



European  
Commission

# research<sup>eu</sup>

RESULTS MAGAZINE

No 11 April 2012

## In this issue:

### Special features:

Interview: The Balkans — a new approach to an entangled history ■

Through the looking glass:  
search engines, data and the semantic adventure ■

### Other highlights:

Dr Robot, brain surgeon, page 6 ■

Clean energy? Mother Nature still knows best, page 14 ■

Strengthen education to build social cohesion, page 20 ■

Gigabit wireless data coming to your home, car... or flight, page 27 ■

A noiseless, emission-free car?

Europeans are on the right track, page 37 ■

# research\*eu

## RESULTS MAGAZINE

Published by  
CORDIS Unit  
Publications Office of the European Union  
2, rue Mercier  
2985 Luxembourg  
LUXEMBOURG  
E-mail: [cordis-helpdesk@publications.europa.eu](mailto:cordis-helpdesk@publications.europa.eu)

**Editorial coordination**  
Gyn Nilsson

All issues of the *research\*eu results magazine* are available online at:  
<http://cordis.europa.eu/research-eu>

The *research\*eu results magazine* is published by the Publications Office of the European Union, as part of the EU-funded research programmes.  
Content is prepared using several sources, including the Technology Marketplace on CORDIS, the Research Information Centre, as well as original material collected specifically for this publication.

To **subscribe** to either *research\*eu results magazine* or *research\*eu focus*, please go to:  
[http://surveys.publications.europa.eu/formserver/po\\_cordis\\_publications\\_subscription](http://surveys.publications.europa.eu/formserver/po_cordis_publications_subscription)

To **order a single issue** of *research\*eu results magazine* or *research\*eu focus*, please go to:  
EU-bookshop  
<http://bookshop.europa.eu/en/home/>

The technologies presented in this magazine may be covered by intellectual property rights.

### Submitting project results to CORDIS

The European Commission is interested in receiving information on research results and the projects which have produced them.  
For more information, please visit:  
[http://cordis.europa.eu/results/submitting\\_en.html](http://cordis.europa.eu/results/submitting_en.html)

ISSN 1831-9947 (printed version)  
ISSN 1977-4028 (e-book)

© European Union, 2012

Reproduction permitted, provided the source is acknowledged. Neither the Publications Office nor any person acting on its behalf is responsible for the use that may be made of the information contained in this publication or for any errors that may remain in the texts, despite the care taken in preparing them. For reproduction or use of photos and any other artistic material, permission must be sought directly from the copyright holder. Excluded from this constraint are the photos and artistic material owned by the European Union.

'Specials' icon: ©iStockphoto.com/Tom Nulens  
Cover photo:  
©Nathan Holland, JM Travel Photography

Order the issues on EU Bookshop  
<http://bookshop.europa.eu/en/home/>  
You can still order previous issues of *research\*eu results magazine*.



Do you know *research\*eu focus magazine*?

## Entangled webs... and how connections are building the future

Connections, entanglements, networks and webs — these are key to our understanding of the modern world. And it is clear that, whether we are talking about European cooperation or global communications, these links cross the boundaries of countries and nationalities.

This issue of *research\*eu results magazine* looks at two aspects of these connections: a feature on research cooperation in the Balkans and the rest of South-eastern Europe includes an interview on historical links in the region, while a second feature on the semantic web and search technologies covers different aspects of the challenge of making sense of the growing amounts of data and processing power accessible via the Internet.

In our interview, Professor Roumen Daskalov explains his project to re-examine the history of South-eastern Europe from the point of view of connections, rather than isolated national stories. He says, 'there is some positive and integrative value in showing how "entangled" the histories of the present-day Balkan nations and states were and still are.'

In the modern day, links between countries in the region are growing in importance. Other featured articles on this topic cover projects on: alternative energy for the Western Balkans, helping the Balkans study climate and environment, and upgrading Western Balkan research in cellular biology.

The 'IT and telecommunications' section comprises a feature entitled 'Through the looking glass: search engines, data and the semantic adventure'. The articles focus on different aspects of the growth in data and devices connected to the web: from saving ecosystems with open data and e-infrastructures to services and linked data that feed the Future Internet.

We also have our regular biology and medicine section. The top story describes a project that aims to help surgeons with new robotic tools to help precision.

In the energy and transport section we investigate a project that looked at how we can learn from plants' processes of photosynthesis in order to produce and consume energy more efficiently in the future.

Meanwhile, our industrial technologies section features advances in nanotechnology and materials science.

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

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

## TABLE OF CONTENTS

<b>BIOLOGY AND MEDICINE</b>	<b>6</b>
Dr Robot, brain surgeon.....	6
Plant food supplements in the spotlight.....	7
Scientists find link between vascular endothelial growth factor and skin cancer stem cell regulation.....	8
Supercomputers target HIV.....	9
Upgrading Western Balkan research in cellular biology.....	10
Reforming mental health services in the Balkans.....	11
Signals and receptors guiding brain function.....	11
Behind the scenes of viral immunity.....	12
Teaming up to diffuse the effects of stroke.....	12
Healthy interaction for improved health care.....	13
<b>ENERGY AND TRANSPORT</b>	<b>14</b>
Clean energy? Mother Nature still knows best.....	14
Researchers light up Europe with LEDs.....	15
Faster transistors drive better safety and security.....	15
Alternative energy powers the Western Balkans.....	16
Renewing local economies with renewable energy.....	17
Assessing biomass potential in the Balkans.....	18
Bacterial 'recyclation' of waste for energy use.....	18
Redesigning vehicle engines.....	19
<b>ENVIRONMENT AND SOCIETY</b>	<b>20</b>
Strengthen education to build social cohesion.....	20
Interview: a new approach to an entangled history.....	21
Slavic languages to go digital.....	22
Helping the Balkans study climate and environment.....	23
Better thermal management promises cheaper, greener, cooler electronics.....	23
Managing small fry in the Mediterranean.....	24
Facilitating good governance for our future.....	25
The state can help families balance work and home.....	26
Mining quarries with less environmental impact.....	26



## TABLE OF CONTENTS

<b>IT AND TELECOMMUNICATIONS</b>	<b>27</b>
Gigabit wireless data coming to your home, car... or flight.....	27
Graphene and a new dimension .....	28
Extending the potential of the web .....	29
Data mining 3.0 — from info to ‘collective intelligence’ .....	30
Services and linked data feed Future Internet .....	31
Putting knowledge in context to end information overload .....	33
EU project develops advanced data management system .....	34
Multimedia at your fingertips .....	34
Saving ecosystems with open data and e-infrastructure ecosystems .....	35
<b>INDUSTRIAL TECHNOLOGIES</b>	<b>37</b>
A noiseless, emission-free car? Europeans are on the right track.....	37
Cheaper alloy material in the pipeline .....	38
Micro-manufacturing in the spotlight .....	38
Shedding light on material wonders .....	39
Ground-breaking risk assessment of nanomaterials .....	40
Indium nitride: materials for the future .....	40
Minimising complexity and enhancing competitiveness.....	41
Taking the guesswork out of thermoforming.....	41
<b>EVENTS</b>	<b>42</b>

## BIOLOGY AND MEDICINE



© Neuroengineering and Medical Robotics Laboratory, Politecnico di Milano

# Dr Robot, brain surgeon

*EU-funded researchers have invented a robot that will help neurosurgeons to perform some of the most delicate and exacting operations they are called on to undertake on the human brain. The research, involving the complex interaction of precise controls, feedback sensors and machine intelligence, will also have a big impact on robotics for medicine in general.*

In theory, robots are the perfect candidates to assist in brain surgery. They can perform extremely precise manoeuvres, they have prodigious memories and they can 'think' quickly. And, of course, they do not need to have the perspiration wiped from their forehead! They could easily and rapidly increase the number of surgical operations that medical centres can perform.

