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RESULTS MAGAZINE

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Special feature



Archaeology, history and heritage: a civilisation discovered in Libya's desert

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Beneath our feet... the past

'Those who cannot remember history are condemned to repeat it', wrote the Spanish-American philosopher George Santayana.

Producing a publication focused on scientific research we could be forgiven for spending much of our time thinking about the future. Science is concerned with making new discoveries and producing new knowledge, while technical development and innovation concentrates on creating new technologies, products and services.

With such a focus on the new, why would we be interested in the old?

*Well, as we hope this issue of research*eu results magazine demonstrates, there are many good reasons for Europe to support study in the fields of archaeology and history. Learning where we came from can help us understand where we are going.*

In our interview, David Mattingly describes how he discovered a new civilisation under the sands of Libya's desert, increasing our understanding of the Garamantes, a desert people of the central Sahara first recorded in the History of Herodotus in the fifth century BC but since ignored. In addition, we look at how the Medistone project studied ways in which three other important sites in North Africa can be rehabilitated.

Due to the richness of its ancient civilisations, the Mediterranean is of course a huge draw for archaeologists. The Stachem project has developed a regional strategic plan for research infrastructures in archaeology and digital heritage in the eastern Mediterranean, while divers from the University of Nottingham and the Greek Ministry of Culture's Agency for Marine Archaeology have mapped a sunken city in the shallow waters off the Greek coast.

'Building the future on lessons from the past' could be the title of this issue, but it is also the theme of the Piano project, which studied European architecture between the First and Second World Wars in order to learn from its innovations in design and construction. Past and future are also linked by the use of futuristic technologies like nanotechnology for the preservation of Europe's historical heritage, as is being done by the Stonecore project.

As well as this special section, the headline story in our environment and society section considers the European context of slavery and the slave trade.

We also have our regular biology and medicine section. The top story describes a study showing a link between human ancestors' brains and evolution.

In the energy and transport section we investigate a project developing new composite technologies for low-weight aircraft. And the top story in our IT and telecommunications section looks at wireless healthcare.

Meanwhile, our industrial technologies section features nanotechnology put to a health application, as bio-nanotech fights the disease trypanosomiasis south of the Sahara.

The issue 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*

The editorial team

Want more information on the contents of this issue?

For online versions or information about the contributors in this issue of *research*eu results magazine*:

- Technology Marketplace: <http://cordis.europa.eu/marketplace>
- Research Information Centre: <http://ec.europa.eu/research/infocentre>
- European Research Council <http://erc.europa.eu/>
- Thank you to Professor David Mattingly of the University of Leicester for his contribution to the 'special' dossier in this issue.





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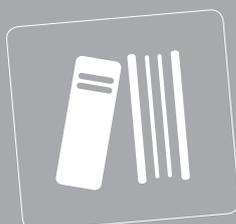
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Watch this space!

Coming up in issue 10 of *research*eu results magazine* a special dossier on 'Innovative cross-border science and technology'.



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Study shows link between ancestor's brain and evolution

An international team of researchers suggests that the reorganisation of the brain and sense organs could shed light on the evolutionary success of vertebrates. Presented in the journal Nature, the study takes a close look at the brain of a 400-million-year-old fossilised jawless fish, an evolutionary intermediate between the living jawless and jawed vertebrates. The research was partially funded under the EU's Seventh Framework Programme (FP7).

Researchers from China, France, Switzerland and the United Kingdom investigated the structure of the head of a primitive fossil jawless fish called a *galeaspid* using high-energy X-rays at the Swiss Light Source, Paul Scherrer Institut (PSI) in Switzerland. Their work exposed the shape of the animal's brain and sense organs.

'We used a particle accelerator called synchrotron as X-ray source for performing non destructive 3D microscopy of the sample. It allowed us to make a perfect computer model of the fossil that we could cut up in any way that we wanted, but without damaging the fossil in any way. We would never have got permission to study the fossil otherwise,' says PSI's Professor Marco Stampanoni, a co-author of the study.

'We were able to see the paths of all the veins, nerves and arteries that plumbed the brain of these amazing fossils,' explains lead author Gai Zhi-kun of the University of Bristol in the United Kingdom and of the Institute of Vertebrate Palaeontology and Palaeoanthropology (IVPP) in China. 'They had brains much like living sharks but no jaws. We've been able to show that the brain of vertebrates was reorganised before the evolutionary origin of jaws.'

Commenting on the results obtained in the study, Prof. Philip Donoghue, one of the authors of the study, from the School of

Earth Sciences at the University of Bristol says: 'In the embryology of living vertebrates, jaws develop from stem cells that migrate forwards from the hindbrain, and down between the developing nostrils. This does not and cannot happen in living jawless vertebrates because they have a single nasal organ that simply gets in the way.'

According to the researchers, their findings provided the answers they needed. 'This is the first real evidence for the steps that led to the evolutionary origin of jawed vertebrates and the fossil provides us with rock solid proof,' says IVPP's Prof. Min Zhu.

One of the challenges that scientists faced in their efforts to piece together this evolutionary puzzle was that the technology needed to carry out the work was not available.

'This research has been held back for decades, waiting for a technology that will allow us to see inside the fossil without damaging it,' states co-author Prof. Philippe Janvier of the Museum national d'Histoire naturelle in Paris. He pointed out that the scientists, despite their different fields of study, could not have conducted this research and obtained the necessary results if they had not collaborated on this.

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Developing antibiotics against superbugs

Around one-tenth of infections acquired during a hospital stay are brought on by the Pseudomonas aeruginosa bacterium. This pathogen can grow in water, does not mind hot or cold temperatures and is mostly undisturbed by antibiotics.

Infections caused by Gram-negative bacteria, often called superbugs, present a serious problem for patients as they thrive on weakened immunity and are largely resistant to common antibiotics.

The EU-funded Aeropath⁽¹⁾ project is a project taking a multidisciplinary approach aimed at promoting the development of relevant antimicrobial drugs. Researchers aim to better understand the biology of Gram-negative bacteria at a molecular level, using a *Pseudomonas aeruginosa* model, and to characterise potential new drug targets.

The overarching goal is to develop new compounds that can bind to the target proteins and weaken or interfere with the bacterium's ability to cause infection. Aeropath research actively covers experimental validation and identification of novel targets, cloning, characterisation, biochemical and structural biology of the novel targets. Identification of compounds is achieved by virtual screening (VS) and high-throughput screening (HTS), characterisation of interactions between the drug target

and the inhibitor, and initial biological testing for efficacy against Gram-negative bacteria.

Aeropath has used an informatics analysis to prioritise potential drug targets, and researchers are using initial results from work in the above areas to understand how essential proteins can be targeted. This information is crucial for future activities aimed at developing chemicals that can disrupt a biological reaction and kill off bacteria.

Achievements in the first 18 months of the project include computer-based assessment of over 5 000 targets, validation of 11 targets using gene knockout, cloning of more than 80 genes of prioritised targets and crystallisation trials of over 50 protein samples. Project partners have singled out 21 crystal structures and 14 targets in fragment screening, 3 in VS and 1 in HTS. Another project highlight is the release of the Aeropath target database, which integrates information from

various sources and can be accessed from the website.

As work continues, more detailed analyses will be performed on the structure and binding properties of the screening campaigns' most promising compounds. Aeropath is confident of their potential to underpin early-stage drug discovery for development of antibiotic drugs.

Aeropath's projector coordinator is based at the University of Dundee in the United Kingdom.

(1) 'The identification, characterisation and exploitation of novel Gram-negative drug targets.'

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

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Studying HIV drug resistance in resource-poor states

A pan-European surveillance and research network is working to increase knowledge on drug-resistant anti-human immunodeficiency virus (HIV) in clinical settings.



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The EU-funded CHAIN⁽¹⁾ project is a large-scale integrating initiative working to combat new and existing HIV drug resistance. The emphasis is on eastern Europe and resource-poor regions in Africa.

In the first year, research teams were set up and plans developed for a

series of studies. Data have been collected from existing network subjects and a study assessing how transmitted drug resistance impacts responses to first-line therapy has started.

The CHAIN project is developing a model for the emergence and transmission of drug-resistant HIV to see how it affects the choice of antiretroviral treatment (ART). Related to this is the importance of ART monitoring in low- and middle-income countries and its relationship to the emergence of resistance.

As part of monitoring and surveillance efforts, a meta-analysis has revealed that less frequent monitoring may be linked to a higher risk of resistance or developing more extensive resistance. In the UK, efforts have begun to link resistance data to national HIV epidemiological surveys.

In other activities to date, project partners have analysed all available HIV drug resistance data from a Stockholm cohort of patients in the Swedish database for the period from 1994 to 2009.

It is important to provide the knowledge, tools and clinical expertise for effectively

studying and managing HIV resistance in Europe and Africa. To this end, the project's first year also involved work on creating a detailed plan of implementation for 18 courses to be administered in various European and African countries. Two international education courses have already been conducted. CHAIN's project

coordinator is based at University College London in the United Kingdom.

(1) 'Collaborative HIV and anti-HIV drug resistance network'.

Funded under the FP7 specific programme Cooperation under the theme Health.
<http://cordis.europa.eu/marketplace> > search > offers > 6573

Triggering cellular responses for better immunity

Type I interferons (IFNs) are proteins released by lymphocytes as a response to pathogens or tumour cells. They help cells communicate so as to trigger the immune system's protective defences.

Type I interferons make up a network of immune cytokines. These are small cell-signalling protein molecules that trigger various biological responses through a single cell surface receptor. These receptors are made up of the IFNAR1 and IFNAR2 subunits.

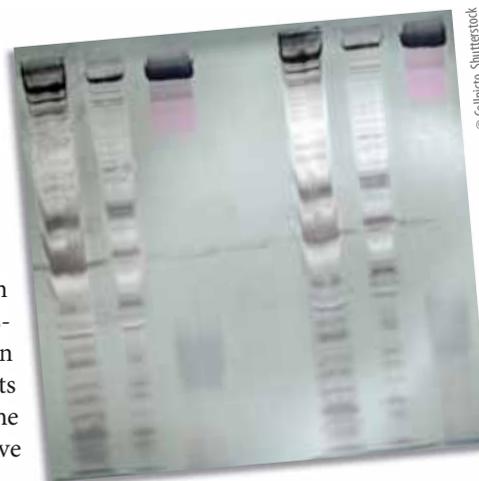
The EU-funded Ifnaction⁽¹⁾ project is taking a systems biology approach in its quest to identify the cellular and molecular dynamics at play in translating receptor behaviour into cellular responses. The team is conducting studies with an approach that combines biochemical, biophysical and genetic analyses of signalling outputs.

Research shows that activated differential signals, when binding each different member of the IFN family, match a different receptor interaction and confor-

mational dynamics. Ifnaction researchers are now working to discover how this interplay unfolds on the cell plasma membrane and affects the input signals translated within the cell, which then produces a relative response.

In order to support this approach, project partners are designing and generating IFN mutants with differential cellular responses and optimised strengths for medical application. The latter is promising in its potential for the development of cancer vaccines.

Ifnaction further intends to analyse the protein-protein interaction network that is a part of signal transduction to gain a better understanding of key signalling pathways. In-depth analyses of gene transcription levels will be performed



and results used to correlate with cellular responses, while experimental and theoretical studies will be coupled in order to test the validity of proposed models.

Ifnaction's project coordinator is based at the Universität Osnabrück in Germany.

(1) 'A system view on the differential activities of human type I interferons'.

Funded under the FP7 specific programme Cooperation under the theme Health.
<http://cordis.europa.eu/marketplace> > search > offers > 6598

Controlling inflammatory gene expression

Inflammation is a complex biological response to injury. Uncontrolled or long-term inflammation can result in diseases ranging from autoimmune afflictions to septic shock and even cancer.

Every inflammatory response calls for a complex gene expression programme. This includes the differential expression of hundreds of genes over an extended period of time to be activated and then accurately controlled both qualitatively and quantitatively.

The EU-funded Model-in⁽¹⁾ project has set out to better understand the main properties of the inflammatory gene expression in mammalian genomes. Bringing together 11 partners from five

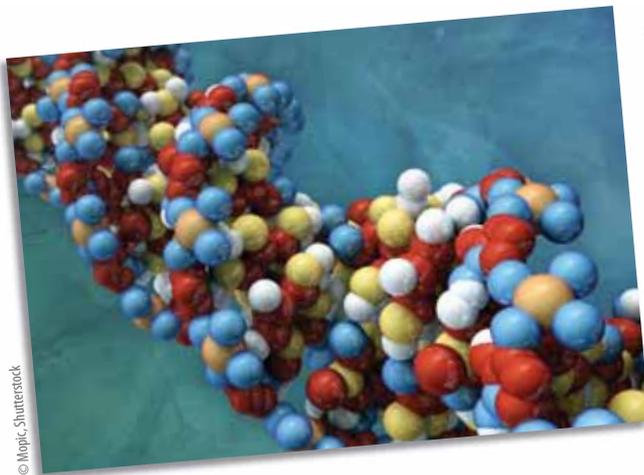
EU countries, this study combines a number of technological and biological approaches; partners used a mouse model to study how specific genomic features (genomic determinants) are interpreted by transcriptional mechanisms. This will help shed light on how this leads to specific outputs and normal or pathological phenotypes.

During the first year of the project, Model-in achieved its objectives although certain technical changes

had to be made as new genomic technologies emerged. Among others, these achievements include multi-parallel sequencing approaches replacing array-based platforms, and representing initial critical data in comprehensive tables of binding sites for different inflammatory transcription factors.

For monitoring transcriptional events in real time, *in vivo* imaging approaches have been set up and optimised. Protocols have also been developed for high-throughput and high-resolution mapping of sequences of DNA wrapped around a protein core (nucleosomes) in large genomic regions. Innovative thermodynamic models for transcription factor-DNA interactions have been developed,





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and genomic maps have been produced for selected transcription factors involved in inflammatory gene control.

Model-in has set up a project website with a public section and some study results have been submitted for publication.

The goal is to define new standards in mechanistic genomic analyses.

Model-in's project coordinator is based at Imperial College in the United Kingdom.

(1) 'Genomic determinants of inflammation: from physical measurements to system perturbation and mathematical modeling'.

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

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What are the unknowns in latent TB infection?

Tuberculosis rates are on the rise worldwide, with 8.8 million new cases and 2 million deaths being recorded each year. Better understanding the interactions between host and mycobacteria is vital for designing vaccination or immunotherapies.

Although some 90 % of individuals infected with tuberculosis (TB) never develop clinical disease, the possible progression from infection to disease is not standard. Of those who are infected and do develop overt clinical disease, about 50 % are diagnosed as fast progressors within two years of infection. The other half develop the clinical disease later. Such cases are described as reactivation or post-primary TB.

Immunisation with the *Mycobacterium bovis*-derived bacillus calmette-guerin (BCG) vaccine can provide protection against childhood TB, but is relatively useless in protecting older children and adults from contracting the disease. Thus, infected individuals carry with them a life-long risk of reactivation, which is intensified when the immune system is weakened, as in the case of HIV infection.

The EU-funded HOMITB⁽¹⁾ project is investigating the interactions between mycobacteria and host cells. Since such interactions can lead to infection, examining their regulation by cellular immune responses is also a part of the study.

Both targeted and genome-wide explorations are being employed to identify genes involved in the immunological control or development of primary *Mycobacterium tuberculosis* infection in children and secondary pulmonary TB in adults. HOMITB is also using various mouse models and human patients to investigate the role that key intracellular signalling molecules play in the immune response and outcomes of mycobacterial infection.



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HOMITB's project coordinator is based at the Karolinska Institute in Sweden.

(1) 'Host and microbial molecular dissection of pathogenesis and immunity in tuberculosis'.

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

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Boosting plasticity to repair nervous system

Neurodegenerative diseases cause damage to the nervous system through loss of nerve cells (neurons) or neural connections. In Alzheimer's disease, the loss is gradual, while in strokes it can be rapid or intermediate.

Following damage to this circuitry, the nervous system can compensate in part by forming alternative connections and pathways. This process is known as plasticity.

The EU-funded Plasticise⁽¹⁾ project is working on the concept that restoring function in neurodegeneration can be achieved through plasticity-enhancing treatments. Increasing plasticity in

certain areas of an adult nervous system back to the level seen in children is a powerful way of boosting functional recovery in animal models.

Plasticise aims to develop new treatments to promote plasticity, and methods to measure and visualise their effects. Clinical work will concentrate on stroke and Alzheimer's disease. In the first instance, plasticity will be driven by

Leishmaniasis vaccine under development

Leishmaniasis is a parasitic disease spread by sand flies. The disease attacks the skin or internal organs in humans and is potentially fatal if untreated.

The EU-funded Leishnavax⁽¹⁾ project is developing a preclinical version of a vaccine aimed at protecting against and treating the disease. The ultimate aim is to produce a safe and effective vaccine. The prototype vaccine will eventually be tested in various clinical sites for human efficacy.

So far researchers have preselected various candidate antigens, distributed *Leishmania* isolates to consortium partners, established a process for selecting vaccine antigens, and tested the immunogenicity of candidate antigens using human cell culture systems. The team has also produced immunogenically defined gene expression (MIDGE) vectors needed for investigating preclinical immunogenicity and safety.

During *in vivo* animal experiments, immunogenicity studies of the first

antigen showed the vaccine to be immunogenic. Virulent parasite stocks were also established and given to partners to help develop the standardisation of procedures (SOPs). The experiments were carried out to test the antigenicity and immunogenicity of the vaccine antigens.

Two training workshops and co-worker exchanges among laboratories have already taken place. Conference presentations have been made and works published to raise awareness about the research taking place to produce the vaccine.

Results already obtained will be used to support continuing Leishnavax work, which will include further development of SOPs, and identification and preparation of clinical sites for conducting trials. One major



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impact is that clinical data can be used to develop an animal model for vaccine trials that can ultimately be extended to humans.

Leishnavax's project coordinator is based at London School of Hygiene and Tropical Medicine in the United Kingdom.

(1) 'Development of a DNA vaccine for visceral leishmaniasis'.

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

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Can anti-obesity drugs finally win the safety battle?

Obesity is the leading cause of diabetes. To date, medication targeting obesity has battled to meet stringent safety requirements.

