.

Scientists at Charles University in Prague will use EU funds to develop computer software to model the electromagnetic response of nanostructures. They aim to use the information gleaned about these structures to design novel artificial metamaterials such as magnetophotonic crystals, and other devices including waveguides and microcavities.

The EU-funded Emswim ⁽¹⁾ project team explained how it will use graphical, user-friendly software based on the numerical algorithm to create a

commercial scatterometric system. It hopes to achieve this aim by working in collaboration with the Japanese screen media technology company Dainippon Screen. The scientists in Prague will take advantage of the company's magneto-optical spectroscopy and other optical, magneto-optical, and complementary magnetism- and surface-science techniques provided by collaborating laboratories in the Czech Republic, Germany, and Japan to create the new software.

This collaboration is expected to develop a code that will be capable of

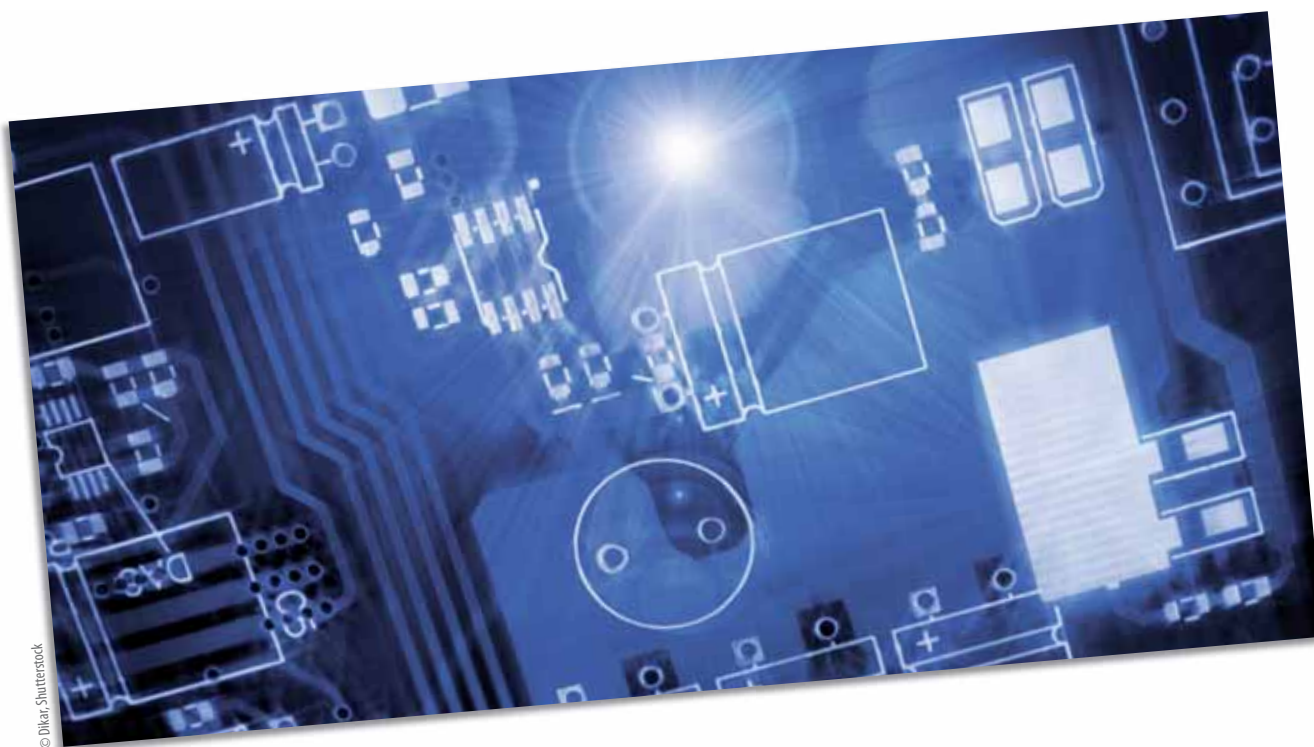
proposing and analysing novel artificial metamaterials and devices based on periodic nanostructures. These should include better tuned moth-eye antireflective surfaces, wire-grid polarisers, grating phase plates, mode isolators, chromatic, spatial and other optical filters, waveguides, fibres, and microcavities.

Emswim project coordinator is based in Prague, Czech Republic.