### If only it were that simple

'Developing a robotic surgical assistant is an extremely challenging task,' said Giancarlo Ferrigno, coordinator of the EU-funded Robocast<sup>1</sup> project. 'The design must factor in a large number of variables and the process demands extreme precision. There is minimal margin for error.'

The Robocast project, which received EUR 3.45 million of its EUR 4.55 million budget from the EU, focused on a particularly precise task, namely robot-assisted keyhole neurosurgery, a technique performed through a very small hole in the skull called a burr hole.

This type of surgery is used for many brain interventions. During an endoscopy, surgeons insert a camera through a keyhole to examine

part of the organ directly, then carry out a biopsy to collect samples of suspect tissue.

The technique can be used to position needles for blood and fluid sampling, as well as cryogenic and electrolytic ablation, which remove tissues using extreme cold or applying an electrical current.

Brachytherapy places a radiation source close to the treatment site while deep brain stimulation (DBS) installs a brain pacemaker.

These techniques have dramatically advanced treatment of tumours, hydrocephalus (a condition whereby fluid builds up in the brain), dystonia (a neurological movement disorder), essential tremor, Parkinson's disease, Tourette's syndrome, clinical depression, phantom limb pain, cluster headache and even epilepsy.

It is a huge and expanding field, but it is also one of the most demanding, requiring high intelligence, extreme dexterity and a very cool nerve.

'Nowadays, neurosurgical procedures are really at the boundary of human capabilities — only new technology can allow surgeons to

overcome [this],' explained Dr Ferrigno. 'Vital functions like sensing, movement, speech and memory can hide within brain tissue that is just a few tenths of a millimetre wide, where damage could lead to permanent injury.'

Developing a reliable, safe and effective robotic assistant could potentially improve safety and would increase the number of operations that could be performed. This will be even more important over the next 20 years, as Europe's population ages rapidly and the incidence of brain disorders rises.

### Mechatronic intelligence

The Robocast team developed both software and hardware. Hardware is called mechatronics in robotics because it comprises mechanical parts and electronic circuits. While the mechatronics makes up the body and nervous system of a robot, the software provides the intelligence.

The complete system consisted of a human-computer interface, with intelligent context-sensitive communication and a haptic, or force feedback, control mechanism. There was also a multiple-robot unit, an autonomous trajectory planner, a high-level controller and a set of field sensors.

## BIOLOGY AND MEDICINE

The mechatronic phase of the project developed a modular system, ensuring a small footprint, in terms of space usage, with two robots and one active bio-mimetic probe. Bio-mimetic systems use biological models to inspire engineering design. The three elements cooperate in an integrated sensory-motor framework to act as a single unit.

The first robot can position its miniature companion robot through six 'Degrees of freedom' (DOF). Degrees of freedom define the directions an object can move in three-dimensional space and six DOF represent the most complete range of movement. In real terms, six DOF means the robot has three linear movements comprising up and down, left to right and backward and forwards; it also has the three rotational movements of tilting forward and backward, side to side, or turning left and right. The robot can combine these movements simultaneously to position its companion at any point in 3D space.

In addition, it can place the miniature companion robot at any point in a surgical theatre. The miniature robot then holds the probe to be introduced through the keyhole. Optical trackers follow both the end of the probe and the patient. The robot can control both the position and the force applied using a combination of sensors.

The Robocast researchers also developed the intelligence side of the robot to be able to define the trajectory of the surgical implementation, a vitally important part of this work. Trajectory is a very tough problem in robotics. Instinctively, the human brain performs the complex calculus required to locate objects in 3D space, and it manages this while the object is moving, literally 'on

the fly', in real time. When a ball is thrown toward us we catch it, usually. It sounds simple but is, in fact, an extremely complicated process.

Robocast developed a control system that can autonomously provide path planning, both outside and inside the patient's body, by analysing preoperative diagnostic information.

The path inside the brain is planned on the basis of a 'risk atlas'. This risk atlas reproduces a fuzzy representation of a brain atlas that relates brain structures to a 'level of danger'. The fuzziness stems from the vast inherent variability of individuals, defining danger in levels from very high to very low. Constructing the atlas relies on cognitive learning, and the system can provide the surgeon with explanations for any suggested action.

The robot can semi-autonomously update the plan in order to adapt to any unforeseen changes that occur during surgery. These updates are based on information gathered and processed during the operation, using technologies such as ultrasonic imaging. The surgeon, of course, retains overall control and responsibility for the operation, and can specify any additional constraints to the path planner.

In this way, the final path plan inside and outside the body stems from the interaction between the surgeon and the intelligent core of the system. The interface between the system and the user requires minimal interaction. But it provides all the necessary information using an intuitive design that uses context-based interpretation of the surgeon's commands.

During a demonstration in February 2011, the Robocast team showed the robot in action, performing an intervention on a dummy in a real operating room. The technology works and the project achieved all of its objectives. Now it needs to be refined and validated for use in a live operating theatre setting.

"The project was hugely challenging, particularly in integrating the work from scientists distributed all over Europe and Israel," noted Dr Ferrigno. "It was like managing an orchestra of extremely high-quality solo players. We overcame this through great coordination and cooperation from all the partners. We also swapped researchers between institutes for weeks at a time, and that helped a lot."

Now a follow-up project, called ACTIVE, will research robotic neurosurgery for patients who are to remain awake during surgery. The bio-mimetic probe also received funding from the European Research Council (ERC) for further development, while the path planner is in use in clinical practice.

It is a major advance in robotic engineering and, thanks to Robocast, it will not be long before medical centres are paging Dr Robot, brain surgeon.

Robocast was coordinated by the Politecnico di Milano in Italy.

- 1 'Robot and sensors integration for computer assisted surgery and therapy'.

Funded under the FP7 specific programme Cooperation sub-programme for 'Information and communication technologies' (ICT).  
<http://cordis.europa.eu/marketplace> > search > offers > 6915

## Plant food supplements in the spotlight

*Natural food does not always mean safe food. EU-funded researchers have discovered that the compounds found in some botanicals and botanical preparations, such as plant food supplements, may be detrimental to our health. Presented in the journal Food and Nutrition Sciences, the study was funded in part by the Plantlibra project<sup>1</sup>, which is backed with nearly EUR 6 million under the EU's Seventh Framework Programme (FP7).*

A past study found that alkenylbenzenes contribute to higher incidences of liver cancer in animals. In their latest study, researchers from Wageningen University in the Netherlands and Università degli Studi di Milano in Italy found that the level of these compounds in

many plant food supplements are so low that they are of no concern. However, some plant food supplements currently available contain alkenylbenzenes at levels comparable to those increasing cancer cases in experimental tests, which suggests that improved regulation

and quality control of such supplements is needed.