Anti-obesity drugs must also prove effective in decreasing abdominal fat in order to be approved. Over the last few years, only one drug has been approved but is limited to a restricted set of patients.

The EU-funded Reprobesity⁽¹⁾ project is employing a novel approach to

overcome such barriers to the treatment of obesity. The project is focused on clinical phenotyping of obese patients, discovering biomarkers and identifying new indications of existing drugs with potential for anti-obesity efficacy.

In the first 18 months, Reprobesity targeted abdominal fat cells in *ex vivo* samples of human adipose tissue to develop a novel and effective technique for reprofiling existing drugs. In efforts to identify subsets of responsive patients with good safety profiles, a new technique called Combinatorial cytomic biomarkers (CCB) was developed. The biomarkers identify how obesity, together with environmental factors (such as carbohydrate

consumption), contributes to an abnormal cellular response, which may be implicated in the onset of diabetes.

Researchers are also working to identify what takes place on biochemical signalling pathways. This information will also prove valuable in future development of new therapeutic alternatives. Project partners have initiated the patenting and development of new chemical entities interacting with these targets.

The Reprobesity team expects the high efficiency of reprofiling techniques and exploration of pharmacological targets will result in several safe anti-obesity drug candidates ready for use in clinical trials.

Reprobesity's project coordinator is based at the Instituto Mediterraneo para el Avance de la Biotecnología y la Investigación Sanitaria in Spain.

(1) 'Search for new therapeutic agents against complicated obesity by reprofiling existing drugs'.

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

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Micro-organisms – friend or foe of the fish farmer?

Scientists are trying to learn how to work with, rather than against, nature in an effort to improve the quality and quantity of fish produced by Europe's extensive aquaculture industry.

Aquaculture is all about controlling variables, such as water temperature, feeding regime and so forth, in order to maximise output. While it is known that fish health can be affected by micro-organisms, both positively and negatively, little is known about how to control this interaction.

The EU-funded Promicrobe⁽¹⁾ project received financial support from the EU to investigate the role of micro-organisms more thoroughly. The major species raised on fish farms, including sea bass, cod and talapia, are being studied.

A series of experiments has been designed to determine if different tank set-ups and diets affect the make-up of microbial communities in the fish's digestive system. Advanced genetic forensics, such as polymerase chain reaction (PCR) combined with denaturing gradient gel electrophoresis

(DGGE), enable the Promicrobe team to differentiate the microbial DNA of the various samples easily.

The definition of specific protocols is critical to the success of this research. In addition, the ability of a number of fungicides and radioactive treatments to eliminate bacteria and fungi from fish eggs is being tested. Finally, the Promicrobe research team is also looking at the effect of exposing fish larvae to pathogenic bacteria as well as beneficial probiotic bacteria at different stages post-hatching.

The conditions that boosted the survival rate of fish larvae and juveniles have been identified and will be further analysed in order to develop specific recommendations for Europe's aquaculture.

Promicrobe's project coordinator is based at the University of Ghent in Belgium.

(1)'Microbes as positive actors for more sustainable aquaculture'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.
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Disease immunity in rainbow trout

The European-funded Smartfish⁽¹⁾ project has studied the immune system of rainbow trout (Oncorhynchus mykiss) in order to reduce the number of fish lost through disease.

Demand for fish continues to grow as they are a cheap source of protein for many people across the globe. However, the world's fisheries are becoming severely depleted and increasingly aquaculture is required to fill the gap.

One of the greatest challenges in fish farming is to control and prevent

infectious diseases that can cause serious economic losses. This can be achieved by improving our understanding of the fish immune system.

Rainbow trout are one of the most valuable fish species farmed in Europe. The EU-funded Smartfish project has investigated the rainbow trout's immune system, focusing on interleukin 2 (IL-2).

This signalling molecule is instrumental in the organism's response to microbial infection. Researchers studied the potential signalling pathways involved and the use of IL-2 as an adjuvant, which can enhance the action of fish vaccines.

After characterising IL-2, Smartfish researchers concentrated on IL-21, which influences T helper 17 cells (Th17) that play an important role in antimicrobial immunity. Project partners successfully determined the structure of IL-21 and analysed its function in rainbow trout.

The work conducted by the Smartfish consortium could help improve the quantity and quality of rainbow trout raised in fish farms, enabling European aquaculture to compete with the rest of the world.

Smartfish's project coordinator was based at King's College Regent Walk in the UK.

(1)'Study of specific cell mediated immunity and vaccine optimization against bacterial and viral infections in trout (Oncorhynchus mykiss)'.

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

The dream of designing lighter and stronger aircraft that save on costs, respect the environment and meet aviation demand much more quickly is set to take off with a new European project.



The European aeronautic industry is a formidable player in aviation on a world level, known since its early days for innovation and novel technology. The EU-funded Maaximus⁽¹⁾ project is developing new composite technologies for low-weight aircraft and a platform to identify and validate novel solutions quickly and early on.

Maaximus has brought together 57 partners from 18 countries: aircraft manufacturers, material behaviour specialists, software developers, computational mechanics experts and test centres, both from industry and academia. The combination of such experience and know-how is set to enhance capitalisation of results from past and current projects on national and global scales.

The project involves a two-pronged approach, working simultaneously on virtual simulation and physical components. This is followed by cross-validation of the results and identifying progress. Such an approach could lead to a cultural change in the way airframes will be developed in Europe. It

has the potential to reduce operating costs for aviation companies and airlines, minimise time to market, and reduce environmental impact.

The highly optimised composite airframe is set to yield a 50% reduction in assembly time of large composite sections by using robotics for assembly automation and tolerance management. It will reduce the manufacturing and assembly recurring costs by 10% and also reduce structural weight by 10%. In the meantime, the development timeframe will be reduced by 20%. A new certification philosophy based on virtual testing is also being assessed. It considers the structure as it is actually manufactured and assembled, not only as it is designed, speeding up approval and delivery significantly.

So far, the Maaximus project team has defined virtual development challenges and strengthened the links under design optimisation analysis. It has completed requirements for virtual testing, integrated the manufacturing process monitoring in selected applications and achieved nearly all prerequisites on different levels. Maaximus will strongly contribute to strengthening the European aeronautical industry, particularly since the novel technology is likely to take to the air sooner rather than later.

Maaximus's project coordinator is based at Airbus Operations SAS in France.

⁽¹⁾ 'More affordable aircraft structure through extended, integrated, and mature numerical sizing.'

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

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Flight on time

Interference in the form of electromagnetic waves can affect aircraft systems and compromise their safety. A new research initiative is aiming to minimise these risks before aircraft even get off the ground.

Electromagnetic interference rarely interferes with aircraft systems, but when it does the consequences can be fatal. One ambitious EU-funded project is investigating ways to minimise the risk of electromagnetism, whether it originates from outside the aircraft or from within.

The EU-funded HIRF SE⁽¹⁾ research project (where HIRF is a high-intensity radiated field) is elaborating the framework to develop technology that lessens electromagnetic interference. A

'synthetic environment' means designing advanced novel concepts to generate and validate a virtual arena for testing scenarios at the early stages of aircraft development. When such research is integrated in the design phase of an aircraft, it can enhance safety and save manufacturers a significant amount of resources at the same time.

The project is also providing a considerable reduction in the certification/qualification tests required on aircraft. It is addressing the drawbacks of the design,

certification and modification through electromagnetic computer modelling to develop high-level software tools that can evolve as more numerical information becomes available.

HIRF SE has established a private website intended as an online management tool to improve communication of project partners. It has also developed a public website to disseminate project results to stakeholders beyond the immediate partners. On the technical side, the partners have assessed electromagnetic sources and scenarios, conducted electromagnetic modelling, and met with certification authorities.

Importantly, the HIRF SE project is also working on reducing delivery



timescales of future aircraft and systems, cutting down the time required for physical testing, possible redesign and possible retesting. This is achieved through virtual modelling and validation of virtual testing to reduce the number of actual development tests required for certification, producing better results at the same time. This is due to the technology and software being able to simulate different in-flight conditions and their

electromagnetic properties on the ground. This project's work could prove important for both safety and delivery of aircraft to aviation companies.

HIRF SE's project coordinator is based at Alenia Aeronautica s.p.a. in Italy.

(1) 'HIRF synthetic environment'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6562

Hygienic air travel

Air travel brings with it the possibility of contamination by diseases from other parts of the world or even through biological terrorism. A new system for neutralising threats from such contamination is in the making.

As air travel increases and new, more remote areas of the world are served by civil aviation, infectious diseases are also on the rise. Air transport can carry infected individuals, animals or insects to new locations, or transmit diseases through cross-contamination via cabin surfaces.

The EU-funded Aircraft decon⁽¹⁾ project is examining one way of controlling the spread of diseases: by stopping transmission through aircraft cabin surfaces. More particularly, the target is norovirus infections, frequent in ships, yet grossly under-reported in aircraft.

Influenza viruses have long survival times on cabin surfaces and materials, as do bacteria such as anthrax, used in the US mail terrorist attacks. This can be countered in part by sanitising and

decontaminating aircraft cabins before take-off with an efficient and safe antimicrobial agent.

Building on studies conducted in the United States, Aircraft decon is examining and comparing technical, operational and regularity data from both sides of the Atlantic. It is transferring United States-based studies to Europe in order to create an EU mechanism towards this aim, and is managing all knowledge transfer issues. The project is also examining the practicality of adapting United States expertise in the civil aviation field in Europe, as well as exploring the socio-economic potential of the project. Once such a system is finally in place, European aircraft will be healthier and safer to fly, as the threat

of surface-communicated viruses and terrorist-related chemical agents will be minimised considerably.

Aircraft decon's project coordinator is based at Leeds University in the United Kingdom.

(1) 'Airliner decontamination for infection control transition to the European engineering, regulatory and operational context'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6683



Wired for flight

A new wiring system for aircraft may make them lighter, easier to maintain and more efficient than before. The technology uses the same wires to transfer both power and data, saving resources and simplifying installation of aircraft components.

As aircraft engineering becomes more sophisticated with many new systems working to improve performance, safety and communications among others, more efficient wiring systems are needed to maintain these high-tech advances.

The EU-funded project TAUPE⁽¹⁾ is working to reduce the length and mass of aircraft cabling. It is defining a new avionics

architecture for specific systems that mixes aircraft power and communication networks together to optimise wiring needs.

The project team is introducing 'power-line communication' (PLC) and 'power over data' (PoD) technologies that supply power and data over the same cable. It is outlining specifications and requirements for wiring and network

equipment that allow system weight reduction, cost-effectiveness and easy installation, as well as retrofitting features and simpler maintenance.

With the help of 17 partners from six European countries, the TAUPE project mapped existing applications in the aeronautical environment. It then simulated and validated the adoption of PLC technology, developing a tool to predict the feasibility and performances of a PLC link. Based on the results, the most ideal approach was adopted to develop such required architecture, and a specific type of PoD technology was used after extensive testing.





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Other important issues considered by the project were feasibility and safety of the new components and technology. Overall, TAUPE's results are set to

encourage more efficient transport, with demonstrations on the Airbus A320 having already yielded many benefits. This includes a reduction in weight of around 300 kg, which could mean 180 tonnes of fuel saved per day for the entire A320 fleet. Easy and cost-effective installation as well as retrofitting planes with the technology can save up to 30 % on costs and time. In addition, savings in maintenance can add up to 20 %.

Safer flights thanks to virtual reality

More accurate virtual reality technologies that immerse test pilots and researchers into quasi-real-life flight simulations will yield many positive results for aircraft design, security and staff training.



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Simulations of reality on computers have offered great support to the development of high-tech products and services. Yet the underlying technologies are still far from satisfying the real-life needs of aerospace industrial practice. The EU-funded Vision⁽¹⁾ project is upgrading virtual reality (VR) for aerospace applications.

The project is specifying and developing key interface features in VR technology, namely immersive visualisation and interaction, to improve flexibility, performance and cost efficiency. This particularly applies to critical aircraft-related virtual products such as the virtual cockpit and virtual cabin, making them more 'real' than ever.

In more high-tech information technology (IT) terminology, the project involves specific human-oriented

developments regarding simulations such as visual perception, real-time rendering, markerless body tracking and smart objects interaction.

Vision is currently integrating these features within a common IT platform and validating them based on test cases that focus on specific aircraft-related virtual products. This will enable the launch of multidisciplinary activities around a virtual prototype that ensures human immersion in the desired context completely.

Importantly, the technology will consider the simulation of different aspects of an aircraft's life-cycle (e.g. virtual assembly operations, cabin operations, tasks undertaken by crew or passengers). This will improve the human-oriented functionality and usage of these virtual products throughout their life cycle.

Human factors and their implications in human-machine interaction within the aircraft-related products are also being considered in the definition of the technology specification framework.

The project is expected to have significant impact on the creation of virtual

All these findings were communicated to stakeholders through various channels, such as the Avionics Europe 2010 conference and exhibition in Amsterdam, the Netherlands. Once this new wiring system is adopted, the project will have set new standards in safety and cost-effectiveness for the aviation industry.

TAUPE's project coordinator is based at Safran Engineering Services in France.

(1) 'Transmissions in aircraft on unique path wires'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6572

aircraft products. The achievements of Vision are set to enhance credibility of aircraft-related VR simulations involving human interaction. They will improve aircraft-related virtual products to enable their use for increased design verification, validation of ergonomics and elaboration of specifications, as well as operational and situational training.

Significant progress has been made on the technical side in developing the required features and software. Vision has already delivered concrete outputs that are fully aligned with its end users' interests. Analysis of requirements and project specifications have also been completed. Vision has delivered detailed visualisation/interaction technology specifications for virtual aircraft applications and human-factor guidelines required for development and implementation of the integration platform.

These achievements plus Vision's ongoing developments promise the delivery of an advanced system that produces aircraft-related virtual reality simulations, facilitating training, enhancing security and testing new technology. This heralds an important step in the right direction for furthering safety and efficiency in the aeronautics industry.

Coordinator: University of Patras, Greece.

(1) 'Video content description system'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6614

Automatic road safety

Car safety features have come a long way, but the driver has always remained in charge. A new theory proposes that in some cases more automated safety features may enhance safety and supersede the driver's judgement in dangerous situations.



'Advanced driver assistance systems' (ADAS) can generally enhance the safety of drivers in many ways. Such systems boast features such as cruise control, lane departure warnings, pre-crash systems, night vision, pedestrian protection, and drowsiness detection.

Because ADAS allow drivers to remain in full control of the car at all times, they are sometimes limited in correcting driver errors. An improvement may come in the form of 'partially autonomous driver assistance systems' (PADAS) that take over full control of the car in certain cases to increase safety. In this respect, a design methodology is needed to prove that these partially automated systems can always maintain a safe state of driving. This is the goal of the EU-funded Isi-padas⁽¹⁾ project.

The project is developing a time saving driver-model based evaluation of the effect of PADAS to prove that the system prevents driver errors without introducing new ones. So far, effects of assistance systems have been investigated empirically through expensive time-consuming tests featuring driving simulators or with prototypes on test tracks. Other tests are conducted after market introduction based on field

operational tests and accident reports, representing another costly approach.

The project's novel model or 'driver-vehicle-environment' (DVE) simulates driver behaviour based on modelling the driver's cognitive processes. Together, driver models, vehicle models and traffic scenarios can be developed into computerised simulations applied in early development stages to predict driver behaviour and errors. This helps formulate design alternatives and test the need for specialised assistance systems. It also reduces the amount of simulator tests with human subjects by highlighting those scenarios that require more detailed investigation due to predicted potential hazards.

Isi-padas is ultimately developing software that reflects driver behaviour, integrated in a 'Joint driver-vehicle-environment simulation platform'. The latter allows rapid simulation of a vast number of traffic scenarios to predict the probability of driver errors for different PADAS design alternatives.

The software is built on actual driving experiments with human drivers to investigate errors with regard to

unassisted and assisted driving in real traffic and in car simulators. The project is focusing on longitudinal control, including the selection and maintenance of a safe speed and distance from preceding cars or obstacles. This area of study was chosen because it is of great importance in crash statistics and in driver assistance systems.

If the project's new risk-based design methodology can show that PADAS minimise driver errors, the outcome will be increased traffic safety on the roads. It will also mean that Europe can set the standard for even more efficient transport and vehicle safety.

Isi-padas's project coordinator is based at Offis E.V. in Germany.

(1) 'Integrated human modelling and simulation to support human error risk analysis of partially autonomous driver assistance systems.'

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

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On track for greener rail

As a means of transport, rail travel is considered eco-friendly compared to cars and other transport. This is reinforced by strict guidelines for the European railway network and infrastructure.

The EU-funded Infraguider⁽¹⁾ project is outlining different environmental aspects of railway infrastructure in Europe. It is identifying a common approach to harmonise material procurement based on these aspects, taking into account the physical, operational and management dimensions of the system.

Infraguider is therefore identifying the environmental significance of materials used in railway infrastructure systems,

including 'systems analysis' (SA), 'material flow analysis' (MFA) and waste management. The project is preparing a set of 'environmental performance indicators' (EPI) as a draft European environmental guideline. It is focusing on five key environmentally strategic functions of infrastructure organisations, comprising the board of directors, planning and implementation of projects, infrastructure operation, contractors and procurement.



Infraguider has analysed railway infrastructure environmental management according to ISO 14001. It has evaluated railway infrastructure material flow through MFA and investigated material procurement in view of its impact and



life-cycle on the environment. Life cycle assessment and eco-procurement are critical for railway environmental management as they reduce unwanted material inflow, shift focus onto eco-friendly bulk material and control material build-up within the infrastructure. Overall, Infraguider has made significant progress in developing systems models, as well as tools and methods to assess

environmental impact. It has also outlined material flow models of how major materials and substances enter the railway infrastructure and are released as waste or emissions in the air, ground and water. Ultimately, important recommendations are expected to emerge from the project that will render the railway industry more eco-friendly, particularly in terms of materials life-cycle and procurement.

Research aims to slash maritime transport emissions

An EU-funded project wants to drastically reduce carbon dioxide (CO₂) and nitrogen oxide (NO_x) levels in maritime transport.



As world trade increases, it becomes more urgent to keep the world's maritime fleet's carbon footprint as lean as possible. EU researchers are therefore investigating ways of slashing carbon dioxide emissions from maritime transport by reducing fuel consumption of

diesel engines and improving the efficiency of diesel propulsion systems.