(1) 'Electromagnetic and spin wave interactions in magnetic nanostructure-based meta-materials and devices'.

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

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The road more travelled

After the success of the EU's transport network under the European Research Area (ERA), a follow-up project has been launched to forward European transport research and unity within the sector.

There are many systems of transport in Europe, both old and new, running on different technologies and protocols. In 2004 an ERA networking initiative to foster transport collaboration called ERA-NET Transport (ENT) was set up. The network was instrumental in coordinating research in transport, in line with national transport research policies, and harmonising transport protocols.

The EU funded ENT II ⁽¹⁾ project is the second phase of this initiative; it comprises 12 EU countries that undertake research programmes under one network. It is exploiting the knowledge and experience gained in the past, encouraging research programme cooperation through exploratory workshops and by the research community.

ENT II has developed new procedures, mechanisms and tools for setting up and implementing joint transnational cooperation activities related to transport research programmes. These are continuously tested and refined based on the experiences gained while implementing transnational cooperation. As a result, a monitoring report has been prepared, and the ENT Cooperation action handbook has been revised and supplemented with the latest findings.

From its onset, the project has helped build six transnational cooperation networks, better known as action groups. Three of these networks (Surprice, Electric mobility, and Climate-friendly freight network), have succeeded in creating funding opportunities for European projects.

ENT II wants to enhance cooperation for the national transport research programmes that are linked to it through more financing. This will be achieved through a formal call to participate in projects dubbed ERA-NET Plus call. The proposal is being discussed among participants and with the EC, promising a strong call for project participants to further their research. Moreover, ENT II is attracting stakeholders from new EU partner countries, spreading European standards and protocols to a much wider area. This international dimension will support ENT II in one of its major objectives, that of becoming an important pillar within the European transport research area.

ENT II's project coordinator is based at Tuev Rheinland Consulting GMBH in Cologne, Germany.

(1) 'ERA-NET transport II'.

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

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Sensors for safety

A system of fixed or mobile sensors to capture information from video to radioactivity will connect emergency response teams, enhancing efficiency and ultimately saving lives.

Technology in safety and security has come a long way, allowing emergency response systems to evolve beyond what we're familiar with today. An EU-funded project, ESS ⁽¹⁾, will provide high-tech information to crisis managers in real time. It enables them to improve control and management more quickly and with better synchronisation. New technology that can be either portable or fixed was designed to capture data immediately through sensors, including audio, video, radioactive and biochemical information; the

information will be easily accessible to crisis managers through an online portal.

Before it began developing the system, the project team extensively analysed existing approaches in crisis management. It then defined the requirements and architecture for the system, including data collection, data analysis, and portal development. The team has also identified end-user requirements for the system, closely consulting with potential users to define their needs.

ESS uses mobile technology, more specifically a cell phone localisation system, which was developed and tested at mobile telecommunications laboratories. This technology helps crisis managers understand population distribution and density in and around the crisis area, allowing quicker and better-informed decisions to be made.

A proof-of-concept event was organised in June 2010, during which a trial version of the system was built and tested in hypothetical emergency scenarios. The results were very positive and the system's ability to cope with intense and complex crisis events was demonstrated. The results of the project's success have been disseminated through the ESS website, press releases, workshops, conferences, brochures and videos. ESS subsystems such as the universal alert system will further enable rapid alerts to reach emergency authorities and citizens.

The system is set to have a strong impact on crisis management practices. It will yield improved command and control decision-making. The police, fire brigade and medical emergency teams that currently use outmoded mechanisms to interface will be able to combine their forces and share intelligence.

In short, the system offers much better coordination of emergency services in real time, sharing force locations, reconnaissance results and risk assessments during crises. It will provide the most up-to-date information and give more actionable data to decision-makers to assess a given situation. Much economic benefit will be gained through sharing of resources and rapid response, and hopefully many lives will be saved through ESS technology.

ESS project coordinator is based at Verint Systems LTD in Herzelia, Israel.

(1) 'Emergency support system'.

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

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Nanotech shines a light on disease development

Technology is fast helping to advance diagnostic instruments, screening tests and therapeutic targeting. Tumour biology and dementia are the conditions to benefit from such research.

The EU-funded Nanosmarts ⁽¹⁾ project aimed to develop enhanced tools for the diagnosis of tumours and the study of neurodegenerative disease.