Many Europeans use botanicals and botanical preparations such as plant food supplements and, according to researchers, their market volume is growing. To get a better understanding of the

safety of plant food supplements used in the EU, the researchers selected and assessed 30 botanical compounds in plant food supplements that could potentially cause problems with human health. The main concern was to determine how these compounds affect genetic



## BIOLOGY AND MEDICINE

material, and whether or not they are carcinogenic.

Most of these compounds belong either to the alkenylbenzenes group or to the group of pyrrolizidine alkaloids. Regulatory officials recognise how they can impact human health. As a result, the use of pyrrolizidine alkaloid-containing botanicals in food and plant food supplements is prohibited in most EU Member States for precautionary health protection

reasons. The alkenylbenzenes estragole, methyleugenol, safrole or beta-asarone used as flavouring agents in food are also banned within the EU, but no restrictions have yet been enforced regarding the presence of alkenylbenzenes in plant food supplements.

The team assessed various plant food supplements containing basil, fennel, nutmeg, saffras, cinnamon or calamus, or their essential oils as the main

ingredient. According to the researchers, some of these products contain relatively high levels of alkenylbenzenes. The use of such plant food supplements could adversely affect human health, they suggest, adding that it is important that risk management actions be implemented.

The researchers noted that while more research is needed, better regulation and quality control of plant food supplements

containing alkenylbenzenes is also required.

1 'Plant food supplements: levels of intake, benefit and risk assessment'.

Funded under the FP7 specific programme Cooperation under the theme 'Food, agriculture and fisheries, and biotechnology' (KBBE). Promoted through the Research Information Centre. <http://ec.europa.eu/research/infocentre/search/23813>

## Scientists find link between vascular endothelial growth factor and skin cancer stem cell regulation

*Identifying how cancer stem cells and tumour growth are regulated is one of the biggest challenges facing oncology scientists. Researchers in Belgium, in cooperation with German colleagues, have recently shed new light on how vascular endothelial growth factor (VEGF) is instrumental in regulating skin cancer stem cells. The study, presented in the journal Nature, was funded in part by a European Research Council (ERC) Starting Grant of EUR 1.6 million under the EU's Seventh Framework Programme (FP7) to support the Cancerstem<sup>1</sup> project. The findings reveal a dual role for the VEGF molecule in the promotion of skin cancer stem cell growth and tumour progression, which may have significant implications for the prevention and treatment of various skin cancers.*



© Lisa S. Shutterstock

Results from past studies suggested that skin squamous cell carcinomas contain specific cancer cells, so-called 'cancer stem cells', which show a stronger potential to self-renew and contribute to tumour growth. However, information about the precise mechanisms that regulate cancer stem cell functions has been lacking... until now.

Scientists led by the Institut de Recherche Interdisciplinaire en Biologie Humaine et Moléculaire (IRIBHM) at the Université libre de Bruxelles in Belgium have identified a new connection between skin cancer stem cells growth and VEGF.

Dr Benjamin Beck at IRIBHM and his colleagues discovered that VEGF, a molecule that normally

promotes new blood vessel formation, is expressed at high levels by skin cancer stem cells. The team genetically removed the expression of VEGF by tumour cells, and discovered that skin cancer stem cells were quickly lost due to a defect in their renewable properties. This in turn triggered tumour regression.

Dr Beck, lead author of the study, acknowledges: 'It was extremely exciting to see the complete disappearance of these tumours only two weeks after the treatment.'

The receptor which binds VEGF, called Neuropilin-1, is also highly expressed by skin cancer stem cells, and is also required to promote cancer stem cell renewal and tumour growth, according to the researchers. They discovered that the Neuropilin-1 receptor plays a critical role during both cancer initiation and tumour growth.

The team says that while VEGF signalling in endothelial cells is needed indirectly by tumours to maintain the tumour's blood supply, its production and signalling in cancer stem cells also directly promotes cancer stem cell renewal and tumour growth.

'Anti-VEGF therapies are currently used to treat cancers,' explains Dr Cédric Blanpain of IRIBHM, the senior author of the study. 'These new results have important implications for the prevention and treatment of different epithelial cancers, as new therapies blocking VEGF and/or Neuropilin 1 functions in cancer cells may be more effective for the treatment of certain cancers compared to the therapeutic strategies blocking VEGF function only in endothelial cells.'

Experts from the Flanders Institute for Biotechnology (VIB), Ghent University and the Vesalius Research Centre in Belgium, as well as the Medical Clinic and Institute of Tumor Biology in Germany contributed to this study which was coordinated by the Université libre de Bruxelles in Belgium.

1 'Stem cells in epithelial cancer initiation and growth'.

Funded under the FP7 specific programme Ideas by the European Research Council. Promoted through the Research Information Centre. <http://ec.europa.eu/research/infocentre/search/23313>



## Supercomputers target HIV

*A world-class supercomputing infrastructure, developed by EU-funded scientists, has enabled new insights into HIV research. It provides the processing power necessary to study the molecular mechanics of the virus and its interactions with drugs.*



© iereston, Shutterstock

This is vital research. AIDS has killed more than 25 million people between 1981 — when it was first recognised — and 2005, making it one of the most destructive pandemics in recorded history.

Medical science urgently needs to find new approaches to tackle the virus, but the research is very challenging. The DEISA infrastructure, supported by the DEISA2<sup>1</sup> project, has helped researchers in developing molecular simulations of HIV mechanics.

Over the course of five years and two projects, DEISA linked Europe's most powerful supercomputers via a network, and developed software that made it easy for researchers to access and use their massive processing power. The project teams also developed support services to ensure researchers can get the greatest benefit from the available equipment.

In the course of their work, they set up the 'DEISA extreme

computing initiative' (DECI) to support leading-edge scientific research in Europe — research that would benefit from the enormous computing power DEISA has made available.

Researchers at the RNAHIV project, for example, used the infrastructure to seek a better understanding about how drug molecules bind to ribonucleic acid. RNA is one of the molecules that form the basis for all life on the planet — along with deoxyribonucleic acid (DNA) and proteins — and it directs the creation of proteins. But most anti-HIV drugs target viral proteins rather than viral RNA. As a result, they can fail because the virus develops drug resistance.

There is still a lack of knowledge about how HIV RNA interacts with human cellular proteins to enhance the viral transcription, an important step in viral replication. Attempting to inhibit such interaction could lead to more promising anti-HIV drugs and make an

important impact in the field of drug design.

To tackle diseases such as HIV, drugs must be developed that bind to a specific region of viral RNA, called the 'trans-activating response' (TAR) region. However, the problem is that standard computational approaches are simply not very good at predicting accurately how or where drug molecules will attach to RNA. Normal drug design tools struggle to do this.

'But by focusing on the physics that governs the interactions that occur when molecules bind to each other, we were gaining good insights that might help in the development of RNA-based drugs,' explains Paolo Carloni, coordinator of the RNAHIV project and professor of Computational Biophysics at the German Research School for Simulation Sciences, a joint graduate school of RWTH Aachen University and Forschungszentrum Jülich (FZJ), Germany.

The RNAHIV project began in 2008 and was completed in 2010. It gathered researchers from around the world, including the SISSA/ISAS in Trieste Italy, ETH Zurich in Switzerland, the University of Washington in the USA, and the University of Ho Chi Minh City in Vietnam.