Under the aegis of the Hercules-b⁽¹⁾ project, scientists aim to reduce the fuel consumption of marine diesel engines by 10 % and improve the efficiency of marine diesel propulsion systems to a level of more than 60 %. This, they claim, will reduce CO₂ emissions substantially.

The project will also aim to find ways of producing ultra-low exhaust emissions. This means a 70 % reduction of NO_x levels and a 50 % reduction of particulates from marine engines by the year 2020.

Hand-held building power

New hand-held technology with three-dimensional imaging and administrative features has the potential to render the European construction sector highly competitive and gain savings in building costs as well.

Europe's construction industry is facing tough competition from Asia according to the European Construction Industry Federation, which represents 2.4 million small to medium-sized enterprises (SMEs). The European Federation of Building and Woodworkers, with 2.3 million members, is also echoing these concerns. This is especially due to competition from ultra-low cost, low-experienced migrant workers and companies in the Asia Pacific region.

In addition, 25 % to 50 % of engineering and management time on construction

sites is wasted due to incorrect communication or non-conformity, causing delays and waste billions of euros. To combat both challenges, construction efficiency must be improved and the construction sector must provide significant added value over its Asian counterparts.

The EU-funded project Mobi3con⁽¹⁾ provides inexpensive, hand-held solutions for easy three-dimensional (3D) data management at the construction site. The project is overcoming the gap in 3D information between the actual

Coordinator: Electrical Engineering Department, University of Genova, Italy.

⁽¹⁾ 'Infrastructure guidelines for environmental railway performance'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6626

The research team will aim to develop engines with extreme operational pressure and temperature parameters. To achieve this, they will examine thermo-fluid-dynamic and structural design issues, including friction and wear as well as combustion, air charging, electronics and control.

Moreover, they will develop combustion and advanced after-treatment methods. They also aim to improve the whole power-train and will investigate the interaction of the engine with the ship as well as the use of combined cycles to optimise the overall system.

Coordinator: Uleme E.E.I.G., Germany.

⁽¹⁾ 'Higher efficiency engine with ultra low emissions for ships'.

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

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on-site situation and information stored in the construction stakeholders' databases. This rugged and robust handheld 3D navigation and 3D data processing system can be used on-site and in different field conditions, facilitating 3D data management significantly.

The handheld unit will be used for data gathering, processing and visualisation. It will boast a task management feature and other important tools for on-site management such as supplier contacts and construction drawings.

The Mobi3con project is heavily driven by 'building information modelling' (BIM) software and integrates BIM into the construction phase, rather than employing it only during the design phase. The equipment will feature a relatively large display with touch sensitivity to be able to display



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About EUR 910 billion was invested in construction in 2003, representing 10% of the gross domestic product and 51.2% of the gross fixed capital formation of the EU. Estimates show that this technology could save EUR 6.2 billion annually and reduce design deviations in construction SMEs estimated at EUR 2.8 billion.

3D rendition, communication, client management and supplier management will all contribute towards reduced costs and enhanced efficiency.

Mobi3Con's project coordinator is based at the Osauhing Eesti Innovatsiooni Instituut in Estonia.

(1) 'Developing mobile 3D data collection, processing and dissemination solution for construction SMEs.'

Funded under the FP7 specific programme Capacities under the theme 'Research for the benefit of SMEs'.
<http://cordis.europa.eu/marketplace> > search > offers > 6617

drawings. The initial cost of the device should be between EUR 400 and EUR 500, to be marketed to Europe's entire construction sector, which employs 11.8 million people.

The Mobi3con market study highlights strong market readiness for such a device, to be used by medium-level construction workers, managers and experts. With this hand-held device, improved visualisation,

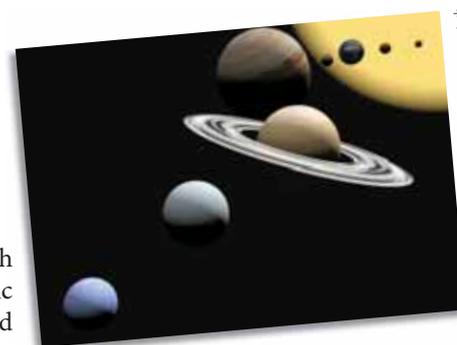
High-speed aero-capture technology investigated

EU-funded researchers are investigating how to improve aerocapture technology to develop advanced space transportation systems.

An important step to allow for expansion into the solar system is to develop advanced transportation systems to move humans and cargo between 'geostationary earth orbit' (GEO) and 'low earth orbit' (LEO) satellites, and to return them from the moon or from Mars. Researchers are therefore examining how to best use aerocapture, a flight manoeuvre that takes place at very high speeds within a planet's atmosphere and provides a change in velocity using aerodynamic forces instead of propulsive thrust for orbit insertion.

The EU-funded Aerofast⁽¹⁾ research team noted that the use of atmospheric drag to slow space vehicles is regarded as one of the largest contributors to making both lunar and Martian missions affordable. They added that in the coming decades, aerocapture will become one of the core capabilities for planetary transportation.

Growth in this technology will be helped by the fact it saves a large amount of mass – up to 30% – at launch and is fully adapted to large-weight missions. The project's goal is to prepare for a flight



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demonstration on a planet with atmosphere: earth, or Mars, an even more attractive option.

Coordinator: Astrium S.A.S., France.

(1) 'Aerocapture for future space transportation'.

Funded under the FP7 specific programme Capacities under the theme Space.
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New European lift-off

Researchers in France are investigating how to increase the versatility of space propulsion systems.



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EU-funded scientists are investigating how to increase the versatility of space propulsion systems, in particular how to improve hybrid propulsion technology to allow the European space community to remain independent.

The main objectives of the EU-funded Orphee⁽¹⁾ project are to increase the versatility of space propulsion systems, to ensure a significant increase on the performance of hybrid engines and to improve solid fuel technological maturity. According to the research team, if these goals are achieved, in particular advances pertaining to hybrid engines, this will allow access to new space transportation missions and obtain significant cost reductions.

Hybrid propulsion is based on the injection of a liquid oxidiser into an engine's combustion chamber where it reacts with

a solid fuel to generate hot gases providing the thrust. The Orphee scientists explained that engines based on this technology offer various advantages, including thrust performance, throttling (thrust modulation) and versatility – making it easy to adapt to various configurations.

Orphee's project coordinator is based at SNPE Matériaux Energétiques S.A. in France.

(1) 'Innovative propellants in hybrid propulsion technology and its applications in space transportation'.

Funded under the FP7 specific programme Capacities under the theme Space.
<http://cordis.europa.eu/marketplace> > search > offers > 6628



Slavery: the European context

Europe's part in slavery and the slave trade was greater than many Europeans would like to believe. A new initiative is demystifying this taboo subject and building bridges with affected nations.

It is well known that slavery and its consequences impacted the US. Europe was also involved in the practice, however. The continent's past, tied to the slave trade and to the eventual abolition of slavery, is now being investigated.

A new EU-funded initiative EURESCL⁽¹⁾ is clarifying the role of slave trade and slavery in constructing a European identity. It is investigating the political, economic, social, cultural, intellectual, memorial and educational aspects of the subject. This includes the evolution of representations and social practices inherited from racialised transatlantic slave trade and slavery.

The project is studying Europe's relationship with the outside world, specifically its former colonies, in this context. Slave trading and slavery are seen as important areas of research as they connect political systems and societies in the different continents as far back as the Middle Ages.

In the long term, the project will identify the historic changes occurring in the slaves' countries of origin, and will follow the modern construction of 'race' and its ties to economic wellbeing, measuring the importance of the subject in reference to time periods and locations. EURESCL is also examining the economic exploitation of a slave workforce in a colonial setting. It is examining notions of nation and/or state in this context.

The project is currently connecting different historiographies relating to slavery and the slave trade through project seminars so as to explore the results and emerging information. A seminar on 'National silences on slave trade and slavery and their legacies on the migration question' took place in 2008.

Another on 'Slavery in the Mediterranean and Continental Europe: areas of slave trade and economic dynamics' was held in Madrid in 2009. An important seminar held in France during the same year explored 'Emancipated slaves and descendants of emancipated slaves in the Atlantic world in the 15th and 19th centuries'. A conference in the same country also probed the 'The effects of Great Britain abolishing slavery on national discourse', bringing to light yet another important angle related to the subject.

In its bid to shed light on this neglected aspect of history, EURESCL has developed the first multilingual and



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multidisciplinary online educational tool related to the slave trade and slavery. Aimed at school teachers and the public, it includes resources for teaching the subject of slavery and the slave trade in the French, Haitian and Senegalese education systems.

Moreover, EURESCL set up two knowledge-transfer initiatives that promote the subject. The first was a scientific video festival on 'Heritage and legacies of slavery and the slave trade', being viewed in different locations worldwide. Another was a conference in France entitled 'Black, negro, Africans, Afro-descendants, descendants of slaves, immigrants: deconstructing categorisation and examining identities and perceptions from yesterday until today'.

The emerging discourse from all these conferences, initiatives and resulting studies has a wide-reaching impact on many disciplines, including sociology, history, psychology, economics and anthropology. It helps tackle important issues that bridge a darker past with a present and forges atonement and understanding among cultures.

EURESCL's project coordinator is based at the Centre National de la Recherche Scientifique (CNRS) in France.

(1) 'Slave trade, slavery abolitions and their legacies in European histories and identities'.

Funded under the FP7 specific programme Cooperation under the theme 'Socio-economic sciences and the humanities'.
<http://cordis.europa.eu/marketplace> > search > offers > 6615

Forced labour issues brought into the open

Forced labour, despite being abolished in most parts of Africa after 1945, is still a reality in various guises. A European project has conducted a study of forced labour in sub-Saharan Africa for the 40-year period leading to 1970.

Forced labour, the work people do against their will under threat (of destitution, death or violence, for instance) can take many forms. While the practice of forced labour has been condemned, repressive labour organisation is a subject meriting further academic attention.

The EU-funded Forced labour⁽¹⁾ project has studied the history of this



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labour practice in south-west, west and south-central Africa (Angola, Gabon, and Zambia) between 1930 and 1970. The researchers have outlined and compared experiences involving decolonisation and the post-colonial redefinition of labour relations.

The huge amount of archival work has resulted in seven articles and four conferences, two in sub-Saharan Africa and the other two in Europe. The project has identified the main trends in the organisation of forced labour.

Firstly, the ubiquitous nature of this labour practice by European administrators became apparent. Whole towns were destabilised as a result of migration to avoid being exploited.

The impact of repressed labour is continuing well into the post-colonial period. These trends will be detailed in a handbook on the history of forced labour in southern Africa.

The study could encourage some African governments to take a much stricter stance against modern-day phenomena such as child trafficking and domestic slavery. It is hoped that by openly discussing the European history of enforced labour, the way will open to dealing with present-day forms of this repressive practice.

Coordinator: Centro de Estudos Africanos da Universidade do Porto, Portugal.

(1) 'Forced labour in West Central and South Central Africa: an Afro-European colonial heritage in comparative perspective, 1930-1970.'

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

<http://cordis.europa.eu/marketplace> > search > offers > 6662



Interview: a civilisation discovered in Libya's desert

A British team of archaeologists, headed by David Mattingly, Professor of Roman Archaeology at the University of Leicester, have discovered a lost civilisation buried beneath the sands of the Libyan desert. The discovery could help rewrite the history of a region still embroiled in the aftermath of Gaddafi's fall from power.



David Mattingly © University of Leicester

Funded by a grant from the European Research Council, the Trans-Sahara Project uncovered more than 100 fortified farms and villages and several towns dating from AD 1 to 500. Four-metre tall castle-like mud-brick walls were also found. The discovery challenges the current belief that people living during this era were barbaric nomads. The implications of the find could extend far beyond Libya.

Prof Mattingly, whose team were evacuated from

Libya, in February, have since used satellite imagery to continue their research. However, the team may soon return and pursue this extraordinary project that explores the country's pre-Islamic heritage. *Research* eu results magazine* speaks to Prof Mattingly who provides compelling insight into his research and what it means for a country searching for a new beginning.

Prof Mattingly is the author and editor of numerous peer-reviewed articles and books. He was awarded the British Academy Research Readership award from 1999 to 2001 and was elected Fellow of the British Academy in 2003.

• Your project has found evidence of a lost civilisation in the Libyan desert. What is this lost civilisation and how did you come about its discovery?

My work focuses on the Garamantes, a desert people of the central Sahara first recorded in the History of Herodotus in the 5th century BC. They are a genuinely 'lost civilisation' in the sense that the low level of prior archaeological work rendered so many questions about their society and way of life unanswerable.



The recent breakthrough in knowledge is the culmination of a long research process. I have worked in Libya for over 30 years and the recent discoveries build on my earlier work as well as the work of previous generations of archaeologists. In Gaddafi's Libya a low value was placed on heritage by the regime – witnessed in a chronic underfunding of the Antiquities service and minimal promotion of the rich pre-Islamic archaeological heritage to Libyans.

While the recent discoveries allow us to go much further than before in presenting the Garamantes, we are really still at an early stage of academic research – we have reached the end of the beginning. That is why my success in winning an ERC Advanced Researcher Grant is such an amazing opportunity to take the research to the next stage.

• Your discovery challenges historical accounts that the people living in this area were barbaric nomads. Can you elaborate? What are the implications for Libya?

The Greco-Roman literary and historical sources are more or less unanimous in characterising the Garamantes as barbaric nomads, with all the expected

accoutrements of such people (dwellings described as tents or huts, few mentions of farming, emphasis on lack of law and evolved structure in society, and so on).

When compared with the archaeological evidence it becomes obvious that there is a significant element of stereotyping and prejudice underlying this unfavourable characterisation of the Garamantes. In fact, the Garamantes lived in elaborate mud-brick buildings, typically in villages or towns, they were primarily sedentary oasis cultivators, using sophisticated irrigation technologies and growing a wide range of Mediterranean, Saharan and sub-Saharan foodstuffs. They had a rich material culture and a pronounced social hierarchy, reflected in their burial customs. All of this can be demonstrated through the archaeological evidence.

The Gaddafi regime did not encourage Libyans to make a dynamic engagement with the history and culture of ancient Libya. I very much hope that the new Libya that is taking shape will place much greater emphasis on its heritage and on expanding the knowledge of it among

ordinary Libyans. I hope to see the day when the Libyan educational curriculum celebrates the Garamantian civilisation and the achievements of indigenous Libyans in the Roman empire.

However, the implications of the research extend well beyond Libya itself. The existence of a powerful and territorially extensive state in the central Sahara in the early 1st millennium AD challenges many conventional assumptions about the Saharan zone in the pre-Islamic period. Part of the Trans-Sahara Project's work thus relates to rehabilitating the reputation of the Garamantes, but a more important aim is to take the new knowledge of the Garamantian kingdom and explore the implications this has for other societies across the entire Trans-Saharan zone.

• Your team was forced to leave Libya in February when the anti-Gaddafi revolt started. Can you describe the research conditions leading up to this revolt?

The revolt took us and our Libyan colleagues by surprise. The initial stages of the Arab Spring in Egypt and Tunisia



Garamantian fortified village © Tony Savage

were carefully followed on TV, but until mid-February there was little sign that the Libyan people might finally lose patience with the Gaddafi regime.

Working with a large group of Libyan colleagues, our fieldwork was centred on the oasis city of Ghadames in western Libya when the demonstrations in eastern Libya started. However, once Gaddafi's troops and loyalists opened fire on the unarmed demonstrators in al-Bayda and Benghazi, the situation escalated rapidly.

Not only did the position of my team become a concern, but our continued presence also materially endangered our Libyan colleagues. Fortunately, implementing a rapidly evolving contingency plan, my team was able to evacuate across the border into Tunisia without serious incident, but with some anxious moments.

• *Are you now able to conduct research safely?*

I hope that we shall be able to return to the field relatively soon, though after the traumatic events of the last months the country has many urgent priorities to address. I am in contact with Libyan archaeologists and ready and willing to go to Libya as soon as they judge I can be of help to them.

• *What do you expect to uncover?*

The preservation conditions in the central Sahara are such that in ideal conditions one can record entire man-made landscapes in fine detail and excavations regularly yield rare organic material, such as textiles, leather and wooden items. Because so little was known about them previously, part of the excitement about working on the Garamantes is that every survey, every excavation we have conducted has delivered surprising new information about their society. That is quite rare in any field of science,

to be perpetually encountering the unexpected. The ERC grant will enable my team to significantly enhance the baseline studies of the Garamantes we have carried out previously and to disseminate our results to a much broader scholarly and public audiences.

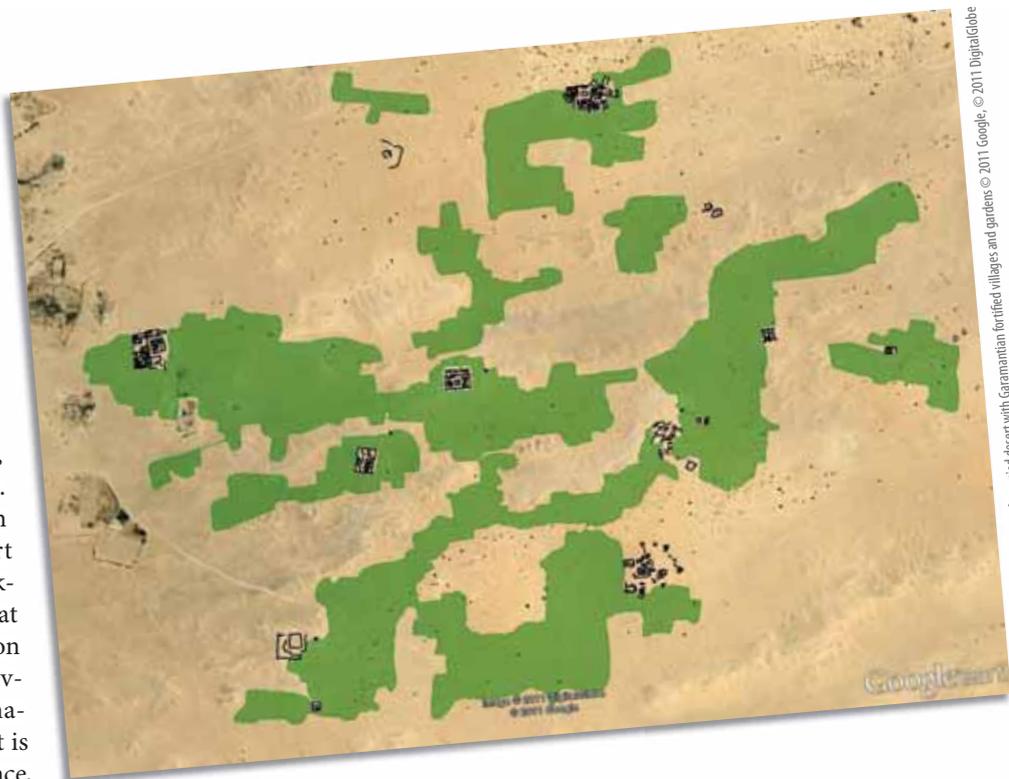
• *What are the main themes of the Trans-Sahara Project?*

The main themes of the Trans-Sahara Project are urbanisation and state formation; trade; technological transfers; human mobility and identity. We are studying these themes in relation to the Saharan world of the Garamantes, to the Roman African provinces to the north and the sub-Saharan peoples to the south. This is an enormously exciting and challenging research programme, but one that forges connections between researchers working on these three broad zones. The first researchers have now been appointed to the project team and others will join us in the coming months.