In the first instance, the team worked with silicon nanoparticles (NPs) as fluorescent probes. However, certain limitations in their suitability led the team to opt for quantum dots (QDs). These are semiconductors with much better fluorescence properties. Various actions taken to optimise NPs resulted in being able to control the number of binding sites and produce monamino QDs. The latter were used for labelling the epidermal growth factor receptor, which is over-expressed in many types of human cancer and therefore an important therapeutic target.

In the second instance, researchers focused on dual-emission band fluorescent biosensors for examining protein conformation in cases such as Parkinson's disease (PD). This disease is characterised by midbrain clusters of neurons mainly made up of the protein α -synuclein (AS). Nanosmarts created dual-emission excited-state intramolecular proton transfer probes that are sensitive to the environment. These were then used to label AS for two purposes.

The first was to study what might influence the binding of AS to membranes. Results showed that AS binds with negatively charged membranes much quicker and more strongly. Findings give new insights into the relation between physical properties of membranes and how effectively AS binds to them, and where. This will help highlight its role in the development of PD.

The second was to systematically monitor how AS gathers. Researchers discovered a family of AS aggregation intermediates, which they termed acunas. After establishing the structural identity of acunas, the Nanosmarts project proposed that their unique features promote interactions with other proteins and structures. This gives rise to the toxic species that ultimately brings about neuronal dysfunction and weakening.

Nanosmarts project coordinator was based at the National Pirogov Memorial Medical University in Vinnitsa, Ukraine.

(1) 'Smart nondimensional biosensors for detection of tumor cells and cytotoxic amyloids intermediates'.

Funded under the FP7 specific programme People

(Marie-Curie actions).

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Nano study may increase potable water supplies

Researchers in the UK are attempting to understand quantitatively the behaviour of liquids flowing in nanoscale pores.

Mass transport through pores in the nanometre size range has been studied for many years in a variety of disciplines, including membrane science, soil permeability and cell physiology. However, research into the effects on fluid behaviour of intermolecular forces, or physical and chemical interactions between the liquid and the solid surface, is lacking.

Scientists at the University of Bath, UK have taken on this challenge as part of the EU-funded TPN ⁽¹⁾ project. They

will focus in particular on the nature of interactions between liquids and the pore structures with systematic studies of the effect of pore size, shape, surface chemistry and structure on fundamental nanoscale transport phenomena. These include wall slip, liquid velocity, surface tension and the contact angle of liquids. In order to achieve this objective, they are developing an innovative fluidic chip that combines nanochannel manufacturing with traditional micro-fabrication techniques.

The research team said that although the project is focused on the fundamental understanding of liquid behaviour at the nanoscale, the results could nonetheless provide a significant impact in the area of water filtration and desalination. They explained that the possibility of performing water filtration and desalination through carbon nanotube membranes could widen dramatically the access to clean and drinkable water.

TPN project coordinator is based in Bath, UK.

(1) 'Transport phenomena at the nanoscale'.

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

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Measuring nanotechnology

Nanotechnology is bringing unprecedented advances to science and technology in Europe. However, it requires the kind of organisation and order that only the field of nanometrology can provide.

Nanotechnology may become the most promising technology for the 21st century. It offers huge potential in applications and economic benefits. For nanotechnology to flourish, it must go hand in hand with nanometrology, which is concerned with producing nanomaterials and devices that yield very accurate and reliable nanomanufacturing.

More specifically, nanometrology develops new measurement techniques and standards to meet the needs of next-generation advanced manufacturing that relies on nanometre-scale materials and technologies. Nanotechnology urgently requires more accurate nanometrology and with higher resolution than the level that has been achieved so far.

In response to this challenge, the EU-funded Co-nanonet ⁽¹⁾ project is helping develop a European strategy for nanometrology to identify associated nanometrology needs. The project is studying high-level strategic research on the current and planned nanometrology activity of 19 European and 11 other countries to support the future commercialisation of nanotechnology.

A detailed Co-nanonet assessment in these countries has mapped many aspects of nanotechnology (chemical, biological, mechanical, and electrical,



among others). A survey on each of these areas covered the current status of the technology, capabilities and limitations of key techniques and instruments, and emerging industrial measurement needs.

This foresight review has led to the publication of a nanometrology consultative paper that maps the future needs and opportunities within Europe for nanometrology. The paper has been distributed to the European nanometrology institutes and is awaiting their feedback. Both the consultative paper and the comments received will be integrated into the European strategy for nanometrology.