Over the course of 24 months, the experts sought to simulate the dynamics of the binding mechanism between HIV and RNA. But studying these interactions is a big problem computationally. 'We were dealing with several thousand atoms and, in order to carry out simulations, you have to know where each goes and be able to follow its motion,' explains Dr Carloni. 'This requires a lot of computer power!'

Although these extremely complex simulations are very challenging, Dr Carloni believes this method provides a much more rigorous description of the process by which the drug binds to the RNA. 'In conventional drug design, you end up only with a prediction of where the drug

binds, but you don't learn anything about the way that the drug molecule travels to the RNA and latches on to it,' he notes.

### Exciting new approach

Dr Carloni stresses that this is very useful research. 'It not only suggests a new way to design drugs, but the methods we have developed can be applied to the study of any kind of reaction between proteins and DNA or between proteins and RNA. Those types of reactions take place in an enormous number of cell processes.'

It was an exciting project, he stresses, because it really brings together physics and medicine to solve a very challenging problem. Their work involved a three-step process. The researchers began by drawing on their theoretical knowledge of biophysics to predict how the RNA and drug would interact, and they used spectroscopy techniques in an experimental phase to test whether their predictions were correct. The spectroscopy data was then used to inform the simulations of the molecular dynamics.

The computing time provided by EU-funded DEISA played a vital role in the success of the RNAHIV project. Computations of the RNAHIV research were performed on the Cray XT4/XT5 system at the IT Centre for Science in Finland. There were three independent runs, each using up to 256 CPU cores. About 250 000 CPU hours were invested into the core of the production simulations, and the hardware was complemented by software support.

'But DEISA has done more than just provide access to supercomputers. By supporting projects, such as RNAHIV, DEISA has also opened up opportunities to use supercomputers in other projects related to human health. And by making it possible for scientists from a developing country, like Vietnam, to participate, DEISA has spread the benefits still further,' says Dr Carloni.



## BIOLOGY AND MEDICINE

'Carrying out experimental research is difficult for our Vietnamese collaborators, but with computers they can work remotely. In our case, DEISA provided a wonderful opportunity for Vietnamese researchers to enter into the exciting field of RNA drug design, and to be able to take the knowledge back home,' he continues.

RNAHIV was not the only HIV research project to benefit from DEISA's expertise and power. The EU-funded 'Virtual laboratory' (ViroLab) project also used DEISA to run computationally expensive molecular dynamics simulations.

A big challenge with the HIV virus is the variety of strains associated with the disease. Some strains are more resistant to one drug, but more susceptible to another. ViroLab supports the decision-making process of doctors treating patients with HIV. The treating

physician starts by analysing the HIV viral sequence infecting their patient. Once the analysis is complete, the doctors receive a selection of appropriate drugs.

ViroLab automatically retrieves data from a variety of sources. It finds the resistance rules provided by the commonly used HIV drug-resistance interpretation systems through drug-ranking databases like Rega, HIVdb and ANRS. Meanwhile, anonymous patient data comes from participating hospitals, while the literature related to the particular strain of HIV is extracted from the US National Library of Medicine.

As part of ViroLab's work, the project also developed and published a study validating their 'Binding affinity calculator' (BAC) tool, which helps determine which drugs would be more effective and which would be more resistant.

By using DEISA-powered simulations, the ViroLab project acquired atomic-level insight into molecular-level interactions between a strain of HIV virus and particular drugs. This allowed the project to probe how resistance-associated mutations interact with one another and cause changes in drug binding. This type of research could be used to assess the existing rules used to select drugs. But even more promising is the work's potential impact on future drug design.

RNAHIV and ViroLab are just two projects in the life sciences sector that have been helped by the supercomputing hardware, software, support and expertise provided by DEISA2.

DEISA2 was funded to the tune of EUR 10.24 million (of a total project budget of EUR 18.65 million) under the EU's Seventh Framework Programme for

research (FP7), 'e-Science grid infrastructures' sub-programme.

The coordinator of the RNAHIV project was based at the German Research School for Simulation Sciences, a joint graduate school of RWTH Aachen University and Forschungszentrum Jülich (FZJ), Germany.

DEISA2 was coordinated by the Max Planck Gesellschaft zur Förderung der Wissenschaften in Germany.

1 'Distributed European infrastructure for supercomputing applications 2'

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7048



## Upgrading Western Balkan research in cellular biology

*Laser-scanning confocal microscopy (LSCM) is a method of scanning many thin sections of a given thick sample, such as tissue from living organisms, and reconstructing a very clear three-dimensional (3D) image of it. A laser is used as the light source, enabling highly specific depth focus which is not possible with conventional light microscopes that only allow the user to 'see' as deep as the light penetrates the specimen.*

LSCM is used widely in the biological sciences and particularly in cell biology. The Institute for Physiology and Biochemistry (IPB), School of Biology, University of Belgrade developed the Neuroimage<sup>1</sup> project in its centre for laser microscopy to improve the capacity of its research centre and that of the Western Balkans in general.

Strengthening both facilities and personnel in the Balkans involved in neuroanatomy and neurophysiology research is an important step in integrating the Western Balkans into the European Research Area (ERA) centres and the European neuroscience arena.

As such, EU funding for the project was used to upgrade

the basic confocal microscopy facility with an advanced laser and high magnification objectives. In addition, to complement the microscopy capacity, the researchers also designed and implemented an electrophysiology set-up and included software for physiology time-series measurements.

The Neuroimage project researchers at IPB are experts in the field of cellular neurophysiology. Together with colleagues at the Western Balkan partner centre, the Croatian Institute for Brain Research (CIBR) in Zagreb, who offer complementary neuroanatomy expertise, the researchers are now well positioned to bring significant advances to the field of neuroimaging.



© paul prescott, Shutterstock

This project provided funding for three postdocs and two PhD students for the new PhD programme in neuroscience. In addition, the grant enabled numerous professional development and knowledge-sharing opportunities, including several workshops and a training programme in neuroimaging and complementary techniques.

To summarise, the Neuroimage project enabled significant technological enhancements to the research centre at IPB related

to LSCM, alongside professional development for a number of young Western Balkan researchers in the field of cell biology. The project was coordinated by the Faculty of Biology at the University of Belgrade in Serbia.

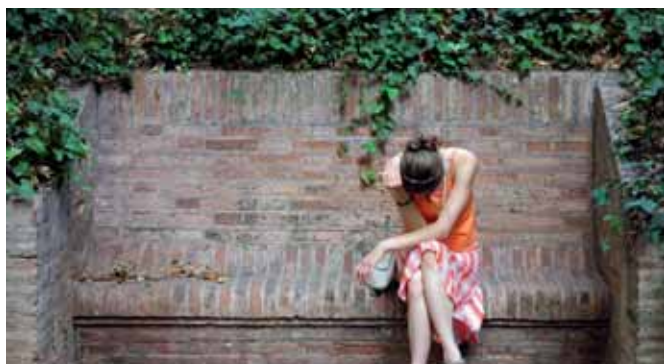
1 'Reinforcing a centre for laser microscopy and cell profiling for regional networking'.