The 'Urbanisation and state formation' workgroup, with Dr Martin Sterry as postdoctoral RA, seeks to characterise degrees of urbanisation in the Saharan zone and provide models for

understanding state formation within the different sub-regions of the Trans-Saharan zone in pre-Islamic and Islamic eras. Differences between Garamantian settlements and contemporary nucleated settlements to north (e.g. Roman North Africa) and south (e.g. states of the Middle Niger and Lake Chad) are being investigated.

New evidence to be studied by the TRADE workgroup suggests that current views for limited pre-Islamic trans-Saharan contact hugely underestimate the scale and significance of commerce in this region. Another of my post-doctoral researchers, Dr Victoria Leitch is studying the evidence of a much more extensive trade with the Garamantes in Mediterranean pottery than was previously realised. Distinguishing the different types of trade, from local to long-distance Mediterranean contacts will be important for mapping distribution, including exciting recent discoveries for Garamantian manufactured goods such as beadwork and textiles that may have been exported. Plants, animal and humans may also have been traded and sophisticated scientific techniques will be used to trace such remains.





Identifying Trans-Saharan technological change through archaeological evidence, such as the adoption of irrigation technology, metallurgy or advanced pyrotechnology will be the focus of the 'Mobile Technologies' research group. From pottery making techniques to materials, glass manufacture, metallurgy and salt purification, each individual production will be explored to test for chronological patterns and the inter-regional transfer of ideas.

Scientific methods will be used by the 'Human mobility and identity' workgroup to look for the ethnic composition of Garamantian society, and in-depth analysis into the admixture of Mediterranean and Sub-Saharan African populations in the human remains from Garamantian burials will be undertaken. Expressions of identity across the Saharan communities through material culture, burial ritual and funerary structures form another fascinating strand of research which may help identify distinctive sub-groupings within society through the varied use of material culture and behaviours

Fortunately, a significant component of the Trans-Sahara project work programme does not entail immediate access to Libya and we have been able to make an excellent start to the work. In particular, we are mapping archaeological sites in a series of Saharan

case study areas, using available satellite imagery and archive air photographs. It is simply extraordinary how well preserved the ancient settlements, cemeteries and fields are in many desert regions and even more astonishing that so little has ever been recorded before, never mind mapped in detail. I am very hopeful that it will be feasible to return to the fieldwork in the Libyan desert to do the necessary ground-based follow up to our remote sensing programme.

A second element that we have started on is the collation of available data on the distribution and trade of classical (Roman) pottery within the Trans-Saharan zone. We are seeking a better understanding of the commercial mechanisms that underlay these patterns and whether, for instance, the Roman frontier forts were served by the same transport networks as carried Mediterranean goods south to the Garamantes. There is minimal evidence for Roman pottery reaching the sub-Saharan zone and we hope to offer a better explanation of why this was so, while also identifying what commodities were traded between the Garamantes and their southern neighbours.

Another significant component of the work relates to the laboratory analysis of isotopic signatures in the teeth taken from burials we have excavated in the

region. This work, which will be overseen by colleagues at the University of Cambridge, should help us determine the extent to which people were born and brought up in the Central Sahara or whether a significant minority had migrated from outside the region at some point in their lives.

• Did you think you would be a field archaeologist when you were still at school?

I must confess to having started early in archaeology, but at first it was just a nice hobby. My determination grew much stronger when I had the chance to study and visit North Africa as an undergraduate. My first experiences of the Libyan desert and of the UNESCO World

Heritage Site of Lepcis Magna was awe-inspiring and defined much of my subsequent career.

Part of the value of the Libyan research projects I have been involved in is that they do not simply address the academic priorities set by European archaeologists in the modern colonial era. This old agenda had effectively alienated many Libyans from any positive association with Libya's pre-Islamic past.

I have been particularly interested in exploring the socio-economic relationships of native Africans with the great civilisations of the Mediterranean world and, through this, to bring about greater understanding among Libyans of their links to the pre-Islamic heritage of their country.

The fall of the Gaddafi regime hopefully heralds a window of opportunity to take this work to a new level. The Roman era history helps explain much that defines the different regions of Libya today the pre-Islamic heritage of their country. Libyans from any in the south. But archaeology also has high potential for illustrating themes that unite these widely separated regions. In particular, the story of the Garamantes is emblematic of Libya's desert heritage and the early rise of an autonomous Libyan civilisation.

A window into ancient history

Efforts to find better ways to preserve important archaeological sites in North Africa have borne fruit. New knowledge on the origin of stones, degradation and rehabilitation will help prolong the life of these outstanding monuments.

The area around the Mediterranean basin features some of the most spectacular archaeological sites of our time. Sadly, the socio-economic pressures bearing down on certain countries have led to neglect of these sites.

The EU-funded Medistone⁽¹⁾ project studied how three important sites in North Africa can be rehabilitated. These are Djemila in Algeria, the Alexandria lighthouse in Egypt, and Volubilis in Morocco.

The project began by identifying the stones and their origin, including former quarry sites where possible. It also diagnosed the condition that the ruins and stones were in and degree of deterioration. This involved a study of factors that could affect the stone such as temperature variations, high winds and other climatic conditions.

Once it documented all the background information, Medistone outlined the most ideal conservation and restoration

approaches. It sought to address the main challenges of conserving and restoring stone based on European know-how, taking into consideration all the local factors as well.

The project successfully identified the stones of the Alexandria lighthouse and offered a wealth of knowledge regarding Egyptian stones. In addition, Medistone pinpointed the origin and characteristics of the ornamental and building stones of Djemila, also adding valuable knowledge on Algerian sites and the origin of stones there. Significant headway was also made in Morocco, adding to the global database of information on origins of ruins and their stones.

The project released several publications on its findings, which now pave the way to the most appropriate techniques of restoration. Proper conservation of these sites aims to underline important archaeological sites in these countries, encourage tourism and helping preserve a part of our world's heritage.



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Coordinator: Bureau de Recherches Géologiques et Minières, France.

(1) 'Preservation of ancient Mediterranean sites in terms of ornamental and building stone: from determining stone provenance to proposing conservation/restoration techniques'.

Funded under the FP6 specific programme Capacities under the theme 'Horizontal actions and measures in support of international cooperation'.

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Scientists argue against selective sweeps as driver of human evolution

Scientists in Europe and the US are challenging the traditional notion of human evolution. For the past 35 years, geneticists have designated classic selective sweeps, when a beneficial genetic mutation quickly spreads through the human population, as the primary drivers of human evolution.

However, a study published in *Science* suggests that such events may have been rare, with little influence on the history of our species. Instead, it claims that smaller changes in multiple genes may have been the primary driver of changes in human phenotypes, and calls for new models to retrace the genetic steps of evolution.

After examining the sequences of nearly 200 human genomes, researchers said they found new evidence arguing against selective sweeps as the dominant mode of human adaptation.

'Our findings suggest that recent human adaptation has not taken place through the arrival and spread of single changes of large effect, but through shifts of frequency in many places of the genome,' says co-author Dr Molly Przeworski, a professor of human genetics and ecology and evolution at the University of Chicago in the US. 'It suggests that human adaptation, like most common human diseases, has a complex genetic architecture.'

Under the classic selective sweep model, a new and advantageous gene

appears, spreading quickly through the population. Because of its rapid rise, the gene becomes fixed in the genome with less variation than a gene that spreads more slowly. Geneticists have used this model to look for genetic segments surrounded by 'troughs' of low variation, the theoretical footprint of a selective sweep. Applying the model has identified more than 2000 genes – equivalent to around 10% of the human genome – suggesting that selective sweeps were a frequent occurrence that drove the evolution of humans away from their primate ancestors.

'The selective sweep model was introduced in 1974 and has pretty much been the central model ever since,' Dr Przeworski says. 'It is fair to say that it is the model behind almost every scan for selection done to date, in humans or in other organisms.'



However, areas of low diversity around gene segments might also be generated by other evolutionary mechanisms. To test whether selective sweeps were the predominant cause of these troughs, the team used data from 179 subjects in the 1000 Genomes Project, an international effort to catalogue human variation.

‘This is really a groundbreaking dataset that allowed this type of analysis to be done for the very first time,’ says Professor Ryan Hernandez of bioengineering and therapeutic sciences at University of California at San Francisco (UCSF).

The research team looked at genes with human-specific substitutions, where the nucleotide sequence was different from close primate relatives. ‘Phenotypic variation in humans isn’t as simple as we thought it would be,’ Dr Hernandez

explains. ‘The idea that human adaptation might proceed by single changes at the amino acid level is quite a nice idea, and it’s great that we have a few concrete examples of where that occurred, but it’s too simplistic a view.’

Further evidence against common selective sweeps was provided by comparing genome variation in different populations. Because Nigerian, European, and Chinese/Japanese populations separated roughly 100 000 years ago and subsequently adapted to different environments, frequent selective sweeps would be expected to fix clear genetic differences between the populations.

‘These findings call into question how much more there is to find using the selective sweep approach, and should also make us skeptical of how many of



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the findings to date will turn out to be validated,’ concludes Dr Przeworski.

Experts from Israel and the UK contributed to this study.

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Strategy for eastern Mediterranean archaeology

The eastern Mediterranean region is littered with archaeological sites dating from Greek and Roman times. But the diversity of this cultural hoard poses challenges. Scientific analysis of finds, documentation, preservation, and communication services lack a regional strategy.

While there are excellent research centres in the region providing material on archaeological finds, co-ordination and policies are lacking. This has a knock-on effect such as duplication of effort and a general lack of data interoperability. It leads to missed opportunities between research institutions.

Additionally, there is a general lack of infrastructure to support archaeological work in the region. Digital libraries, laboratories and multimedia communication centres are fragmented; meaning archaeological post-processing often has to be done in other centres.

The EU-funded Stachem⁽¹⁾ project was launched in 2008 to support The Cyprus Institute’s Science and Technology for Archaeology Research Centre (STARC). Stachem – made up of eight project partners – aimed to contribute to a regional strategic plan for research infrastructures in archaeology and digital heritage in the eastern Mediterranean.

Stachem grouped together regional players with expertise in archaeological sciences, marine-related techniques, and digital heritage. To build up a regional cluster of experts, the project explored the needs and requirements in the region. It proposed joint trans-national activities between actors in the region through numerous workshops.

Apart from the obvious benefits at the European and regional levels, the project had an impact in the long- and medium-term strategies of the various national institutions involved in the project.

As a result of the research cluster Stachem produced, cooperation between institutions in the region and other European and international bodies has received a boost thanks to greater outreach. The implementation of Stachem will have an enduring impact in the region, as STARC has been designed to provide a



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lasting regional strategic plan, which was an essential objective of the project.

Stachem’s project coordinator is based at the Cyprus Institute in Cyprus.

(1) ‘Science and technology for archaeology and cultural heritage in the eastern Mediterranean.’

Funded under the FP6 specific programme Capacities under the theme ‘Horizontal actions and measures in support of international cooperation.’

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Futuristic nanotechnology helps preserve history

A European-backed research project is developing revolutionary technology to identify cracks and repair damage in historic stone buildings across Europe.

Europe is proud of its recent history and heritage, something that is clearly witnessed in old stone buildings scattered around cities from the eastern Mediterranean to the North Sea. But many of these fine buildings are threatened by the ravages of time and need innovative solutions to keep them as beautiful as they once were.

The EU-funded Stonecore⁽¹⁾ project is applying a new approach for renovating stone, mortar and plaster used in the construction of historic monuments and buildings. It is developing and testing nanomaterials that are compatible with the stone and mortar used in these structures, as well as novel safe methods for the assessment of stone.

The project studied different types of nanomaterials that would fit its needs, determining their suitability in preserving natural and artificial stones, mortars and plasters. It documented, sampled and categorised all the materials to be tested and studied, before investigating different fungal and algal growth on different stones, mortars and plasters.

Stonecore is developing sols (liquid-like suspensions) with calcium hydroxide particles at the nanoscale that could increase the strength of treated mortar and stone. These sols are white to white-opal and have a stability of several months. The dispersion medium and concentration of the calcium hydroxide nanosol have also been carefully selected.

At the same time, different species of mould and algae were isolated and identified in trials on buildings, to be neutralised with new nanolime dispersions.

Novel non-destructive ways were also developed to assess and diagnose stone. These include non-invasive 'ground-penetrating radar' (GPR) technology and innovative ultrasonic measurement systems. The system can detect even very thin fractures and cracks as well as monitor the renovation with nanosols. Initial field results have shown that modern, high-frequency pulse radars are also capable of detecting thin fractures and fracture networks in stone structures.



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In addition, an ultrasonic measurement tool has been developed to determine the stiffness of the stone material and identify loose surfaces. With this revolutionary technology the character and charm of European buildings will be preserved, and so will an important part of our history and heritage.

Stonecore's project coordinator is based at IBZ-Salzchemie GmbH in Germany.

(1) 'Stone conservation for the refurbishment of buildings'.

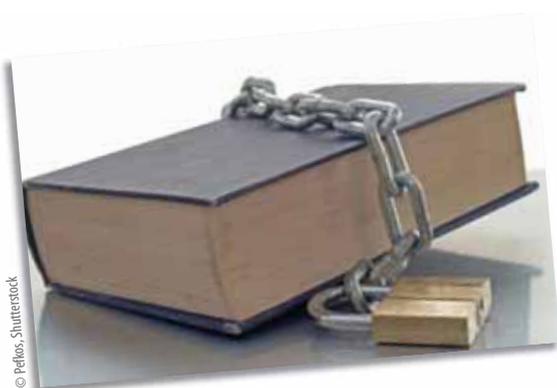
Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies'.

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Researchers dive into ancient treasure

Archaeologists from Britain's University of Nottingham and Greece's Ephorate of Underwater Antiquities at the Ministry of Culture are using digital equipment to unlock the mystery behind the ancient Greek town of Pavlopetri, thought to be the oldest submerged town in the world. Discovered and mapped by researchers of the Institute of Oceanography at Cambridge University in 1968, no other work has since been conducted at the site. This project could fuel underwater archaeology in the future.



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The ruins of Pavlopetri, which lie in three to four metres of water just off the coast of Laconia in the Peloponnese, date from at least 2800 BCE. Buildings are still intact, and streets, courtyards, and chamber tombs exist as well. Experts believe the ruins belong to the Mycenaean period (circa 1680-1180 BCE).

Dr Jon Henderson from the Underwater Archaeology Research Centre (UARC) at the University of Nottingham is the first archaeologist in 40 years to obtain special permission from the Greek Government to examine the submerged town. This project will help shed light on how the town was developed, when it was occupied, what it was used for, and why it disappeared under the sea.

'This site is of rare international archaeological importance. It is imperative that the fragile remains of this town are accurately recorded and preserved before they are lost forever,' explained Dr Henderson. 'A fundamental aim is to raise awareness of the importance of the site and ensure that it is ethically managed and presented to the public in a way which is sustainable and of benefit to both the development of tourism and the local community.'



The submerged buildings, courtyards, streets, tombs and graves are located close to an area frequented by tourists and campers. The researchers assert that both tourism and industry are having a negative impact on the ruins; tourists looking for souvenirs can be found snorkelling in the area, and boats cause damage as their anchors are dragged along the seabed.

Dr Henderson and his team, working together with Mr Elias Spondylis of the Ephorate of Underwater Antiquities, are using equipment initially developed for the military and offshore oilfield market. Experts believe the equipment could transform underwater archaeological survey and recording.

The researchers will perform a millimetre-accurate digital underwater survey of the area using an acoustic scanner developed by a North American offshore engineering company. The equipment is able to generate photo-realistic, three-dimensional (3D) surveys of seabed features and underwater structures to sub-millimetre accuracy very quickly.

‘The ability to survey submerged structures, from shipwrecks to sunken cities, quickly, accurately and more importantly, cost effectively, is a major obstacle to the future development of underwater archaeology,’ Dr Henderson pointed out. ‘I believe we now have a technique which effectively solves this problem.’

Dr Nicholas Flemming, the man who discovered the site in 1967, is on board. His team from Cambridge surveyed the area with hand tapes in 1968. Dr Chrysanthi Gallou of the University of Nottingham is currently carrying out a systematic assessment of the finds recovered back then.

The archaeologists will finish their full underwater survey by the end of June.

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<http://ec.europa.eu/research/infocentre> > search > 11593



Building the future on lessons from the past

Examining one of the most inspiring and creative periods in the history of recent European architecture has led to recommendations on how to cope with future threats.

The modern avant-garde period in European architecture between the First and Second World Wars featured some of most interesting and functional buildings of the time. With fresh perspectives in art, music and philosophy emerging, European architecture also saw innovations in design and construction.

Art deco, reinforced concrete, seismic considerations, industrialisation and housing solutions for the middle class all played a role in creating a new European trend in building design. These buildings were often built to solve social problems or to give a more glamorous image to a city.