In parallel, the project has overseen formation of nanometrology action groups to address subjects such as engineered nanoparticles, nanobiotechnology, thin films, structured surfaces, scanning techniques, modelling and simulation. This involved the identification and engagement of stakeholders in industry, and public organisations as well. Relevant publications and a website were put out, covering current capabilities, emerging needs and community issues for their field, including a review of nanometrology training courses in European academic institutions.

Through this project, nanometrology is putting nanotechnology in order and

paving the way for a well-established and well-organised high-tech field that will open new avenues in research. Europe's primacy in this area has already been established, and nanometrology will be the icing on the cake.

Co-nanonet project coordinator is based at the European Society for Precision Engineering and Nanotechnology in Cranfield, UK.

(1)'Coordination of nanometrology in Europe'.

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

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Superconductors and X-ray beams: the drawing shapes

A British-Italian team of scientists has succeeded in drawing superconducting shapes using an X-ray beam. Presented in the journal Nature Materials, the study shows how being able to create and control tiny superconducting structures could lead to innovative electronic devices.

The research was funded in part by COMEPHS ⁽¹⁾, a project supported by the EU. Researchers from the London Centre for Nanotechnology in the United Kingdom and Sapienza University of Rome in Italy have successfully

manipulated regions of high temperature superconductivity, in a material that combines oxygen, copper and a heavier element called lanthanum, at the Elettra (Trieste) synchrotron radiation facility. Superconductivity is a

special state where a material conducts electricity with no resistance. In essence, zero energy is wasted.

According to the researchers, high temperature superconductivity is triggered when oxygen atoms in the material are re-arranged thanks to X-rays being illuminated. This type was first discovered by scientists a quarter of a century ago. Shapes can be drawn in two dimensions when the X-ray beam is used like a pen.

The researchers could also erase structures by applying heat treatments.

So not only do the tools allow them to write/draw with high precision, but they can also erase with just a few easy steps and without any chemicals. They say rearranging the underlying structure of a material can be applied to other compounds containing metal atoms and oxygen. Fuel cells and catalysts are an example.

'Our validation of a one-step, chemical-free technique to generate superconductors opens up exciting new possibilities for electronic devices, particularly in re-writing superconducting logic circuits,' says co-author Professor Gabriel Aeppli of the London Centre for Nanotechnology and the Department of Physics and Astronomy, University College London.

'Of profound importance is the key to solving the notorious "travelling salesman problem", which underlies many of the world's great computational challenges. We want to create computers on demand to solve this problem, with applications from genetics to logistics. A discovery like this means a paradigm shift in computing technology is one step closer.'

Commenting on the results, co-author Professor Antonio Bianconi of Sapienza University in Rome says: 'It is amazing that in a few simple steps, we can now add superconducting intelligence directly to a material consisting mainly of the common elements copper and oxygen.'

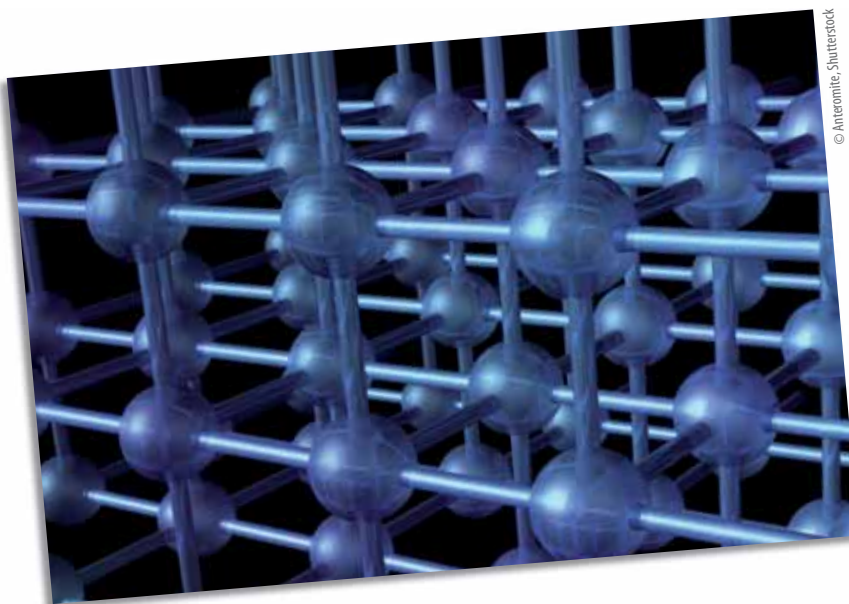
COMEPHS was backed under the 'Nanotechnologies and nanosciences, knowledge-based multifunctional

materials and new production processes and devices' (NMP) thematic area of the EU's Sixth Framework Programme (FP6) to the tune of EUR 3.18 million. Its project coordinators was based in Athens, Greece.