Funded under the FP6 specific programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7758



## Reforming mental health services in the Balkans

*In cooperation with international initiatives, in the last decade or so Bosnia and Herzegovina has carried out a major overhaul of its mental health care system. However, the further development of services in the region of the Western Balkan countries calls for high-quality mental-health-reform research.*



© Thinkstock

Towards this end, the Evidence<sup>1</sup> project established and developed a research unit at the Psychiatry Department of the Clinical Center University of Sarajevo (KCUS). Project partners recognised the potential of the department to consolidate the region's sustainable research

expertise and access health care and social services networks for carrying out related research.

Against this backdrop, Evidence worked to gather the critical mass of local academic expertise needed and develop the long-term infrastructure

for conducting pertinent research. As such, the initiative laid the groundwork for strengthening the research capacities and evaluation of mental health services in Bosnia and Herzegovina.

Networking efforts proved successful for setting up group and individual links for research focusing on the evaluation of mental health services. The latter was carried out at the Psychiatry Department of Sarajevo University. Within the framework of the Evidence project, the MNH Services Research Network conducted studies related to primary data analysis, the efficacy of psycho education for treating patients with unipolar depression, effectiveness of mental health interventions for patients with depression, and routine data gathering.

Project outcomes and the research produced succeeded in raising the awareness of professionals regarding the importance of research into

mental health services, especially in the context of social and economic disruption. Evidence also raised awareness of available services for mental health problems and their efficacy related to populations at risk. This spurred efforts to decrease the risk of stigma for those seeking mental health services. Dissemination activities also contributed to the project's success, and ongoing research and information sharing will work to support the development of health and welfare policy in the region.

The project was coordinated by the Department of Psychiatry at the University of Sarajevo in Bosnia and Herzegovina.

- 1 Strengthening research capacities and evaluation of mental health services in Bosnia and Herzegovina<sup>1</sup>.

Funded under the FP6 specific programme 'International cooperation'.  
[http://cordis.europa.eu/marketplace > search > offers > 8140](http://cordis.europa.eu/marketplace/search)

## Signals and receptors guiding brain function

*Communication between cells in the brain involves glutamate receptors. European scientists dissected the mechanism that controls proper localisation of glutamate receptors in the hippocampus.*

Signal transmission in the brain occurs mainly through transmembrane receptor proteins which interact at synapses through the release of the neurotransmitter glutamate. Kainate receptors (KARs) fall in the category of excitatory glutamate receptors and appear to be involved in synaptic integration, plasticity and neurotransmitter release. These functions require proper localisation of receptors in neurons and interaction with cytoplasmic and extra-cellular proteins.

Seeking to dissect the mechanism of KAR localisation, the EU-funded Kartraf<sup>1</sup> project used an animal model that lacked glutamate receptor 6 (GluR6). Scientists showed that by re-expressing the alpha component of the GluR6 receptor, the current activity in the

mossy fibre hippocampal synapses was restored to wild-type levels.

To further delineate the molecular interactions responsible for GluR6 synapses, a number of receptor mutants were used and the KAR-mediated current was measured by electrophysiological techniques. It was found that the last 29 amino acids of the GluR6 receptor were required for proper synaptic localisation. In addition, experiments with a mutant lacking the anchoring PDZ domain — the amino-acid domain shared by the 'Post-synaptic density protein' (PSD95), 'Drosophila disc large tumor suppressor' (Dlg1), and 'Zonula occludens-1 protein' (zo-1) — showed that proteins interacting with this domain were dispensable for correct KAR localisation at synapses. Further



© Levent Konuk, Shutterstock

insight into the mechanism of KAR targeting regulation indicated that the N-cadherin/b-catenin adhesion complex played an important role in the process.

Overall, the Kartraf project provided novel insight into the mechanism regulating KAR localisation at the hippocampal synapses. The project findings contribute to a better understanding of hippocampal signal transmission and the role of Kainate receptors in brain function.

The project was coordinated by the Université Victor Segalen Bordeaux II in France.

- 1 'Synaptic trafficking of Kainate receptors in Hippocampal CA3 pyramidal cells *in vivo*'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
[http://cordis.europa.eu/marketplace > search > offers > 7712](http://cordis.europa.eu/marketplace/search)



## BIOLOGY AND MEDICINE

### Behind the scenes of viral immunity

*Innate immunity constitutes the second line of defence against pathogens. European scientists aimed to further understand the process of viral recognition by the innate immune system by studying toll-like receptors and their ligands.*

Toll-like receptors (TLRs) are membrane-bound receptor proteins that recognise molecular patterns of certain infectious agents. They represent the first line of innate immunity against invading pathogens. TLRs binding to bacterial molecules are localised on the cell membrane, while those that bind foreign nucleic acids are found in the cellular endosomes. Upon binding, intracellular signalling cascades trigger the activation of transcription factors that initiate the expression of host defence mechanisms. So far, 10 human receptors have been identified, but it is believed that more receptors and ligands exist.

Aiming to broaden understanding on the mechanisms of TLR action,

the EU-funded Tollicor<sup>1</sup> project set out to identify novel interactors of endosomal TLRs. Following an interdisciplinary strategy with molecular and cell biology techniques, receptor complexes were analysed and putative novel interactors of endosomal TLRs were selected.

The CD14 molecule was found to interact with endosomal TLRs and to promote signalling by secretion of pro-inflammatory cytokines. Delineation of the mechanism indicated that CD14 was required for efficient uptake of foreign DNA but not of bacteria and viruses. In addition, soluble recombinant CD14 protein was shown to enhance endosomal TLR activation and a monoclonal antibody to block such a response.



© Bonk, Shutterstock

Overall, the dual role of CD14 in nucleic acid uptake and as endosomal TLR co-receptor is of significant interest for the scientific and medical community. Autoimmune diseases, cancer and vaccination are closely linked to TLRs and will benefit from the findings of the Tollicor project. Tuning of CD14 activity may prove a useful approach to treating immune-response related diseases.

The project was coordinated by the Forschungszentrum fuer

Molekulare Medizin GmbH (CEMM) in Austria.

1 'Dissecting pathogen recognition complexes of toll-like receptors: hunting for new co-receptors and ligands'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace>search>offers>7704>

### Teaming up to diffuse the effects of stroke

*A group of European scientists is taking a new approach to resolving stroke-related problems. Knowledge generated by this project aims to improve prevention and treatment strategies for the benefit of both individuals and society.*



© Imagegami, Shutterstock

The Eustroke<sup>1</sup> project brought together researchers, government, industry, the non-profit sector and patient group associations to tackle the physical, social and economic consequences of stroke. The strength of the network is based on its multidisciplinary research programme, high-quality training for European scientists and clinicians, and promotion of national and global partnerships.

The EU-funded initiative has already made headway in improving understanding of the neurovascular unit (NVU) for enhanced stroke-prevention strategies and treatment. Achievements in this area are being advanced by promoting the integration of clinical and experimental research teams

in cerebrovascular biology, imaging, prevention and reperfusion.

Eustroke combined resources with the 'Affording recovery in stroke' (ARISE) project, to form the European Stroke Network (ESN). This association resulted in joint meetings and research themes, mutual training workshops, a joint scientific advisory board and new research partnerships. Network co-operation includes the ESN Clinical Trial Platform, which integrates the world's largest stroke treatment network, Safe Implementation of Treatments for Stroke (SITS).