The fully EU-funded PIANO⁽¹⁾ project documented this movement. It examined spatial and functional implications of these buildings, including interior organisation and novelty in construction. This subject has not been addressed comprehensively in previous studies and has the potential to enlighten future design in many respects.

PIANO looked at buildings from the interwar era in Greece, Italy, Portugal and Slovenia primarily, but also

in Germany, France, the Netherlands and Austria. It documented numerous buildings in these countries and undertook a systematic analysis of their style, form and function, which had led to a model inspired by the Dutch artistic movement in 1917, dubbed De Stijl.

The project examined the architecture of the era, considering its use of reinforced concrete and efforts to retrofit buildings with a frame structure. It also examined seismic behaviour of these structures, focusing on the relationship between structural engineering and architecture.

PIANO extrapolated important conclusions from the evolution of architecture and construction on how environment-related challenges – e.g. earthquakes, tsunamis, climate change – can be addressed in today’s buildings. It then looked at the phenomenon of ‘rediscovered green space’ to address the lack of greenery today in dense urban areas where such buildings abound. These emerging solutions and recommendations were supported by participation of citizens in the process. The



research was enhanced by computer modelling and processing, yielding new information and models that will improve construction in the future.

In short, the project not only documented and showed due appreciation to the architecture of the past, but it gathered important information to ‘build’ a better future.

Coordinator: Fundatia Ergorom '99, Romania.

(1) ‘The innovation in the plan of the current floor: zoning in blocks of flats for the middle class in the first half of the 20th century.’

Funded under the FP7 specific programme People (Marie-Curie actions).
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Policy-making: have your say

Many governments are including their citizens in policy-making processes, especially when it comes to controversial subjects in science and technology. The true impact of citizens on policy remains to be seen.



It is always beneficial to involve citizens in policy-making on different themes and aspects of governance, including science and technology policy. This process is called 'participatory technology assessment' (PTA). Its success is normally demonstrated by the impact it has on emerging laws and decisions. But can PTA keep its promises and increase the influence of citizens' voices on decision-making? What really is the true impact of PTA on decision-making and how can we increase it?

The EU-funded Cit-part⁽¹⁾ project is aiming to answer these questions. Cit-part is using as an example the controversial subject of 'xenotransplantation' (XTP) which involves the

transplantation of animal organs, tissues or cells into humans. XTP's advocates perceive it as promising since it could help to remedy the shortage of human transplants, while its opponents claim it involves too many medical risks and ethical uncertainties.

Through this theme, Cit-part is examining the factors that encourage or hamper the effect of citizen participation on policy-making. The project team first analysed the connection between political systems and the potential impact of PTA on policy-making. It examined the role of the state (e.g. interventionist vs liberal), degree of centralisation, bureaucracy, corporatism and public participation mechanisms, as well as links between policy-making and scientists or experts. The project also looked at the availability of checks and balances in government systems and the nature of the electoral system to ascertain how citizens affect policy-making.

The project's analysis of international XTP policy over the last few decades showed a significant time lag between policy development and public participation, as well as limited public participation. Cit-part also demonstrated the lack of a homogeneous global policy towards XTP, with policy-making being

mostly a closed circle led by experts.

Cit-part highlighted in a national context XTP issues such as ethics, animal rights, health care rights, industry rights and research rights, as well as past policy failures or scandals. It revealed an interesting interplay between national identity, international developments and globalisation with respect to XTP, stemming from mobility of experts and industry input. Examination showed that national political culture had a significant effect on the level of public debate involved in this issue (results which could be inferred in other issues as well).

Important questions that the project will look at in the near future include who participates in PTA and decision-making, who constitutes the public and what is considered as impact. The project's researchers, hailing from anthropology, communication studies, political science, public law, social psychology and sociology fields, will surely have more interesting revelations concerning policy-making and the public soon. Hopefully, this will enable governments to improve mechanisms for involving the public in policy decisions on many levels.

Cit-Part's project coordinator is based at the Institut für Höhere Studien und Wissenschaftliche Forschung in Austria.

(1) 'Impact of citizen participation on decision-making in a knowledge intensive policy field.'

Funded under the FP7 specific programme Cooperation under the theme 'Socio-economic sciences and the humanities'.
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Climate change mitigation: what is the cost for Europe?

A unique cluster of computer models is providing insight into what policy measures may be most effective in combating climate change without breaking the bank.

As the first signs of global warming become apparent, public discussion is evolving from whether or not climate change exists to how to cope with it. Despite this transition, computer models remain an important tool in guiding decision-making. In fact, scientists are now combining climate models with economic land-use

models and biophysical models to assess mitigation and adaptation strategies. This research is being funded by the EU in the framework of the CCTAME⁽¹⁾ project.

Work has been carried out to link the different models together



in a cluster, with the aim of addressing previous weaknesses concerning land use and policymaking. Several scenarios have also been designed to examine the impact of a variety of climate change, energy, agricultural and forestry policies. Examples include initiatives to reduce carbon emissions, particularly from agriculture, and the promotion of biofuels as a replacement for fossil fuels.

The next step in CCTAME involves reviewing the regional simulation results with EU Member States. The emphasis is on assessing the cost of mitigating climate change in the land-use, land-use change and forestry sector. This work may also help refine Europe's position in climate talks in the context of the United Nations Framework Convention on Climate Change (UNFCCC).

Coordinator: Internationales Institut für angewandte Systemanalyse, Austria.

(1) 'Climate change – terrestrial adaptation and mitigation in Europe'

Funded under the FP7 specific programme Cooperation under the theme 'Socio-economic sciences and the humanities'.
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Predicting landslides in the Alps

Erosion, landslides and changing topographies can have a strong impact on rural areas, agriculture and development. A combined technique can help map the frequency and locality of these geomorphic changes.

The varying cliffs, valleys, tilting plains and mountains of the Earth are known as 'hillslopes'; here, large quantities of soil and sediments have been in constant motion over thousands of years. This process is called 'mass wasting' and determines if the land is suitable for agriculture, building or other activity.

The EU-funded Slidelaws⁽¹⁾ project is investigating the process of mass wasting. It is studying two drainage basins of the Trentino Region in the central Italian Alps, those of Val di Sole and Val di Fiemme.

The project is examining the formerly glaciated landscape, including its hydro-geomorphology, bedrock, sediment flux and other characteristics that impact mass wasting. This is achieved through a series of aerial photographs taken from 1954 to 2006, optical remote sensing technology ('light detection and ranging' or LiDAR) and laboratory experiments. The monitoring techniques have exposed the landslide characteristics of the regions and revealed how this land is used (e.g. alpine, pasture or forest), as well as topographic attributes (i.e. elevation and slope).

When combined, these techniques are effective in understanding the frequency of landslides and their possible threats to settlement and agriculture, for example. To illustrate, the rate of landslide occurrence per unit area is used to calculate the intensity of the landsliding process.

Another result from the Slidelaws project has highlighted clear lithologic

and tectonic controls. High-magnitude low-frequency events occur exclusively on metamorphic rocks. Events smaller than 300 000 m² occur mostly on metamorphic slopes, whereas sedimentary and intrusive lithologies are substantially less active. Again, this information can improve prediction and localisation of landslides.

On the whole, this project is helping to advance our knowledge of landslide occurrence and outlining geomorphic

transport laws. By identifying peculiarities in the geomorphology, slope characteristics and water flows, it will be possible to estimate the extent of potential landslides, including risk to infrastructures and residential areas.

Slidelaws' project coordinator is based at the Università degli Studi di Milano-Bicocca in Italy.

(1) 'Constraining geomorphic transport laws for mass wasting processes'.

Funded under the FP7 specific programme People (Marie-Curie actions).
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A new take on rural development

Is globalisation a threat to rural development? An EU project looked at how industry and businesses in outlying regions can take advantage of globalisation and strengthen their business model.



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Bringing with it important cultural, social and economic changes, globalisation is one of the key challenges facing rural regions in Europe. The lack of definitive studies in this field has contributed to the inability of regional development strategies to cope with these challenges. One EU-funded project, however, wanted to address rural development.

The Derreg⁽¹⁾ project aimed to enable regional development actors to better anticipate and respond to the key

challenges for disadvantaged regions arising from globalisation. The balance of opportunities and threats of globalisation is particularly significant for rural areas.

Derreg examined globalisation through the engagement of local and global representatives in particular regional settings. It considered how rural areas can retain their local distinctiveness yet evolve in their own right. Derreg recognised that regional actors should have the opportunity to intervene in the globalisation processes and shape outcomes in their area. It also highlighted how experiences and outcomes of globalisation can differ in the various rural regions, considering the mechanisms of the phenomenon on the local scale.

Derreg therefore reviewed literature on the subject and analysed the statistical evidence that emerged from 10 regional

case studies. It also mapped business networks and migration trends, as well as analysing policy documents and regional infrastructure with respect to environmental issues and sustainable development. This also involved the investigation of available knowledge systems and innovation systems regarding globalisation in rural settings.

The project aimed to expand scientific knowledge and understanding, enhance policy development, and identify examples of best practice. At the end of the day, this should empower small and medium-sized enterprises (SMEs) in the regions, allowing them to coexist with globalisation trends and retain their individuality.

Coordinator: Aberystwyth University, UK.

(1) 'Developing Europe's rural regions in the era of globalization: an interpretative model for better anticipating and responding to challenges for regional development in an evolving international context'.

Funded under the FP7 specific programme Cooperation under the theme 'Socio-economic sciences and the humanities'.
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Better branding on the horizon

Understanding the perceptions and mechanisms behind product branding, as well as the most effective mechanisms to upgrade brands, could make companies more competitive.



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The EU-funded Globrand⁽¹⁾ project is investigating the relationships between company efforts, corporate image and consumer perceptions. Likewise, the team is exploring the relationship between communications channels used by companies and brand image, detailing channels used as well (e.g. advertising, PR and endorsements).

Globrand wants to identify the more effective and efficient channels to build types of images in the minds of consumers. Another important

consideration is how these relationships vary across different countries.

The project team conducted an extensive review of existing literature on the subject to address these questions. Relevant papers in different journals on business, marketing and consumer research were analysed, focusing on corporate image and corporate reputation.

Globrand then prepared a document which introduces the project and summarises the project objectives for the benefit of concerned stakeholders. It designed an interview protocol which provides the general framework for interviews in the business world to help shed light on the project's questions. The interviewees include global companies with significant presence in Europe, followed by interviews with senior managers who are responsible for corporate image building.

One of the firms being interviewed for this research project is a multinational content protection technology company with 900 employees. Others include an IT service provider with around 400 000 employees in 170 countries, as well as a fast-moving consumer goods company with more than 138 000 employees in over 80 countries.

The results of the Globrand study are important in keeping both small and large firms competitive, building brand image and improving their marketing initiatives. In a world where economic difficulties are on the minds of many businesses, the project results may represent a welcome blessing.

Coordinator: Sabancı Üniversitesi, Turkey.

(1) 'Relating company efforts to consumer perceptions: a contingency framework'.

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

Integrating wireless technology into applications and equipment that monitor patients from afar can help raise healthcare standards and pre-empt many dire health situations.

Phenomenal growth of digital wireless and mobile communications systems has opened up a myriad of new applications and possibilities. Wireless sensor networks (WSNs) have emerged recently and allow end users to understand and interact with the environment in an improved way. The technology is expected to enable home automation, smart environments, entity tracking, disaster recovery, environmental monitoring, patient care and patient vital sign monitoring, as well as many other applications.

In healthcare, wireless vital sign sensors (e.g. electrocardiogram or blood pressure) and mobile devices such as portable monitors and portable digital assistants (PDAs) can monitor patient health in an emergency situation. Wireless and portable medical actuators, such as respirators and infusion pumps, which read information from vital sign sensors, can be used to care for patients in intensive care units.

In the past, the EU has funded WSN projects related to healthcare, but Europe is still behind the US in this field. In response, the EU-funded Coolness⁽¹⁾ is defining a new protocol to advance WSN technology in healthcare and beyond.

It is investigating hardware and software that can accommodate a rich variety of sensor devices and applications, and proposing new techniques to enhance the efficiency of WSNs. This involves the creation of new, more efficient cooperative protocols and network coding schemes for wireless technology that must be adapted to the requirements of healthcare applications.

The ultimate goal is to develop a prototype for demonstrating and validating the feasibility of the proposed approaches. In the meantime, project results are being disseminated through technical journals, papers and conferences to further its cause. Infirm and elderly people can benefit greatly from healthcare applications of WSNs, bringing a better quality of life and even saving lives through wireless technology.

Coolness' project coordinator is based at the Universitat Politècnica de Catalunya in Spain.

(1) 'Cooperative transmission and cross-layer techniques for secure wireless sensor networks'.

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

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Managing post-op pain online

Post-operative pain varies widely in different situations and calls for timely and effective management. A central feedback and decision support system will help clinicians manage demands in this area.



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The Pain-out⁽¹⁾ project is working to develop and validate a system providing measurement and tailored feedback on the quality, outcome and support of clinical decision-making. Focusing on the management of post-operative pain, this prototype will establish the foundation for similar applications in other fields of medicine characterised by high variation in care needs.

The first-of-its-kind, unique and user-friendly system will help the medical community improve the treatment of patients suffering from post-operative pain. At the core of the project is a web-based information system sporting three functions for feedback and benchmarking, a 'Clinical decision support system for post-operative pain' and an 'Electronic knowledge library'.

The first component provides member participants with data and analyses regarding the quality of care being provided and identifies 'best clinical practice' for means of comparison. The core data set to be collected has been

defined, while the central database is already established and contains the first 3 000 patient cases. Translation of questionnaires and staff training for data collection is complete, and the Pain-out project has been set in motion at the 11 participating national clinical consortium sites.

The 'Clinical decision support system for post-operative pain' function, which responds to queries for advice on individual patient treatments, is currently being developed in line with ongoing clinical input.

The 'Electronic knowledge library' will use information from published, peer-reviewed studies to provide summaries of evidence-based recommendations that clinicians can adjust according to their patients' post-operative needs. It can be accessed via the website at www.pain-out.eu.

The first two functions will work on information continuously updated in a large database or registry. The registry

will receive data about post-operative patients, including information on side effects and treatment costs, from clinical sites across Europe.

Addressing the issue of health economics in post-operative pain, Pain-out has developed a protocol for collecting health economics data and conducted a systematic review of the cost and health-related quality-of-life outcomes relating to post-operative management.

Pain-out's project coordinator is based at the Universitätsklinikum Jena in Germany.

(1)'Improvement in post-operative pain outcome'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6594

The second mobile revolution

New antenna technology will make mobile wireless communication better and faster, opening up more location-based applications. Advertising, emergency services and many more areas stand to benefit.

From wireless laptops to satellite phones, communication technology has transformed the world into a global village and provided access to a wealth of information. Multi-carrier (MC) transmission technology can meet users' ever increasing demand for improved digital data transfer. Novel advances in this field are promising users all the bandwidth they desire, although intense research is still needed in this area.

The EU-funded Realmars⁽¹⁾ project is examining one way of improving antenna efficiency. It is focusing in particular on a technology called 'Orthogonal frequency division multiplexing'

(OFDM), currently used in many wireless platforms such as WiMAX and GSM.

The project's focus is on how to upgrade the adaptive antenna systems of OFDM. It is working on signal strength by improving estimation of angles of arrival (AOA) and creating more possibilities for location-based services. The latter are becoming very important in high-tech applications (e.g. in medical and security fields), requiring the development of better estimation algorithms. Realmars is therefore working on location estimation techniques that will result in

more accurate high-resolution MC systems and enhance transmission accuracy. The project team is developing a 'toolbox' that is easy to use and will improve location estimation, currently a pivotal topic in



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wireless technology. It will facilitate applications such as cellular-based advertising to emergency services. The business, marketing and high-tech applications benefiting from this project are numerous, and

the toolbox will help Europe remain at the forefront of this technology.

Coordinator: İstanbul Teknik Üniversitesi – Turkey.

(1) 'Research on location estimation in multi-carrier systems'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6695

Knowledge transfer for a better bio-economy

European food products are sought after the world over. In order to maintain this position, however, the lines of communication between academia and industry need to be improved.

With so many centres of research operating in the EU, it is important for companies and small to medium-sized enterprises (SMEs) with an eye to exploiting this research to be able to identify innovation and transfer this knowledge.

The EU-funded Knowledge2innovation (K2I) project was set up with this idea in mind; more specifically, the aim was to promote and improve academia-industry knowledge transfer in the agro-food sector. In order to achieve this, a set of practical, decision-support tools and targeted training materials were created. In addition, other relevant resources which could be of aid to researchers, industry and knowledge transfer professionals were identified and 'signposted' for further research and general attention.

The nine project partners from seven countries mapped out existing resources that can support knowledge transfer. In particular, they focused on funding schemes and support projects.

Data collection was followed up by questionnaires distributed in all seven countries with the aim of identifying possible expectations and perceived hurdles in the knowledge-transfer process for researchers and SMEs.

This research was critical in creating the 'Little yellow handbook' which contains practical tips, checklists and templates aimed at supporting researchers interested in pursuing academia-industry knowledge transfer. The book goes hand-in-hand with the 'K2I profile builder', developed to assist researchers with the presentation of their knowledge and with producing knowledge profiles.

Together, these tools help researchers better understand the needs and interests of industry and familiarises them with the language used by industry.



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In their efforts to better identify innovation and promote knowledge exploitation, Knowledge2innovation has created ties with major technology transfer networks such as the Enterprise Europe Network. In return, the networks have access to the toolkits and knowledge created by Knowledge2innovation.

Coordinator: Food Industrial Research and Technological Development Company (ETAT) SA, Greece.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6718

Digital privacy matures

Blanket privacy measures on computers, such as removing cookies or browser information, are giving way to a much more sophisticated technology. Personal data will be safeguarded more effectively and selectively.

The popularity of internet-based services, wireless networks and mobile phone applications is leaving users more vulnerable to electronic crime. As electronic privacy becomes more important, the need for implementing privacy protocols in user technology also increases.

Current privacy tools on a personal computer, such as removing cookies

and erasing browser preferences, already exist and are simple to apply. However, if the user wants to be more selective in what should be erased or protected, the issue becomes more complicated.