(1) 'Controlling mesoscopic phase separation'.

Promoted through the Research Information Centre.

<http://ec.europa.eu/research/infocentre> > search > 22793



The final frontier: closer than before

Can new rocket technology, innovative thrusters, solar energy, nuclear power and super engines take us at higher speeds further out into space than ever before?



People have dreamed of exploring the stars for centuries, and beyond a couple of trips to the moon and a few space probes, space exploration has been very limited. Now, Europe is investigating innovative new technologies that could take us further and faster than before. The EU-funded Hiper⁽¹⁾ project is overseeing the development of advanced electric propulsion technologies and power generation to fulfil future European space transportation needs. This goes hand-in-hand with the long-term vision for European space transportation and exploration.

Hiper is not only addressing this upcoming technology

but also the social and political considerations involved for both European and non-European partners. Its main objective is to actually begin developing innovative electric propulsion technologies and related power generation technologies for future space exploration.

Already, the project team has analysed mission and transportation scenarios in coming decades in light of the new technology. It is now investigating solar and nuclear high-power generation using advanced gridded ion engines, in addition to high-power electric thrusters. In technical terms, these are magnetoplasma-dynamic thrusters, using forces that result from the interaction between a magnetic field and an electric current to generate thrust. This phenomenon is known also as the Lorentz Force.

Technological requirements and realistic improvements in power generation have been analysed, including related initial requirements such as power, thrust,



specific impulse, mass, redundancy and propellant. Scenarios for near-future missions (e.g. 2020) and longer-term missions have also been studied. The scenarios were based on the assumption of onboard high-power solar or nuclear generation. Preliminary mission analyses also indicated the need for a significant improvement in current power generation.

A nuclear power generation technical roadmap was finally produced, in which the performance and design characteristics of a nuclear fission reactor for power generation consistent with mission requirements were

identified. The technical developments, management requirements and risk management measures necessary to realise these targets were also investigated.

In addition, a preliminary definition of the electric power subsystem architecture that fits with both power systems — solar and nuclear — has been outlined. Engine and thrusters design, as well as preliminary testing on some components, have already been carried out with very promising results.

In the short run, these achievements could have a strong political impact

since they represent a pillar for solid space cooperation between EU Member States and other countries such as China, Russia and the US. In the long run, the project achievements are paving the way to explore the final frontier, 'where no man has gone before'.

Hiper project coordinator is based in Pisa, Italy.

(1) 'High power electric propulsion: a roadmap for the future'.

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

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Researchers investigate fluorinated compounds

Scientists have examined the formation of new late-transition metal-based stilbene and stilbazole complexes, formed via a series of transformations, including metal-olefin coordination, metal ring-walking, and aryl-halide oxidative addition.

Fluorinated compounds are widely used in the semiconductor and pharmaceutical industries. Their applications include electronic materials, solvents, lubricants and phase-transfer catalysts. Despite their many applications, their formation is a

complex process. Transition-metal catalyzed cross-coupling reactions to generate carbon-carbon bonds with fluorinated substrates are often hampered by the formation of strong metal-carbon bonds and other processes.

The EU-funded Ringwalk ⁽¹⁾ project produced various findings relating specifically to late-transition metal-based stilbene and stilbazole complexes through metal-olefin coordination, metal ring-walking, and aryl-halide oxidative addition. In addition, the project generated a series of new materials which have been used by the researchers to study thin-film formation and fabricate solar cells.

Moreover, since the development of molecular-based systems capable of information processing is a rapidly developing field, the researchers studied the role of the molecular structure and reaction parameters on the nature of thin-film growth. They generated electrochromic films using a versatile two-step assembly method with organic and metal-organic chromophores cross-linked with palladium.

Ringwalk project coordinator was based in Rehovot, Israel.

(1) 'Ring-walking, metal coordination and aryl-halide oxidative addition'.