To date, project partners have designed a novel in-vitro three-cell model of the NVU. This has proved useful for understanding the role of the extracellular matrix in NVU



## BIOLOGY AND MEDICINE

maintenance and oedema formation in stroke. Preliminary results of experimental studies indicate that mesoangioblasts are best for inducing neoangiogenesis and the recovery of ischaemic tissue. Project partners are developing early adjunct therapies aimed at developing safer use of thrombolytic agents and stabilising the NVU for thrombolytic treatment.

The use of preclinical imaging studies offers a better understanding

of the role of the NVU in stroke pathophysiology. Among others, magnetic resonance imaging (MRI) methods for the quantitative assessment of cerebral blood flow, microvessel density, and blood-brain barrier permeability have been developed.

Project activities have also contributed to the realisation of an adapted SITS network and database for support of the ESN trial platform. The third generation of

the SITS database allows for implementation of randomised trials and permits infinite protocols.

The Eustroke project's new approach to brain angiogenesis is challenging traditional concepts of stroke pathophysiology, with ongoing efforts aimed at ultimately solving health problems brought on by stroke.

The project was coordinated by the Department of Neurology at

the Ruprecht-Karls-Universität Heidelberg in Germany.

1 'European stroke research network'.

For further information, please consult  
<http://www.europanstrokekenetwork.eu>  
 Funded under the FP7 specific programme  
 People  
 (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 6680

## Healthy interaction for improved health care

*Social scientists and non-academics traversed the boundaries of their disciplines to exchange knowledge and experiences in health and medicine. The results of this initiative stand to impact policy on emerging technologies, home health care and patient organisations.*



© LeventeCoyu, Shutterstock

The Meduse<sup>1</sup> project worked to initiate dialogue between social scientists and non-academic actors in the areas of medicine and health. Professionals, patient organisations, decision-makers and policy-makers were the main actors in the second group.

The EU-funded project focused on three issues of policy relevance identified by the Fifth Framework

Programme's (FP5) 'Identifying trends in European medical space: contribution of social and human sciences' (ITEMS) thematic network. These were the dynamics of European patient organisations, emerging new technologies and responsibilities for home health care in the context of European systems and cultures, and cross-national and European perspectives on health-safety agencies.

Meduse approached its objectives through the organisation of three conferences, one for each issue. Between 60 and 80 participants allowed for diversified representation, experiences and points of view, as well as easier exchanges among the delegates, which included both target groups.

Exchanges centred on questions relevant to the scientific

and political agenda, knowledge needed to address these questions, and the partnership modalities between social scientists and non-academic actors best suited for producing the required knowledge.

To make the exchanges as inclusive and participative as possible, participants were split into three random groups for discussions following the plenary presentations of papers on each theme. Group facilitators ensured discussions stayed on topic, and respondents provided a verbal summary at the close of each session on which participants could comment. This set-up made it possible for all participants to meet and enabled widespread sharing of ideas for greater impact.

The project was coordinated by the 'Association pour la recherche et le développement des méthodes et processus industriels' in France.

1 'Governance, health and medicine. Opening dialog between social scientists and users'.

Funded under the FP6 specific programme  
 'Citizens and governance in a knowledge-based society'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 7769

## ENERGY AND TRANSPORT



© dinadesign, Shutterstock

## Clean energy? Mother Nature still knows best

*As concerns about securing clean energy grow across the world at large, researchers continue their efforts to find the most abundant supply of energy available to us. Most experts have turned to sunlight to meet their objective. The challenge, however, is to determine how best to capture, transfer and store solar energy efficiently. Now, an international team of researchers has discovered that the complex systems at work in nature could be the answer to this problem. Presented in the journal Nature Chemistry, their study puts the spotlight on natural antenna complexes. Their research was funded in part by the Photprot<sup>1</sup> project, which has secured a European Research Council (ERC) grant of EUR 2.86 million under the EU's Seventh Framework Programme (FP7).*

Following their assessment of studies probing natural sunlight-harvesting antenna complexes in plants and microorganisms, scientists in Canada, the Netherlands, the United Kingdom and the United States have compiled the information they found into a guide for researchers and engineers that design future solar energy technologies. By looking at natural photosynthesis, the team provides insight into how human-made molecular energy circuits can be developed to capture, regulate, amplify and direct raw solar energy.

With this information in hand, experts could effectively plug into the plentiful sunlight that is available, later convert and store its energy, and then transfer this power over many distances — all this is possible within the arrays of microscopic energy grids.

'More than 10 million billion photons of light strike a leaf each second,' the Digital Journal quoted Dr Greg Scholes, a chemist from the Department of Chemistry at the University of Toronto in Canada, as saying. 'Of these, almost every red-coloured photon is captured by chlorophyll pigments which feed plant growth.'

One of the challenges is to route the energy from sunlight that is captured and stored for only a billionth of a second by chromophores, what experts define as coloured dye or pigment molecules, before it is lost.

The researchers say that despite the fact that experts have been investigating photosynthesis for over a century, replicating the design principles involved in this complex natural process will be possible if changes are implemented in how existing chemical synthesis procedures are carried out. Novel approaches are needed to mimic the way nature's chromophores are arranged and how natural molecular excitation energy is tuned to optimise light harvesting within solar antenna complexes in leaves and algae. They add that electronic excitation transport in nature is probably the biggest chemical dynamics challenge.

The results of their work can lead to a framework for the design and synthesis of working molecular-scale artificial photosynthesising antenna units and systems. Engineering artificial chromophores with large absorption

capacity, arranging these pigment molecules in optimal patterns on the antennae and benefiting from the collective properties of the light-absorbing molecules are key, the researchers say.

'Solar energy is forecasted to provide a significant fraction of the world's energy needs over the next century, as sunlight is the most abundant source of energy we have at our disposal,' said co-author Graham Fleming of the University of California, Berkeley in the United States, quoted in the Digital Journal. 'However, to utilise solar energy harvested from sunlight efficiently we must understand and improve both the effective capture of photons and the transfer of electronic excitation energy.'

1 'The dynamic protein matrix in photosynthesis: from disorder to life'.

Funded under the FP7 specific programme Ideas by the European Research Council.  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 23075

## Researchers light up Europe with LEDs

*Novel light-source technology has just been given a big boost in Europe thanks to the OLED100.eu<sup>1</sup> project which tackled the challenge to develop the techniques needed to form the basis for efficient 'Organic light-emitting diode' (OLED) applications for the European general lighting industry. Backed with EUR 12.5 million under the 'Information and communication technologies' theme of the EU's Seventh Framework Programme (FP7), the OLED100.eu project partners have successfully increased the energy efficiency and lifetime of organic LEDs for large-area lighting applications.*



© tarcas, Shutterstock

Led by Philips Technologie GmbH in Germany, the OLED100.eu team has been working on OLEDs for the last three years. Over this 36-month period, the researchers resolved technical quirks and probed the acceptance levels and preferences of end-users concerning this new lighting technology. They also developed a large-area OLED luminaire consisting of nine OLED tiles of 33 x 33 square centimetres (cm<sup>2</sup>) each.

The aims and objectives of the study were to boost the luminous efficacy, strengthen the lifetime, upscale the light-emitting area, optimise

processes to slash production costs, and standardise measurement based on application research.