The EU-funded PASS⁽¹⁾ project is developing easy-to-use tools that apply safety measures not only within applications, but on operation systems



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and entire networks as well. The project is implementing privacy as a service or application that automatically 'scrubs' user data according to user preferences, monitoring the electronic environment and tracking personal identification data.

The system is being developed for both novice users and experts and differentiates between privacy requirements at different stages of a file's usage or life-cycle. For instance, idle files may be ignored until they become attachments in emails, where they are then cleansed of certain user information. A bank or trusted colleague may be enabled to view relevant data while an online forum may be denied.

Sophisticated methods for protecting the user's electronic environment from information leaks to the web are being developed by examining millions of documents online. The project is also developing security and privacy protocols that consider access rights and privacy-conscious data sharing in medical environments.

Such research will help firms develop new software that can give all users their

desired level of privacy in an increasingly invasive high-tech world.

Coordinator: Foundation for Research and Technology - Hellas, Greece.

(1) 'Privacy architectures for system services'.

Funded under the FP7 programme Cooperation under the theme 'Knowledge based bio-economy'.
<http://cordis.europa.eu/marketplace> > search > offers > 6672

Digital soil maps for all of Europe

Essential groundwork is being laid for the provision of digital soil maps for Europe, which will be of great value to those responsible for managing these important natural resources.

Soil degradation is a growing environmental threat that affects water and air quality, biodiversity and climate change. To manage this problem, we must first understand its extent. This can only be accomplished by soil mapping, an often imprecise and costly undertaking.

Scientists are taking a fresh approach to this subject in the context of the Isoil⁽¹⁾ project. Financial support from the EU is being used to evaluate a number of new soil sampling techniques.

The Isoil team narrowed its focus to mobile, non-destructive methods in order to reduce time requirements while expanding geographical coverage. Emphasis was placed on reproducibility of results. Soil samples have been collected to help derive the relationship between sensor feedback and actual data, which is expressed as a geophysical transfer function. Finally, models are proving

extremely useful for examining the connection between soil features and geophysical parameters.

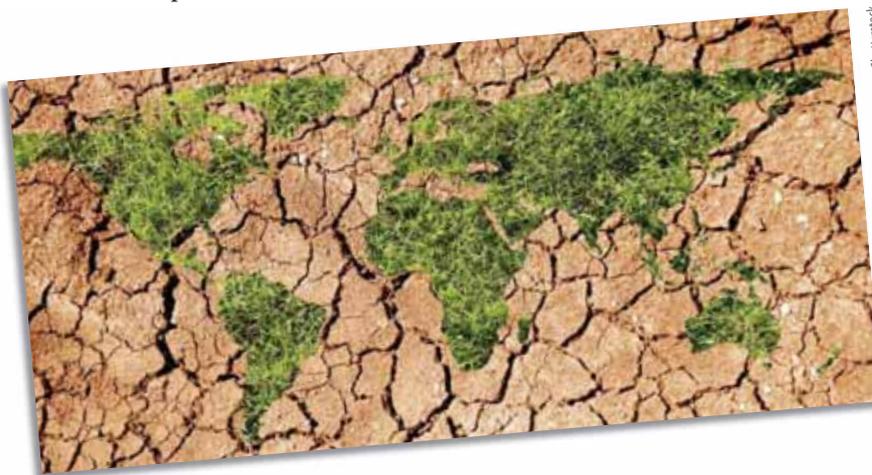
Other important work being performed by the Isoil scientists includes development of guidance to harmonise efforts by soil researchers spread across the globe. Standards for specific methods are also

in progress. Dissemination of this information, which is accomplished through dedicated workshops, is therefore an integral component of the project.

Coordinator: Helmholtz-Zentrum für Umweltforschung, Germany.

(1) 'Interactions between soil related sciences – linking geophysics, soil science and digital soil mapping'.

Funded under the FP7 specific programme Cooperation under the theme Environment.
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New heights for radio astronomy

New advances and improvements in European radio astronomy are set to propel research excellence to new levels.

Astronomy is a fascinating field that attempts to answer some of the oldest questions in the world: How do stars and planets form? Do we understand the extremes of the Universe? The answers to these questions and many others, can only come with the proper networks and facilities for researchers working in the field.

Under the EU's Seventh Framework Programme (FP7), the Radionet⁽¹⁾ project is grouping together Europe's leading facilities and astronomers to answer these questions and more. Radionet comprises 27 partners from 14 countries, including radio telescope facilities, universities and laboratories that specialise in fundamental research, microelectronics,

and superconducting component fabrication. Its aim is to significantly enhance the quality and quantity of research in the astronomy field.

Since the onset of the project, the partners have progressed with all their various networking and joint research activities. Moreover, user access to radio telescope facilities has met or exceeded the project's original goals.

Radionet has undertaken a series of events and activities which include



28 meetings on subjects such as magnetic fields, a new golden age of radio astronomy, and recent developments in lessening radio frequency interference. Radionet also participated in the annual meeting of the Young European Radio Astronomers Club (YERAC), reaching out to future astronomers. All these events have brought together hundreds of astronomers and engineers, and the results are published on Radionet's website. In the meantime, access to Radionet's facilities is expected to increase sharply, as modern new telescopes, such as the 'Sardinia radio telescope' (SRT) and the 'Low-frequency array radio telescope' (LOFAR), become fully operational.

Radionet is also running sub-projects or 'joint research activities' (JRAs). One

of these is examining how to improve user software of Europe's major interferometers (telescope arrays or segments acting together to probe structures with higher resolution). Another is designing a large-format radio camera and developing a next-generation two-dimensional receiver array for certain telescopes.

All JRAs under Radionet have met with notable successes, including the new software system to facilitate telescope applications, furthering European astronomy significantly. At this rate, astronomy's mysterious questions might just be answered in our lifetime.



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Coordinator: Stichting Astronomisch Onderzoek in Nederland, the Netherlands.

(1) 'Advanced radio astronomy in Europe'.

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

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Developing opto-nanomagnetism

EU-funded researchers are investigating opto-nanomagnetism as a viable technology for future magnetic recording and information processing.



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Scientists working in the Netherlands are aiming to develop so-called opto-nanomagnetism to facilitate the development of a novel technology for incredibly fast magnetic recording and

information processing. The frequency of the electromagnetic waves will be in the order of terahertz (THz), one trillion hertz. The developments will include 'spintronics', the emerging technology of spin transport electronics.

Spintronics, also known as magneto-electronics, exploits both the intrinsic spin of an electron and its associated magnetic moment, in addition to its fundamental electronic charge. Under the aegis of the Ultramagnetron⁽¹⁾ project, scientists are investigating the effects of light on magnetic order at the nanoscale. They hope this will allow them to obtain highly efficient and ultrafast — in the range of one picosecond and faster — optical control of nanomagnets. The researchers believe

that this will help initiate the development of novel technology.

To pursue this aim, the Ultramagnetron team have formed a multidisciplinary consortium of academic and industrial partners offering expertise in a variety of research areas. The spheres of expertise range from, for example, coherent non-linear magneto-optics and ultrafast magnetisation dynamics to spatially and time-resolved magneto-optics, nanophotonics and X-ray nanoprobings of magnetism.

Coordinator: Stichting Katholieke Universiteit (SKU), the Netherlands.

(1) 'Ultrafast all-optical magnetization reversal for magnetic recording and laser-controlled spintronics'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6618

Securing critical infrastructures

Critical infrastructures, such as energy generation plants and police facilities, contribute significantly to our society, and must remain safe and secure at all times.

These installations often boast an advanced level of technology, classified data and off-limits areas accessed solely by skilled staff, and involve complex interactions between sections, facilities and even different countries.

To ensure their safety and security, these installations require protection systems that can control all the complexities and interactions involved. The EU-funded NI2S3⁽¹⁾ project is developing security systems based on a technology called 'network-enabled capability' (NEC).

This technology integrates sensors, decision-makers and support capabilities to ensure that the right information is available in the right place, at the right time and in the right amount. The technology will also be based on 'service-oriented architecture' (SOA), a flexible set of design principles that guide systems development and integration in computing.

With NEC and SOA technologies, the security systems will be capable of collecting

and processing information from diverse sources to ensure and improve the situational awareness of critical infrastructures. NI2S3 is thus developing the technology for evaluating the performance, robustness and reliability of such a protection system using performance indicators and tools for system validation. It is working on a viable application demo or prototype that will protect these infrastructures. Once the prototype is ready, the project

will oversee distribution and exploitation of the technology.

The project has so far analysed the current state of the art in the field and defined security scenarios to help elaborate a security system. It has outlined system specifications to develop a secure system for critical infrastructures.



The resulting protection system is set to involve all necessary components and tools to acquire, exchange, process and monitor information. It will rely on the continuous feeding of information to ensure rapid access for designated end users so they can take appropriate, timely decisions concerning security.

For example, critical transportation systems have an international scope, so that the most suitable instrument to achieve advances in protecting such infrastructures is a system based on international cooperation. Lastly, the NI2S3 project will ensure that the prospective protection system is error-proof and does not react in ways that may lead to erroneous, inadequate or disproportionate system actions.

In summary, such a system will help keep our critical infrastructures safe from errors, sabotage, terrorist acts, and natural or manmade hazards.

Coordinator: Vitrociset spa - Italy.

(1) 'Net information integration services for security systems'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6623

Sophisticated sensors to improve motor performance

Novel semiconductors have great potential to power sensors that will control both small and large motorised equipment. This will increase efficiency and save energy for a whole range of devices with motors.

Electric motors, such as those in electric cars or those powering electronic devices, are the driving force behind equipment of all sorts. Accurate manipulation of these motors is necessary to ensure smooth functioning and precise control of speed, force, power and energy savings.

Normally, these motors are controlled by sensors that monitor the electric current. The high density of sensors often required, and any temperature instability present, can wreak havoc with these systems, particularly in industrial applications.

To solve this problem, the EU-funded IHACS⁽¹⁾ project is developing highly compact and efficient sensors that are self-calibrating. The technology of these sensors is based on 'Complementary metal-oxide semiconductors' (CMOS), building on breakthrough conductors founded a century ago by physicist Edwin Hall.

The new semiconductors developed by the project team have no ferromagnetic

parts and are unaffected by fluctuating temperatures. The team is ensuring that the sensors will work in an environment that has any temperature with guaranteed stability between minus 25 °C and 150 °C.

They can be mounted significantly closer to motors and related equipment, a feature which reduces size. In more technical terms, the new sensors are capable of much more sophisticated magnetic field filtering and sensitivity boosting. IHACS is also integrating the

new sensors in very small chips, yielding improved spatial sensing, lower costs and easier reproducibility.

The project has already developed the final version of the CMOS magnetometer-related sensor required to realise this initiative. Once the technology is fully exploited, the sensors are expected to enable a host of motorised equipment to work more efficiently and economically.

Coordinator: Sensap SA, Greece.

(1) 'Wide-band, self-calibrating, CMOS-integrated HALL magnetometer for current sensing applications'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6706



Predicting randomness

Homing in on new computational algorithms will allow for better testing of probability distribution, ideal for large sets of variables and data in emerging research.

The EU-funded Distribution testing⁽¹⁾ project is examining the most efficient ways of understanding probability distribution. It is studying the complexity of samples with respect to distributions over a large area or domain. Analysing sample distributions and random variables in such cases has traditionally been complex and challenging.

Thus, the main objective of the project is to develop different mathematical and computer-generated algorithms that can study distributions and probabilities in better ways. The project

team is scrutinising different kinds of distributions to develop these novel algorithms. Numerous tests are being conducted and the detailed observations documented. The Distribution testing project is also probing previously unstudied properties, as well as the relationship between computational complexity and sample complexity, to reach its aims.

These new algorithms will shed light on emerging applications in data mining and natural sciences. They will facilitate



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this area of statistics and support new sets of data and variables in research.

Coordinator: Tel Aviv University, Israel.

(1) 'Algorithms for testing properties of distributions'.

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

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Reinventing manual work

Globalisation means European manufacturers are outsourcing manual work to other parts of the world, resulting in a loss of jobs and value across the EU. The Manuvar⁽¹⁾ project will demonstrate that high-value, high-knowledge manual work is an opportunity to improve the competitiveness of EU industries and reduce the need for outsourcing.

High-tech improvements in the way manual work is conducted can streamline industry, ensure sustainability, secure jobs and add value to a new generation of skilled technicians and assembly workers. High-knowledge manual work is essential for assembly, manufacturing and maintenance in many sectors of industry, from nuclear reactors and satellites to factory operation.

Millions of Europeans work in high-value, high-knowledge manual work. The EU-funded Manuvar project is reinventing this important part of the industrial process. The project is developing a system that supports manual work throughout the life-cycle of the product or service involved. It is looking at ways to improve the quality, productivity and competitiveness of manual work, while facilitating customisation and keeping production 'lean'. Manuvar is also supporting knowledge and skills management throughout the entire product life-cycle.

This new approach is using 'virtual reality' (VR) and 'augmented reality' (AR) with high-tech components to simulate and enhance the role of manual work in

industry across the product life-cycle. It also enables bidirectional communication between all actors along the product life-cycle. They can give constant feedback through a virtual model to facilitate industry processes at different stages in the life-cycle.

Manuvar is identifying the key challenges faced by European industries with respect to manual work, taking into account preliminary business analysis and economic impact. It is outlining models and system designs that will improve manual work, including aspects such as ergonomics, integration with product life-cycle management, and the implementation of VR/AR technologies in industry. These models and system designs can elevate the status of manual work in Europe, while reducing associated risks for workers.

Soon, the project team will be ready to demonstrate semi-commercial prototypes of advanced manual work technology on the factory floor for certain sectors and train workers in its use. The business and social impact of the project will then be explored to see how



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this technology can be disseminated and exploited. As a result, manual work could become more comfortable, more effective and more streamlined, as will the products and services that will emerge from these new and improved processes.

Coordinator: Valtion teknillinen tutkimuslaitos (VTT) Finland.

(1) 'Manual work support throughout system life-cycle by exploiting virtual and augmented reality'.

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

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Nanotech fights *trypanosomiasis* south of the Sahara

Trypanosomiasis is having a devastating effect on the economy and health in sub-Saharan Africa as it infects humans and livestock. The diagnostic tests and treatments currently being used have serious limitations.

The Nanotryp⁽¹⁾ project is using nanobody technology to develop new diagnostic and treatment tools. Nanobodies are small antibody fragments produced as recombinant proteins. They are unique by virtue of their improved stability and in their capacity to recognise particular epitopes, the area of an antigen that can bring on an immune response. Nanobodies can also be used as transport devices of other biologically active components.

Compared to nanobody technology – which avoids expensive, labour-intensive molecular techniques – diagnostics based on ‘polymerase chain reactions’ (PCR) – are much more costly and require infrastructure and equipment maintenance that are hard to sustain in African field situations. The ease of use of nanobody technology, however, renders it viable for knowledge transfer and the technique can be adopted by participating African partners.

Nanotryp aims to generate a number of nanobody libraries able to recognise all four major African trypanosome species, develop fast and easy-to-use nanobody-based *trypanosomiasis* diagnostic tools based on parasite detection, and assess the viability of anti-trypanosome nanobodies as drug-targeting molecules. Project partners also want to build a forum for knowledge exchange and to increase awareness of both human and livestock African *trypanosomiasis*.

In work to date, Nanotryp has delivered a set of nanobodies that can recognise the *Trypanosoma* species *brucei*,

congolense and *vivax*. The use of these nanobodies revealed a major increase in sensitivity to parasite detection.

Nanotryp is presently developing a nanobody-based dipstick for molecular diagnosis of *trypanosomiasis* and highly specific drug-targeting strategies. The latter will resolve the problem of toxicity that current anti-*trypanosomiasis* drugs present.

Project partners are working on making the transition from experimental and laboratory use of nanobodies to field use. Efforts in this area show that nanobodies do not pose a health concern for animals such as monkeys, nor do they elicit an anti-nanobodies immune response.

The results of various Nanotryp studies have been published in a 2009 issue of the *EU Parliament Magazine Research Review*.

Nanotryp’s project coordinator is based at the Vrije Universiteit Brussel in Belgium.

(1) ‘Exploiting nanobodies in development of new diagnostic tools and treatment methods for *trypanosomiasis*’.

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

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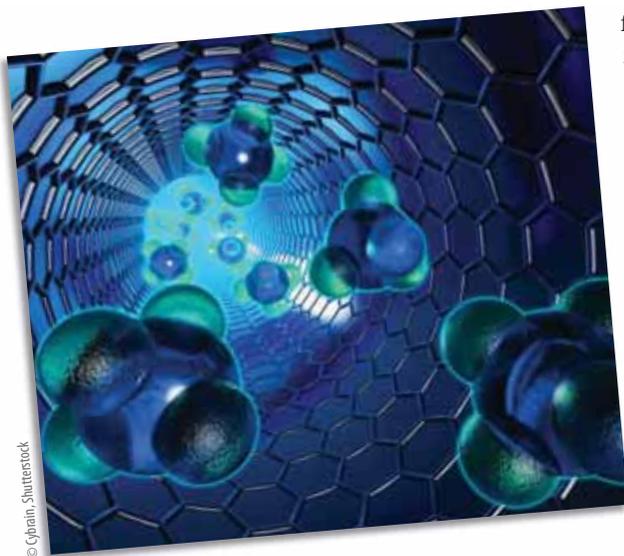


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Nano success on a grand scale

Developing a transnational infrastructure for the advancement of micro and nanotechnologies will ensure Europe's leadership in this very important field which affects dozens of economic sectors.



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Micro and nanotechnologies have the potential to create economic growth in every geographical area of Europe and almost every industry, leading to new product innovations and a renewed job market. Already, the EU has proved itself in nanotechnology applications, especially in the field of functional materials that can be used in a multitude of applications, from clothing to frying pans. To maintain Europe's primacy and competitive edge in this important and relatively new technology, the EU must have a united research and development infrastructure. However, research at the

forefront of nano- and micro-fabrication technologies often involves expensive and highly specialised techniques and trained technical personnel.

In response to this need, the EU-funded Euminafab⁽¹⁾ project was established; it represents the first pan-European research infrastructure for micro- and nano-fabrication of novel and emerging functional materials. It provides researchers and stakeholders with access to a unique portfolio of state-of-the-art technologies for structuring and characterising a multitude of materials at the micro and nano scales.