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

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Food processing moves forward

A network of European food processing stakeholders is making sure that novel technologies take root. They are also promoting a strong knowledge base for the industry.

As Europe's population increases, improving the technology for food processing is becoming important to achieve economies of scale and feed the continent more efficiently. The EU-funded Hightech Europe ⁽¹⁾ initiative is a network of 22 nations that is studying and integrating novel technologies to establish the first European Institute for Food Processing (EU-IFP). The network includes universities, applied research centres and relevant federations, as well as private sector contributions from Europe and Australia, which boast well-established regional knowledge transfer chains in the field.

To upgrade the food processing sector in Europe to the desired level, Hightech Europe is working on merging the comprehensive knowledge and experience available in these knowledge transfer chains. The partners are identifying and evaluating knowledge linked to industrial needs, covering relationships between sources of innovation and food process engineering as well as ethical, legal and social aspects.

The team is collecting databases of information, scientific/technical definitions, relevant literature and even face-to-face interviews that enrich this endeavour.

This also includes documenting the limitations in food processing operations. To direct all this information and transfer knowledge where it is most needed, Hightech Europe is developing a web presence that will be part of an interactive technology portal. The portal will be searchable and will allow easy browsing for users, giving them access and insight to developments, knowledge and technology related to the sector.

Hightech Europe is analysing knowledge transfer chains, implementing an exchange platform, outlining funding opportunities and communicating its initiatives through exhibitions, conferences and symposiums. It is also establishing the Hightech Europe award and preparing the knowledge auction. Both initiatives should spur the sector and highlight its efforts. Eventually, Hightech Europe will publish a white book of European high-tech food processing that can prove very useful to stakeholders.

Europe is once again underlining its primacy in the food and knowledge sectors, with expected positive impacts. Direct benefits to consumers, more efficient processes and technology that could eventually be exported are all in the making.

Hightech Europe project coordinator is based the German Institute of Food Technologies in Quakenbrueck, Germany.

(1) 'European network for integrating novel technologies for food processing'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.

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European fishermen land the big one

Aquaculture relies on creating an ideal environment for fish to flourish. A novel tank set-up delivers excellent temperature control while reducing the ecological footprint of the installation.

The fishing industry in Europe has a proud heritage and forms an integral part of the economy. Aquaculture, also known as fish farming, has grown significantly in recent years, but faces stiff competition, particularly from Asia and South America.

Research to improve productivity and sustainability can provide a much needed advantage to Europe's fish farmers. Supporting research such as the EU-funded Optitemptank ⁽¹⁾ project is therefore crucial. The aim of Optitemptank was to deliver optimal

temperature control for land-based fish farms since fish growth is heavily dependent upon this parameter.

The rotational moulding technique was exploited to manufacture a new plastic tank that boasts both a water-tight seal and excellent thermal insulation. A transparent polymer cover helps further stabilise tank temperature without distressing the tank's inhabitants. Finally, a special control system adjusts the temperature of water added to the tank to





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ensure that thermal equilibrium is maintained.

Looking to reduce the environmental impact of the new tank, a revolutionary approach to waste management was developed during Opttemptank. Faecal matter from the fish as well as food waste is fed to an anaerobic digestion biogas generator. The biogas is then used to power the tank's heating and cooling systems. Ultimately, nothing goes to waste as the generator's by-product, namely

sludge, is turned into fertiliser for neighbouring farms.

These developments are welcome news to the tens of thousands of small companies involved in the aquaculture industry and its supply chain. Opttemptank project coordinator was based at the SPI Play (Europe) Limited in Wrexham, UK.

(1) 'Development of an integrated system for cost effective temperature control in aquaculture tanks'.

Funded under the FP7 specific programme Capacities under the theme 'Research for the benefit of SMEs'.
<http://cordis.europa.eu/marketplace> > search > offers > 6534

Better understanding of interfacial waves to benefit industry

Researchers are investigating the behaviour of interfacial waves. Their aim is to benefit industrial technology in instances such as the design of nuclear power plants.

The behaviour of interfacial waves is critical to many different applications in industrial technology and society at large. Scientists in the UK have therefore studied large-amplitude instability waves and the evolution of large-scale structures in two-fluid shear flows with the aim of applying the results to a variety of industrial problems including oil and gas pipeline behaviour, wind-generated ocean waves and liquid jet atomisation.