The OLED100.eu team succeeded in demonstrating high-efficiency OLEDs based on Novaled PIN OLED technology and out-coupling materials showing 60 lumens per watt (lm/W) which are more efficient than energy-saving lamps. They also secured long-lifetime OLEDs with Novaled know-how, showing 100 000 hours comparable to inorganic LED lifetime. The researchers performed perception case studies on taste and acceptance of OLEDs as a light source, and they

carried out industrialisation scenarios and cost calculation of production processes with a particular focus on cost-efficient technologies like screen-printing for substrate structuring. They also succeeded in devising standardisation of measurement procedures for OLEDs, which currently serve as the basis for work of the International Commission on Illumination (CIE).

'The OLED100.eu research consortium has played a vital part in ensuring that Europe will play a leading role in OLED technology for lighting applications also in the future,' says Dr Stefan Grabowski, senior scientist at Philips Research Laboratories in Aachen.

Commenting on the results of the project, Dr Karsten Diekmann of OSRAM GmbH in Germany says: 'The results of OLED100.eu will contribute to further increase the acceptance of OLED technology. In the project, we gained a better understanding of end-user preferences, a better comparability through standardised measurement procedures, and better OLEDs.'

For his part, Dr Christian May, the head of Business Unit OLED Lighting notes: 'The work to achieve the challenging goals of the OLED100.eu project

brought us to a higher level of our COMEDD pilot process line. We are really proud of the 33 x 33 cm<sup>2</sup> large OLED panels, which are one of the largest worldwide and made at our pilot process line.'

OLEDs convert current into light, but are different from inorganic LEDs because they emit light over a large area. The thickness of the light-emitting area is just around 400 nanometres, which is about 100 times thinner than a human hair.

The OLED100.eu partners are from Belgium, Germany, France, the Netherlands, Austria and the United Kingdom.

1 'Organic light-emitting diode lighting in European dimensions'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'. Promoted through the Research Information Centre. <http://ec.europa.eu/research/infocentre> > search > 23573

## Faster transistors drive better safety and security



© JurfotoStudio, Shutterstock

*Imagine being able to switch your car to 'autopilot' and not having to worry about collisions. EU-funded researchers are working on new technologies, such as longer-range car radar, which could make such idle dreams possible. And the early results are already in commercial production.*

But such applications need to use higher radio-frequency electronics than ever before, and they therefore rely on the development of new, faster microchips in order to work. The EU-funded DotFive<sup>1</sup> project has developed faster transistors that will lay the foundations for these new technologies.

Increasing the running speed of microelectronics can open up new application areas: high-speed wireless communications, car-collision avoidance or high-definition non-invasive imaging for security scanners. But microcircuits that can operate at over 100GHz, necessary to implement these





## ENERGY AND TRANSPORT

new products, demand performance of three times this speed at transistor level.

This is where the three-year DotFive project comes in, with the goal of designing 'Hetero-junction bipolar transistors' (HBTs) that could reach 500GHz (or 0.5THz). The challenge was to double the frequency compared to the state of the art at the submission of the project.

'And we did reach those numbers!' says the project coordinator Gilles Thomas of STMicroelectronics, France.

The project consortium included four technology providers: two companies, Infineon and STMicroelectronics, and two research institutes. All partners made substantial progress; the two research institutes have produced transistors running at the target speed, with Germany's IHP Microelectronics GmbH getting the best results so far.

The DotFive team tried more than one approach to the problem: one of the project's work packages tried to build on existing architectures, while another attempted 'breakthrough' architectures. As Mr Thomas explains: 'The architecture that did best is the one that minimises most of the "parasitic effects" in the transistor (such as capacitances, resistances and access resistance) and shows the best "self-alignment" of base, emitter and collector.'

### Working together

One of the key successes of the project was therefore getting all the partners aligned on using the same methodology, electrical characterisation technique and modelling

techniques so that the results were comparable among the project participants.

'In order to operate at these speeds, we had to understand factors never encountered before, as well as the physics of their effects,' explains Mr Thomas. 'This could not be done without collaboration.'

The kind of technology development carried out by DotFive is pre-competitive, he continues. The teams shared their 'Computer aided design' (CAD) platforms, measurement techniques, model parameters and some data processing.

Just as when the GSM standard for mobile phones was agreed, even if companies involved in a new technology are in competition with each other at the product level, they still need to collaborate to develop and agree the basic technology and standards.

Europe is the leading producer of this type of technology, according to Mr Thomas. 'We established the roadmap for radio frequency (RF) technology, so we'd better cooperate to maintain our lead.'

This is one reason why the EU contributed funding of EUR 9.7 million towards an overall project budget of EUR 14.74 million. 'In order to produce the products that will enlarge the market five years down the road, we need to talk to each other today,' he suggests.

### Results in commercial production

'In terms of commercialisation,' notes Mr Thomas, 'we wanted to

complete three cycles of learning — with incremental improvement of the design, process and tools — over the three years of the project.'

The results from the first year's cycle are already embedded in the circuit designs in preparation, with an increase in circuit speeds from 77GHz to 120GHz.

'We are now in the qualifying stage of the results of the third cycle,' says Mr Thomas, with radar demos running at 140GHz.

'Car radars have moved into a new generation thanks to this project,' he says. In addition to the 77GHz band allocated by international standards, the project expects a new 120GHz band to be opened up for longer-range radar.

'We would also like to develop imaging systems using millimetre waves,' he continues. These lie above the 100GHz range, between microwaves and infra-red radiation. Such imaging systems could contribute to public safety by improving security scanners.

'Currently, such systems exist but they are expensive, bulky and use a lot of electricity,' Mr Thomas explains, as they are built from discrete components not microcircuits. And because they don't use integrated components, they cannot be assembled into large arrays, meaning their resolution remains poor.

'For scanners, if we can succeed with the miniaturisation and integration of our new high-speed components on silicon,' says Mr Thomas,

'it will be like moving from 1950s computers, which filled an air-conditioned room, to PCs.'

The different project partners are now taking various routes to market with their products. Having established the basic technologies, the work is moving from pure research towards commercial development.

'We have now begun a new project, funded by the Eureka programme's Catrene cluster on microelectronics, to develop a BiCMOS technology based on 500GHz HBTs plus digital CMOS for industrial production,' says Mr Thomas.

These would be able to integrate the RF components with the digital-image processing on the same chip. Such revolutionary microcircuits may well contribute to continuing European success in these markets, as well as changing our lives through radically new applications.

DotFive was funded by the EU's Seventh Framework Programme (FP7), under the ICT sub-programme and budget line for 'Next-generation nanoelectronics components and electronics integration'.

The project was coordinated by STMicroelectronics, France.

1 'Towards 0.5 Terahertz Silicon/ Germanium hetero-junction bipolar technology'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7112



## Alternative energy powers the Western Balkans

*New proposals for different kinds of clean energy may soon be put into action, making energy production in the Western Balkans more efficient and ecologically sound.*

Energy-production systems in the Western Balkans are often outdated and too centralised to be efficient. The EU-funded project ADEG<sup>1</sup> promoted better solutions based on hybrid systems and 'renewable energy sources' (RES).

The project aimed to outline the potential for renewable energy systems in the region and articulate a model for identifying solutions in different areas. It also investigated different concepts in energy-generation





## ENERGY AND TRANSPORT

systems and how they could be integrated to produce more efficient and more ecologically friendly power.