Euminafab has tackled global competition by providing the ultimate infrastructure for micro and nano research, building on a consortium of 10 European partners that covers 8 Member States. The project consortium integrates six academic institutes and four industrial partners, reflecting an optimal

balance between research and industry. At this stage, the Euminafab network already boasts 36 infrastructure installations serving an estimated 430 projects or users over a 48-month duration. The network is characterised by high-level collaboration, transnational access and joint research. This allows the project to overcome economic barriers and lack of skills by giving researchers from industry and academia no-fee access to its installations. Such a network also helps generate new knowledge, enables scientific breakthroughs and encourages the development of next-generation products.

Launched in 2009, the project immediately began to establish its identity and business processes, opening its doors to external users as Europe's first research infrastructure in its field. User access across the continent has been facilitated via the virtual entry point of Euminafab online. As this success flourishes, new and more valuable research on micro and nanotechnology is sure to continue buoying the EU in this important field.

Coordinator: Karlsruher Institut für Technologie, Germany.

(1) 'Integrating European research infrastructures for micro-nano fabrication of functional structures and devices out of a knowledge-based multimaterials repertoire.'

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

<http://cordis.europa.eu/marketplace> > search > offers > 6568

Novel bio-based nanostructured polymer composites under construction

New, smart, bio-based surface nanostructured polymer composites with exceptional mechanical, chemical and selective interaction properties are being developed with EU funds.

Researchers in Austria are investigating how renewable resources can be used as the basis for multifunctional nanostructured composite materials that will offer improved surface functionality compared to products already on the market. The work is being conducted as part of the Surfucell⁽¹⁾ project.

The new materials will be composed of nanoscaled polysaccharides layers with embedded nanoparticles, coating

different celluloses matrices. The compounding will target the area where the 'filler' is required; thus, by avoiding the surface and outer layers of the polymers, it will prevent deterioration of the matrix materials' chemical properties.

Surfucell will investigate the effects of cellulose dissolution, structuration with nanoparticles and irreversible coatings. They will also explore several



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ways to create an entirely new type of high-value bio-based material: its properties will be widely applicable and its functions tailored to meet user needs.

The improved properties of these materials, such as flame resistance,

conductivity, antimicrobial activity and barrier properties, could make them ideal for use in medical and hygiene devices, as well as in the electronics industry.

Coordinator: Universität Graz – Austria.

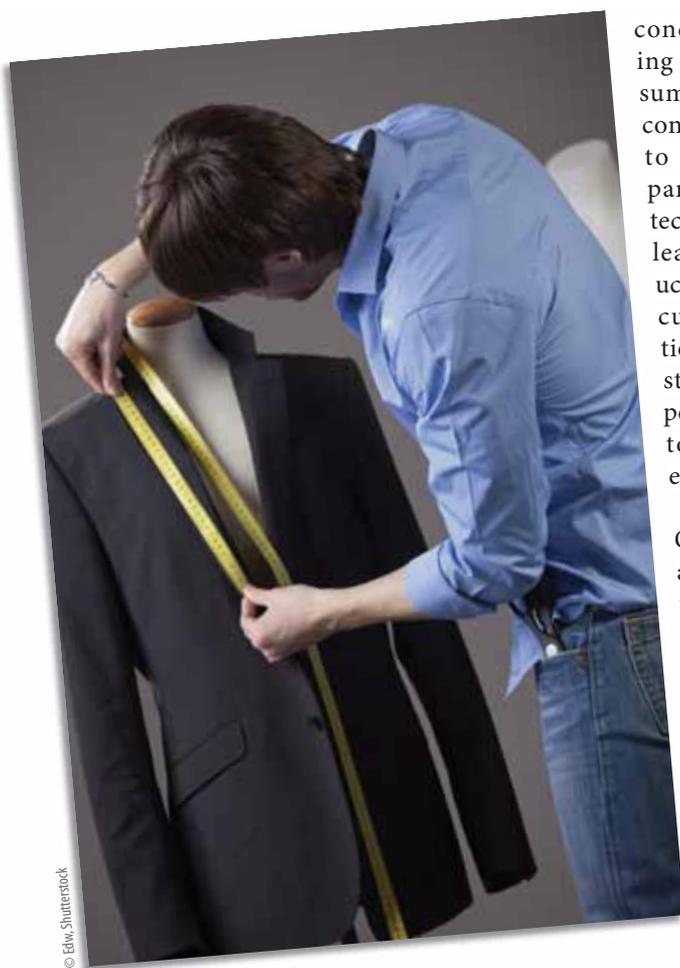
(1) 'Surface functionalisation of cellulose matrices using cellulose embedded nano-particles'.

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

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Made to measure: a new look at the clothing industry

For the European clothing industry to be a global player, it needs to offer a major competitive advantage. This may come in the form of personalised garments designed and ordered online by the consumer.



conceiving, producing and selling consumer-designed and configured garments to customers and partners using web technology. This will lead to new product designs, increase customer satisfaction, and improved stability and competitiveness of small to medium-sized enterprises (SMEs).

Overall, the approach engages the capabilities, knowledge and creativity of consumers through web-based virtual communities. It adopts and integrates mainly existing digital technologies to design and produce individual garments

The global clothing market is a highly competitive one, with a huge amount of low-cost garments finding their way into Europe. The EU is promoting competitiveness in the textile industry by focusing strongly on tailor-made and individualised garments.

The EU-funded Open garments⁽¹⁾ project is creating a 'Manufacturing service provider' (MSP) business model to achieve individualised products. The model will allow for a new way of

ments within a framework of 'Open innovation' (OI) and within the new concept of 'Open manufacturing' (OM). In short, the consumer will be empowered to become the designer, producer and retailer of these garments.

Once the MSP business model is developed, it will be implemented and tested in real industrial environments. The scheme will provide the European textile and clothing industry with a very high degree of customisation in

terms of fit, fashion and function at a comparable price in around 72 hours.

The Open garments project has already defined the concept of the OI community and OM networking, including the services to be provided. The OI online consumer community includes a method for design and sustainable operation, plus a beta version for buying, selling, improving and sharing designs and configurations of fabrics, garments and accessories. In the meantime, the OM manufacturing networking structure and dedicated tools have also been developed, complete with six blueprints for setting up micro-plants and initial installations. One live example is the DigifabriX micro plant for Digital Textile Printing in Berlin, Germany.

The overall technology features colour-consistent digital textile printing, rapid manufacturing, garment rendering and made-to-measure personalisation. In addition, the Open garments service architecture and early prototypes of web services have also been developed.

The project results are being distributed to stakeholders, and hopes for adopting the technology are high. The next steps for the project involve launching the 'Open innovation consumer community', finalising configuration of components, implementing micro-plants and testing their OM networking. The project team plans to make an extensive demonstration action available very soon.

Open garments' project coordinator is based at the Deutschen Institute für Textil- und Faserforschung Denkendorf (DITF) in Germany.

(1) 'Consumer open innovation and open manufacturing interaction for individual garments'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6580

Customise your own clothes

Virtual dressing rooms, style advice, personalised garments and European standards will take the clothing industry to new heights, both online and in retail premises.

Increasing the competitiveness of the clothing sector in Europe hinges on creating customised clothing for clients, thereby filling a global niche market. The EU-funded *Servive*⁽¹⁾ project is developing new concepts for tailoring the garment to the customer.

Servive is encouraging a larger assortment of customisable clothing items and integrating fun, design and functionality by involving end-users in the process. The project is establishing an online virtual customer advisor (VCA), which can recommend the optimum product configuration based on customer style preferences and requirements. Web-based services

will combine style expertise, human body requirements, fabrics and specific manufacturing knowledge.

The idea is to encourage consumers to enrol in a model style community where they review and evaluate new designs and 'virtually' try on different variants of the same garments along with their online friends (the online group shopping concept). This also involves access to professional styling advice with the aid of an intelligent style advisor based on consumers' profile and preferences.

On the technical side, *Servive* is introducing the concept of the networked micro-factory, where decentralised production is

brought closer to retailers and consumers. This involves the development and testing of a new production model based on decentralised high-tech manufacturing cells (micro-factories). Micro-factories can range from networked small-size but high-tech production sites, to sites equipped with automatic knitting machines or semi-automatic three-dimensional (3D) assembly centres. The project is tapping into new market segments, particularly women's wear, knitwear and sportswear.

The project has conducted a market study on 'What to sell to whom in mass customised apparel', identifying potential target groups and product niches. It has elaborated a detailed definition of a comprehensive business model combining a 'Supply network integration' (SNI) platform and online style community. In addition, an enhanced version of the existing *Customax* web-based transaction platform was integrated within the three *Servive* pilot companies and will be finalised soon. The 3D virtual 'try on' feature is also almost ready, complete with a virtual fitting room, and so is the style advisor feature. Together, they will simulate garments in full 3D and display the final result.

Servive also launched the first micro-factory in Kaiserslautern, Germany, offering customisable women's dresses, where consumers can co-design the garment with an advisor in the shop. Eventually, the aim is to reduce production time of each garment in this micro-factory from days to hours.

Such personalisation, online features, quick delivery and style advice will all make the project a leader in reinventing the clothing industry. *Servive* is creating a whole new model for the industry and raising its competitiveness in Europe.

Servive's project coordinator is based at the Athens Technology Center SA in Greece.

(1) 'Service oriented intelligent value adding network for clothing-SMEs embarking in mass-customisation.'

Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies'.
<http://cordis.europa.eu/marketplace> > search > offers > 6632



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Industrial coating for heat and chemical protection

Scientists in Germany are using novel particle technology to develop a new multipurpose high-temperature coating system.

Better protection for a multitude of surfaces will be offered by the creation of a 'novel, unconventional and cost-efficient type' of multipurpose high-temperature coating system, according to EU-funded scientists. The Particoat⁽¹⁾ project partners will use novel particle technology to develop this system, which will offer a thermal barrier effect, oxidation and corrosion protection, electrical insulation at elevated temperatures, and fire protection.

This novel approach to protecting surfaces consists of a coating made, in its initial state, of nano- or micro-scaled metal particles with a defined size, deposited by spraying, brushing, dipping or the 'sol-gel' process. During the heat treatment, the binder is expelled, bonding to the substrate surface achieved, the metallic particles sinter and oxidise completely resulting in hollow oxide spheres that form a quasi-foam structure. Simultaneously to this process, a diffusion layer is formed below the coating, serving as

a corrosion protection layer and as a bond coat for the top layer.

Moreover, users will be able to adjust the structure of the coating system by changing parameters such as the source metal or alloy, particle size, substrate, binder or defined heat treatment. For fire protection, the formation of hollow oxide spheres will be processed in a separate step before deposition.

The flexibility of the new coatings will be able to benefit a wide range of industries, including gas and steam turbines in electric power generation, aero-engines, combustion chambers, boilers, steam generators and super-heaters, waste incineration, and fire protection of composite materials in construction, as

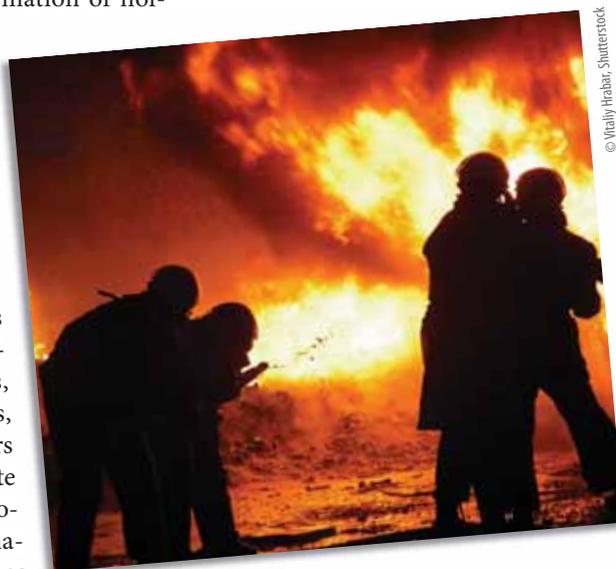
well as reactors in the chemical and petrochemical sectors.

Coordinator: Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. Germany.

(1) 'New multipurpose coating systems based on novel particle technology for extreme environments at high temperatures'.

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

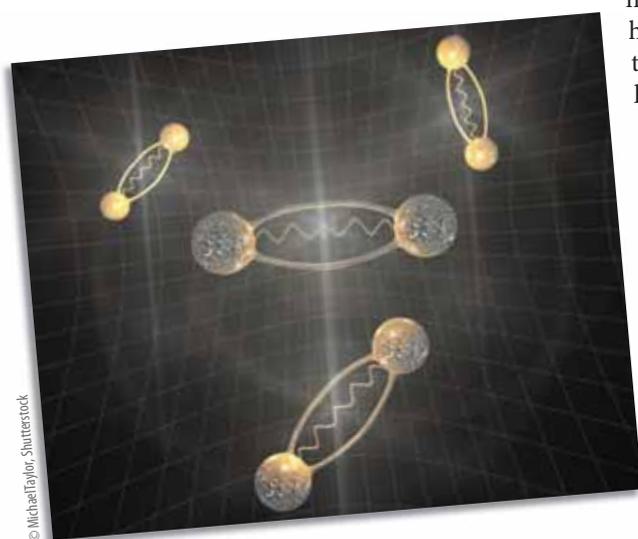
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Further investigations into hadron physics

Researchers in Italy are using EU funds to further investigate hadron physics, the study of strongly interacting particles.



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After previous successful investigations, scientists are leading further studies of

hadron physics to see how this field can contribute to future technological innovations.

The interaction of hadrons is described as the theory of the strong force. The research team for the Hadronphysics2⁽¹⁾ project explained that they can also form more complex systems, in particular atomic systems. Moreover, they commented that under extreme pressure or temperature conditions, hadrons may lose their identity and

dissolve into a new state of matter similar to the primordial matter of the early universe.

The Hadronphysics2 project relates to the organisation of experimental and theoretical collaborative work including ongoing activities and planned experiments. According to the scientists, in hadron physics the close interaction between experimentalists and theoreticians is of paramount importance. They believe that applications in material science, medicine, information and technology are natural 'fall-out' from their work.

Hadronphysics2's project coordinator is based at the Istituto Nazionale di Fisica Nucleare (INFN) in Italy.

(1) 'Study of strongly interacting matter'.

Funded under the FP7 specific programme Cooperation under the theme Infrastructures.
<http://cordis.europa.eu/marketplace> > search > offers > 6624

Reading radioactivity

New portable equipment will be able to localise radioactivity more easily. Nuclear installations, security agencies, recycling plants and customs agencies all stand to benefit.

Nuclear energy has much to offer but can also pose a severe risk. To minimise related threats, the EU-funded COCAE ⁽¹⁾ project is developing new radioactive-monitoring technology. Cd(Zn)Te is a compound of cadmium, zinc and tellurium that can be used efficiently in detection equipment to monitor radioactivity.

COCAE is developing a highly efficient portable instrument able to identify, within a range of a few metres, what kind of radioactivity is present and where the source is. The process is normally an expensive and time-consuming one, but the new technology will make it more efficient and cost-effective, and consequently more accessible.

The technology helps improve the quality of data gathered by customs officers during inspections, for example, and assists first responders during radiological or nuclear emergencies to localise dangerous situations. It is also useful when a radioactive source is melted in

a recycling factory by mistake, or in the case of terror attacks, or during theft of radioactive material.

To achieve its aims, the project is employing novel methods in astrophysics. It is also growing high purity, detector grade Cd(Zn)Te crystals. Their performance is being optimised by material purification and post-growth processing to obtain high-resistance high-transport properties and homogeneous distribution of the material properties in the grown crystals.

COCAE has already developed the required technology for the new monitoring equipment, such as pixel detectors and pixel electronics capable of simultaneous imaging and spectroscopy. Extensive tests and simulation studies have also been performed to validate the new equipment.

In short, the COCAE technology will be exploited for use in areas of border

security, inspection at recycling factories, regulatory authorities, nuclear waste management facilities, decommissioning of nuclear reactors and emergency response. These portable devices could ultimately help avert disaster and upgrade security worldwide.

COCAE's project coordinator is based at the Technological Educational Institute of Chalkida in Greece.

(1) 'Cooperation across Europe for Cd(Zn)Te based security instruments'.

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

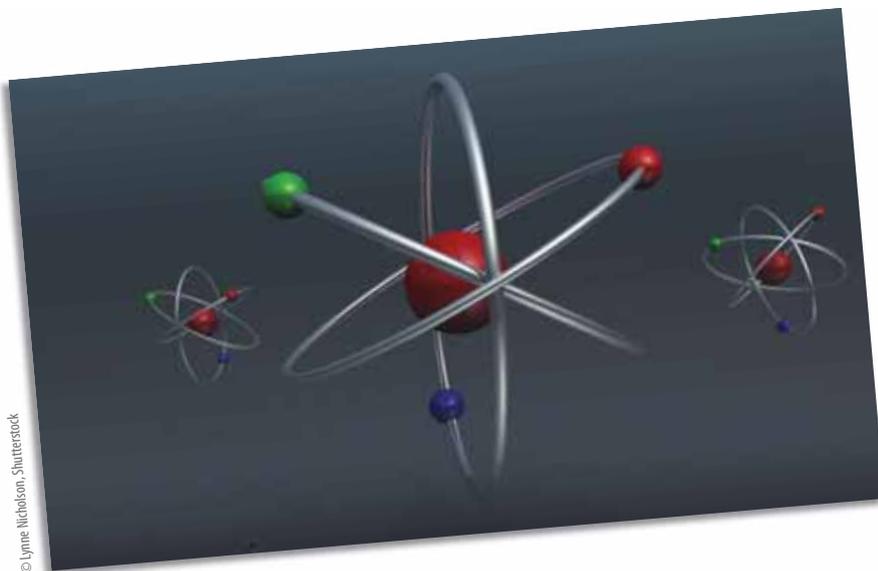
<http://cordis.europa.eu/marketplace> > search > offers > 6613



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Strong interaction in European nuclear physics

By bringing together three notable European institutes in nuclear physics in Croatia, Italy and the UK, this EU-funded project will help upgrade exchange of knowledge and advance this important field.