Within the EU-funded PSE2PHASE⁽¹⁾, project researchers have developed a nonlinear stability method for simulating two-phase shear flows. The approach combines the nonlinear parabolised stability equations (PSE) with a powerful interface tracking scheme, and is validated against high-fidelity direct calculations. Using this approach, they have produced an insightful and computationally efficient framework to provide better physical models of interfacial dynamics.

This knowledge will be important in the design of nuclear power plants, for example, as understanding the position of the air-liquid interface is

critical to the operation of heat exchangers inside the nuclear reactor. Similarly, the creation of liquid droplets is an important design consideration for spray combustors of gas turbine engines.

The broad applicability of this research work should lead to substantial benefits for a variety of European industries,

including companies such as BP and British Nuclear Fuels, according to the researchers. They added that gas turbine manufacturers such as Rolls-Royce will also benefit from more efficient simulations of liquid jets.

PSE2PHASE project coordinator was based at the Imperial College of Science, Technology and Medicine in London, UK.

(1) 'A non-linear stability framework for interfacial wave dynamics'.

Funded under the FP7 specific programme People (Marie-Curie actions).
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For further information on past and upcoming events, please visit:

<http://ec.europa.eu/research/events>

<http://cordis.europa.eu/events>

Fourth international workshop on optimisation for machine learning

The fourth international workshop on optimisation for machine learning will take place from 16 to 17 December 2011 in Granada, Spain.

Machine learning deals with the design and development of algorithms that allow computers to evolve behaviours based inductive inference and observational data. The idea of classification is an important one in the field, as this allows machines to automatically recognise complex patterns, resulting in distinctions and intelligent decisions.

The process of optimisation is important to machine learning as it lies at the heart of almost every machine learning algorithm. For example, many algorithms require tailoring, which depends on a deeper understanding of machine language requirements.

The event programme will include morning and afternoon sessions, three invited talks, an open problems session, contributed talks and an interactive poster session.

For further information, please visit:
<http://opt.kyb.tuebingen.mpg.de/index.html>

Workshop on 'Bayesian optimisation, experimental design and bandits'

A workshop on 'Bayesian optimisation, experimental design and bandits' will take place from 16 to 17 December 2011 in Sierra Nevada, Spain.

The past few years have seen important advances in learning approaches for sequential decision-making. These have occurred in different communities, who use different terminology: Bayesian optimisation, experimental design, bandits (x-armed bandits, contextual bandits, Gaussian process bandits), active sensing, personalised recommender systems, automatic algorithm configuration, reinforcement learning and so on.

The same communities also tend to use different methodologies. Some, for example, focus more on practical performance while others are more concerned with theoretical aspects of a problem. As a result, there are a diverse range of methods for trading off exploration and exploitation in learning.

The event will seek to bring together stakeholders in order to identify differences and commonalities, propose common benchmarks, review the many practical applications and narrow the gap between theory and practice.

For further information, please visit:
<http://www.cs.ubc.ca/~hutter/nips2011workshop/index.html>

Ninth old world conference in phonology

The ninth old world conference in phonology will take place from 18 to 21 January 2012 in Berlin, Germany.

Phonology is the field which studies the function, behaviour and organization of sounds as linguistic items. It can describe, for example, linguistic analysis either beneath the word or to units at all levels of language that are thought to structure sound for conveying linguistic meaning.

The main conference programme will focus on the interfaces between phonology and other areas of linguistics (phonetics, morphology, semantics, pragmatics). There will also be a one-day thematic pre-conference workshop on the phonology-syntax interface.

For further information, please visit:
http://www.zas.gwz-berlin.de/workshop_ocp9.html

Sixth international workshop on variability modelling of software-intensive systems

The sixth international workshop on variability modelling of software-intensive systems will take place from 25 to 27 January 2012 in Leipzig, Germany.

Managing variability is a major issue in the development, maintenance, and evolution of software-intensive systems. To be managed effectively and efficiently, variability must be explicitly modelled.

The workshop will address variability widely, including variability in requirements, architecture, implementation, validation, and verification as well as evolution of variability.

The event will bring together researchers from various areas dedicated to mastering variability to discuss advantages, drawbacks, and complementarities of various approaches, and to present new results for mastering variability throughout the whole life cycle of systems, system families, and product lines.

For further information, please visit:
<http://uni-leipzig.de/~vamos2012/>

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