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The Ruder Boškovic Institute (RBI) in Croatia is one of the top institutes worldwide in experimental nuclear physics, and boasts strong research ties with the country's University of Zagreb (UZ). RBI scientists perform experiments at the institute's noteworthy tandem accelerator facility and at other top EU experimental facilities, in collaboration with prominent EU partners. These include the Laboratori Nazionali del Sud (LNS) in Catania, Italy and the Nuclear Physics Group from the University of Birmingham (UB) in the UK.

The EU-funded CLUNA ⁽¹⁾ project plans to enhance scientific relationships and exchange of know-how among these three institutions. The partnership is focusing particularly on the study of nuclear molecules and new phenomena in nuclear physics.

It has so far funded and overseen notable upgrades in facilities at the RBI,

including a gas target system and silicon detector array that were built, tested and commissioned. This also included a data acquisition system and a new vacuum pump system, as well as infrastructure upgrades of the RBI accelerator, positioning the university's facilities in line with current state of the art. Meanwhile, work on neutron detectors is being planned for the near future.

Beyond facilities and hardware, CLUNA is strengthening the RBI's human potential by employing young graduates and conducting training. Workshops and visits among the partners are ongoing, coupled with solid exchange of knowledge and experience.

Another important component of the project is the dissemination of project results across the international nuclear physics community, as well as to the general public. Activities in this respect have involved updating the CLUNA website and presentation of the upgraded RBI research facility at international nuclear physics conferences. This has led to a rise in use of the facilities at the RBI for laboratory experiments and intricate measurements in the field of nanotechnology.

Overall, improving the capabilities of nuclear physics at RBI will significantly upgrade the scientific infrastructure in the region and render the institute more

competitive within the EU. Project partners are overcoming the negative perceptions of nuclear physics among the general public and improving the educational level of Croatian society. The contributions of this project to the socioeconomic needs of the region will be notable.

CLUNA's project coordinator is based at the Ruđer Bošković Institute in Croatia.

(1) 'Clustering phenomena in nuclear physics: strengthening of the Zagreb-Catania-Birmingham partnership.'

Funded under the FP7 specific programme Capacities under the theme 'Research potential of convergence regions'.
<http://cordis.europa.eu/marketplace> > search > offers > 6631

High-performance process equipment updated

The development of a methodology and criteria for dealing with two-phase liquid-liquid reactions leading to a new generation of flexible and high-performance process equipment is the aim of a UK-based research team.

Scientists will use practical, theoretical and modelling aspects to develop devices that can be applied to two different industrial systems. This development promises to show the wide applicability to the chemical industry of the mono-nitration of benzene and the cyclisation of b-ionone.

Under the PILLS⁽¹⁾ project, researchers will operate micro- and meso-scale reactors at scales relevant to commercial production to demonstrate their improved selectivity, yield and specific

performance. They will also design and construct a state-of-the-art experimental research facility.

Finally, having developed an improved understanding of these processes and the design and operation of appropriate micro- and meso-structured environments, the team will produce a toolkit identifying the most suitable continuous processing methods for any liquid-liquid system. This will allow operators to improve the sustainability of chemicals production by selecting intensified

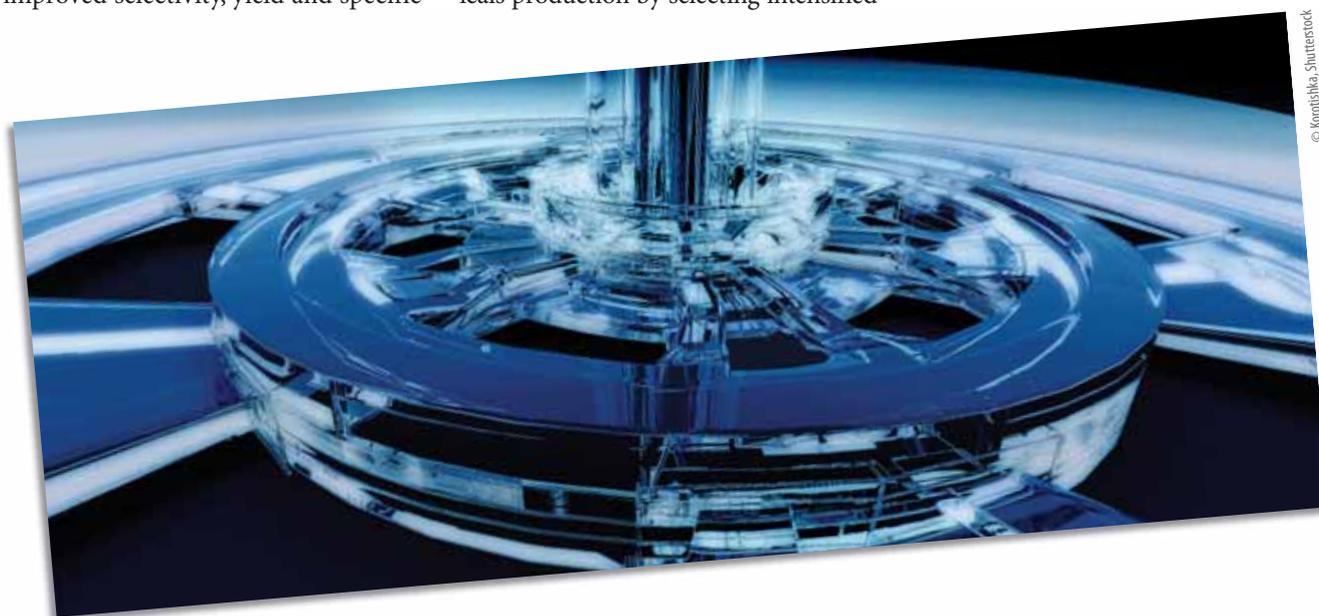
process methods that are both eco-efficient and offer increased safety.

The partners involved in this project come from six countries and include a knowledge transfer company, two small and medium-sized enterprises (SMEs), two manufacturers of equipment and three potential end-users.

Pills' project coordinator is based at Chemistry Innovation Ltd in the UK.

(1) 'Process intensification methodologies for liquid-liquid systems in structured equipment.'

Funded under the FP7 specific programme Cooperation under the theme 'Nanoscience, nanotechnologies, materials and new production technologies'.
<http://cordis.europa.eu/marketplace> > search > offers > 6641



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The ultimate robot comes to life

Getting robots to think and see like humans has been a daunting task for scientists and developers. Now, new technology is helping to achieve this with numerous applications for industry and services.

In coming decades, human-like robots may be a valid part of the future, assisting in many tasks and services. Studies by the United Nations Economic Commission for Europe (UNECE) and the Japan Robot Association (JARA) indicate that robotics may indeed become a major industry worldwide.

While robots can now undertake repetitive, well-defined tasks, future humanoid robots will set the stage for more advanced technology that can be integrated in industrial manipulator

robots. The EU-funded Flexiblerobot-behav⁽¹⁾ project is developing walking humanoid robots and digital humans. The project is enhancing the algorithms and laws of existing humanoid robots to obtain versatile walking behaviour. The end product must be safe enough for tasks such as manipulation, vision, teleoperation and interaction with humans.

Such advances allow more autonomous robots to undertake increasingly complex interactions with less controlled environments, a concept known as service robotics. Before this technology can progress significantly, numerous complex scientific and technical problems must be addressed: actuation, sensor technology, vision, mechanical design, control theory and computer science.

Already, Flexiblerobot-behav has designed a robot featuring full walking motion generation, which decides automatically when

and where to make a step. It has also connected the robot's walking motion generation directly with vision processes, orchestrating the locomotion of the robot directly from its vision of the environment. In addition, the project team has begun experimenting on interaction with humans and has proposed technology that allows the robot to decipher the locomotion of a human and even predict it one step ahead of time.

With respect to complex tasks and required software, the project team has extended and upgraded the classical algorithms introduced 20 years ago for kinematic control of redundant robotic movement. These new advances allow the robot to avoid obstacles more efficiently and extremely quickly.

The advances bode well for highly automated robots that hopefully a few years down the line will be able to assist us in a number of tasks, industries and services.

Coordinator: Institut national de recherche en informatique et en automatique (INRIA), France.

(1) 'Flexible behaviours for humanoid robots and digital humans'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6639



The next step in global science laboratories

The scientific community is looking forward to the development of the International Linear Collider (ILC) hailed as the world's most sophisticated particle accelerator.

While Europe has begun to reap the fruit of the Large Hadron Collider (LHC), the world's most powerful particle accelerator, the scientific community is already looking to the next big project.

This will come in the form of an even more complex facility, known as the International Linear Collider. The EU-funded ILC-HIGRADE⁽¹⁾ project is overseeing the preparation for the rapid realisation of the ILC. This

upcoming facility will complement the LHC and promises to produce high centre-of-mass energies for experiments in electron-positron collisions, featuring precision at the tera scale, i.e. at the quantum level.

The design and concept of the ILC is being finalised through the 'Global design effort' (GDE), represented by



an international team of over 60 engineers and scientists. In mid to late 2012, the technical design report for building the facility will be presented to funding agencies and governments so that construction can commence.

The ILC-HIGRADE consortium is considering where to locate the new facility within Europe; sites in Japan and the United States are also being considered in the GDE. The advantages of each location are being evaluated in this global endeavour, while input from universities and laboratories is being incorporated in the framework for launching the ILC. The team is also studying the design

requirements in terms of costs, as the linear accelerator sections require substantial resources.

ILC-HIGRADE is responsible for the European contribution and assessment, but the facility will be operated as a global resource with scientists from all participating laboratories contributing as they strive to unravel the secrets of the tera scale.

ILC-HIGRADE's project coordinator is based at the Stiftung Deutsche Elektronen-Synchrotron (DESY) in Germany.

(1) 'International linear collider and high gradient superconducting RF-cavities'.

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

<http://cordis.europa.eu/marketplace> > search > offers > 6667

Super sensors using ceramics

Sensors used in industry and other fields have limited capabilities in very hot environments; this poses a challenge to which new research may have found a solution.

High-temperature sensors can function in extremely hot and hostile environments, making them very useful in aerospace, industrial processes, automotive industry, and power generation.

Specific materials known as 'Aurivillius phase ceramics' are very important in manufacturing these sensors. When heated to a certain temperature (known as the 'Curie point') their properties are altered in a way that improves sensor readings.

The EU-funded HITS⁽¹⁾ project conducted studies on Aurivillius phase ceramics to examine their suitability for creating high-temperature sensors. Scientists studied how to produce

efficient piezoelectric sensors, i.e. sensors that can measure acceleration, force, pressure and strain.

The project team investigated various characteristics of the new ceramic material, including its electrical conductivity, Curie point, magnetism, and other properties. HITS also worked on manufacturing microstructures for these sensors using a technique called 'spark plasma sintering' (SPS). This involves rapid heating of the ceramic up to 500 °C per minute at very high pressure, using extremely advanced equipment. The resulting ceramics can achieve the desired piezoelectric properties for highly accurate sensing abilities.

In short, the HITS project documented several new observations and drew important conclusions regarding Aurivillius phase ceramics, particularly their ferroelectric properties under high temperatures. This information will soon help produce more sophisticated sensors that enhance monitoring and safety as well as meet energy needs across several industries.

Hits' project coordinator is based at the Queen Mary and Westfield College, University of London in the United Kingdom.

(1) 'High temperature sensors'.

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

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

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

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

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

Conference on self-adaptive networked embedded systems

A conference on self-adaptive networked embedded systems will take place from 24 to 26 February 2012 in Rome, Italy.

Self-adaptive systems are capable of monitoring their environment and own states in order to optimise and match functions to different scenarios and requirements. The concept of self-adaptivity belongs to the wide scope of autonomic computing, including the aspects of self-awareness, context-awareness and self-adaptation.

Networked embedded systems may have various forms of communication channels including on-chip/off-chip networks, wired/wireless communication, or have a mixture of different types of channels. With self-adaptive features, networked embedded systems can adjust themselves autonomously towards low energy consumption and high dependability.

Topics on the conference agenda are set to include:

- self-adaptive, on-chip/off-chip networked embedded systems;
- self-adaptive wireless networks;
- self-awareness, context-awareness and self-adaptation;
- self-adaptivity for energy efficiency;
- dependability and security;
- formal methods;
- industrial and commercial case studies.

For further information, please visit:

http://www.peccs.org/special_sessions.asp#SANES

First international conference on sensor networks

The First International Conference on Sensor Networks will take place from 24 to 26 February 2012 in Rome, Italy.

Current trends indicate that in the near future low-cost, short-range radio technology may be widely available. Along with advances in wireless networking, this will enable wireless, ad-hoc sensor networks to become commonly deployed. In these networks, each node may be equipped with a variety of sensors, such as acoustic, seismic, infrared, motion, biomedical and chemical sensors with higher level of information inference associated with identification, embedded signal processing and networking of the data.

Wireless, ad-hoc networks have a variety of potential uses, such as:

- security applications to detect and record military information;
- chemical, biological, radiological, nuclear and explosives detection applications;
- applications to monitor environmental changes in plains, forests, oceans, and other topography;
- traffic sensor applications to monitor vehicle traffic;
- transport flow and parking applications.

This event will be a forum for researchers and practitioners to share experience and ideas on innovative developments.

For further information, please visit:

<http://www.sensor-nets.org/>

Second international conference on pervasive and embedded computing and communication systems

The Second International Conference on Pervasive and Embedded Computing and Communication Systems will take place from 24 to 26 February 2012 in Rome, Italy.

Pervasive and embedded computing and communication aim to provide trustworthy computing solutions and communication services all the time and everywhere. This has resulted in the need for an interdisciplinary field of research and development that combines signal processing with computer hardware and software technologies, and utilises and integrates pervasive, wireless, embedded, wearable and/or mobile systems. Applications range from ambient intelligence to ubiquitous multimedia, multidimensional signal processing, sensors, robotics, integrated communication systems and nanotechnologies.

This event will bring together researchers, engineers and practitioners interested in the theory and applications in areas related to pervasive and embedded computing. Areas of discussion will include mobile and pervasive computing, digital signal processing, and embedded systems design.

For further information, please visit:

<http://www.peccs.org>

International congress on research of rare and orphan diseases

An event entitled 'International congress on research of rare and orphan diseases' will take place from 29 February to 2 March 2012 in Basel, Switzerland.

A rare disease, also referred to as an orphan disease, is any disease that affects a small percentage of the population. Most rare diseases are genetic, and thus are present throughout the person's entire life, even if symptoms do not immediately appear. Nearly one-third of children with rare diseases will die before reaching their fifth birthday. According to the European Organisation for Rare Diseases, there are an estimated 20 to 30 million people living with rare diseases in Europe alone, and an estimated 6 000 rare diseases.

The conference will bring together leading researchers and young scientist from university and industry in this field to discuss and exchange ideas in the recent advances in stem cells, cell biology, gene therapy, human genetic and therapeutic applications.

For further information, please visit:
<http://react-congress.org/about/>

Heart and brain conference

An event entitled 'Heart and brain conference' will take place from 1 to 3 March 2012 in Paris, France.

Medical studies have revealed that from the point of view of a stroke, one-quarter of all ischemic strokes are connected to the heart. The source of emboli and clots are formed in the heart, dislodged in the heart and then travel to the brain. Of the 25 %

of ischemic strokes, 45 % of those are due to atrial fibrillation. Among the cases of atrial fibrillation, proper treatment can reduce the risk of stroke by two-thirds. Unfortunately, due to awareness and potential treatment hazards, three-quarters of eligible subjects are prevented from taking available medications.

Clots originating in the heart go to the brain, so the brain is the organ most affected by these emboli. Looking at it from a different perspective, strokes occur in certain areas of the brain; these areas may affect the heart by causing arrhythmia – irregularities of the heart rate – and may cause sudden death. On one hand, the heart affects the brain. On the other, a stroke may also affect the patient's heart.

The conference will bring together cardiologists and neurologists to explore the relationship between the heart and the brain. The event programme will include discussions of how to treat cardioembolic strokes, new trends in drug treatments and related topics.

For further information, please visit:
<http://www2.kenes.com/Heart-Brain/pages/home.aspx>

Smart surface 2012: solar and biosensor application

An event entitled 'Smart Surface 2012: solar and bio-sensor application' will take place from 6 to 9 March 2012 in Dublin, Ireland.

The ability to manipulate surfaces offers the possibility to tailor devices for current engineering and scientific needs and produce new materials to meet challenges in the energy and biomedical fields. These 'smart surfaces' range from dye-sensitised solar cells to labelled antibodies immobilised on surfaces for disease bio-marker detection.

The event will bring together scientists and engineers from around the world to discuss the latest advances in surfaces for application in solar and bio-sensor technologies. Session topics will include:

- smart surfaces for sensors and solar cells;
- nano-materials;
- surface characterisation (photophysical, electrochemical, microscopic);
- nano-biosensors and nano-bioanalytical systems and dye-sensitised solar cells.

For further information, please visit:
<http://www.smartsurfaces2012.ie/index.html>

Child safety: final workshop Cover, CASPER and EPOCH

The CASPER and EPOCH projects on child safety will hold their final workshop from 13 to 15 March 2012 in Berlin, Germany.

The projects will present their research findings on child safety and discuss future activities. The workshop will inform the public about the outcome of the projects through presentations and demonstrators and give room to discuss future research needs for child safety.

Although significant achievements have been made in reducing fatalities and injuries in traffic accidents over the last decade, continued efforts are needed to bring the numbers down further. Motivated by this, the CASPER and EPOCH projects will address some aspects of child safety in vehicles.

For further information, please visit:
<http://www.biomechanics-coordination.eu/site/en/events.php>

CORDIS is the Community Research & Development Information Service

cordis.europa.eu

New service unlocks project information on CORDIS

A new Projects Service, launched on 16 January 2012, will enhance the role of CORDIS. Designed not only to be a comprehensive reference point for project participants, coordinators and stakeholders, the service will also make information and data available to wider audiences.

CORDIS has project records covering a myriad of science, technology and research-related fields and topics. Dating from before 1986 to the present, they relate to not only the Seventh Framework Programme (FP7), but also previous Framework Programmes. The new service will use the breadth of the CORDIS repository as a base to bring together a wide variety of information related to individual projects, including:



- project details such as description, funding, programme;
- project results such as documents, reports, summaries;
- links;
- publications;
- multimedia;
- information and details on project participants.



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