In its research, ADEG focused on Bosnia and Herzegovina, Croatia, Serbia and Montenegro, with parts of the project pertaining to Albania and the Former Yugoslav Republic of Macedonia (FYROM) as well. It looked at solar energy, wind energy, co-generation technologies, small hydro plants, hydrogen (H<sub>2</sub>) production, fuel-cell applications and hybrid

systems related to these different options. The project outlined the potential and availability of renewable energy sources and then investigated considerations and technological barriers in line with local needs and realities.

ADEG proposed an energy model that balances water, electricity and hydrogen demand which addresses storage and supply while considering heat demand and biomass energy supply. Biomass combustion, gasification and co-firing were considered for

different types of facilities, while agricultural waste was examined for biomass utilisation. The project conducted successful experiments in biomass combustion, co-combustion and gasification, which also yielded important results.

In short, the project team succeeded in advancing the use of renewable energy in decentralised systems to increase power production and outline solutions for reliable low-cost energy generation for standalone grids.

The project was coordinated by the National Technical University of Athens in Greece.

1 'Advanced decentralised energy generation systems in Western Balkans'.

Funded under the FP6 programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace> >  
search > offers > 8164



## Renewing local economies with renewable energy

*A recent effort in the Western Balkans has demonstrated that 'renewable energy sources' (RES) can renew local economies as well as help reduce carbon emissions.*

Conditions for the uptake of RES in the Western Balkans have not been ideal with many of its nations having faced internal conflict in recent years. Yet the need for RES is stronger than ever as several remote areas in the region, including islands, do not have access to national electricity grids.

The EU-funded RISE<sup>1</sup> project initiated a collaboration between industry and science that

included participants from the Western Balkans and several EU Member States. The aim of RISE was simple — to investigate how RES could be exploited to bring a sustainable supply of energy to the inhabitants of these remote areas without breaking the bank.

Rather than rely on estimates found in the literature, actual data regarding sunshine, wind and types and amounts of

biomass were collected on the ground. Detailed maps of solar, wind and biomass potential were then constructed. These maps were also enriched with other important information such as potential 'greenhouse gas' (GHG) emission reductions, distance to the national electricity grid, etc.

One of the RISE case studies revealed cost as a barrier to infiltration of solar panel technology. Since investment is an important part of the RES puzzle, a decision support tool called RISE-DSS was created to provide insight into the financial performance of the

various RES technologies depending on the region. Additional software also helps match potential energy supply from RES with demand while taking features such as energy storage needs into account.

In addition, a novel wastewater treatment concept was developed during RISE that addresses both water management needs and energy production. The 'anaerobic-aerobic granular system' (AAGS) can purify municipal as well as industrial wastewater while producing biogas that can be fed to a 'combined heat and power plant' (CHPP) to produce both electricity and heat.

Further to application of RISE-DSS during the case studies, recommendations have been made regarding the appropriate level of feed-in tariffs and other types of financial incentives to promote RES adoption. A campaign to raise awareness about RES also highlighted the potential for stimulating local economies and creating jobs.

The project was coordinated by the National Technical University of Athens in Greece.

1 'Renewable for isolated systems — energy supply and waste water treatment'.

Funded under the FP6 programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace> >  
search > offers > 8160



## ENERGY AND TRANSPORT



### Assessing biomass potential in the Balkans

*Countries that diversify their sources of energy can promote economic growth while becoming better stewards of the environment. The Western Balkans and wood-based biomass are a prime example.*



A plentiful, inexpensive, secure supply of energy is a prerequisite for developing a country's economy. This is particularly true for the Western Balkan Countries (WBCs) as they struggle to emerge from decades of geopolitical strife.

Biomass not only satisfies the aforementioned criteria, but it is also an environmentally friendly option in a world increasingly attuned to climate change. EU funding was used to investigate the potential of biomass in the context of the Accent<sup>1</sup> project.

Accent focused on the needs of and solutions for the residential sector and 'small and medium-sized enterprises' (SMEs). Data was collected to determine the capacity of the WBCs to produce energy-dense types of biomass such as bio-pellets and bio-briquettes. In addition, research was also carried out into technologies available to burn biomass to produce electricity and heat.

While biomass represents a technically and economically feasible solution, its use is currently limited. The Accent team believes

that the key to increasing adoption of this technology is the development of a legislative framework that provides incentives while protecting the natural resources upon which it relies, namely forests. Recommendations have also been made with respect to future research objectives as well as ways to finance this research in countries with limited research and development (R&D) funding, like the WBCs.

These findings have been shared with all the relevant stakeholders in the WBCs through meetings, reports and the Accent website in an effort to build momentum toward greater biomass use.

The project was coordinated by the Black Sea Regional Energy Centre in Bulgaria.

1 'Acceleration of the cost-competitive biomass use for energy purposes in the Western Balkan countries'.

Funded under the FP6 programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6850

## Bacterial 'recyclation' of waste for energy use

*Numerous forms of renewable energy are being explored in an effort to achieve long-term sustainability by reducing our dependence on fossil fuels as well as minimising negative environmental impact. Among these forms of energy is biogas, consisting primarily of methane and carbon dioxide (CO<sub>2</sub>), produced by oxygen-free digestion of biomass by anaerobic bacteria.*

Waste buried in a landfill continues to generate biogas for many years. This biogas can be refined and used as a substitute for natural gas for cooking and heating in homes and businesses.

In addition, anaerobic digester systems are of interest to both the agriculture sector and to waste-water treatment, where

animal and human waste can be treated to reduce bacteria that pollutes water supplies and simultaneously to reduce methane released into the atmosphere, which has been targeted as a major contributor to global warming.

The Biowell<sup>1</sup> project was designed to develop an optimised anaerobic digestion system increasing





## ENERGY AND TRANSPORT

the biogas output of a plant. Specifically, the researchers developed an innovative biomass pretreatment process based on ultrasound activation of various enzymatic systems.

A prototype Biowell system was developed along with software for automated control. The system was evaluated extensively in functionality tests

under industrial conditions. The results supported the potential for enhanced biogas production using homogenisation of biomass, and enabled identification of biomass parameters affecting biogas yields.

The researchers outlined a plan for Biowell sustainability and performance improvement along with a commercialisation

strategy. The results should have significant impact on numerous industries in their efforts to harness energy generated by anaerobic digestion of biomass, including the food and beverage industry, pharmaceuticals and the agriculture sector.

The project was coordinated by the Clausthaler Umwelttechnik-Institut GmbH in Germany.

- 1 'Increased renewable energy recovery from biomass by highly efficient disruption process'.

Funded under the FP6 programme 'SME activities'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 7815

## Redesigning vehicle engines

*A panoply of proposed car-engine solutions is on the verge of bringing us vehicles that produce less emissions as well as being much more efficient.*

Good diesel engines have long been considered more efficient than those running on petrol, but there are still long-term worries about diesel emissions. Based on cutting-edge direct injection (DI) diesel engine technology, the EU-funded NICE<sup>1</sup> project developed novel combustion systems for other fuels as well. These included gasoline, 'compressed natural gas' (CNG), synthetic biomass-based fuels and biogenic fuels, which in theory can achieve

excellent fuel-conversion efficiency with very low emissions.

NICE worked on the convergence of several components and technologies, such as turbo-charging or DI, as well as DI and variable valve trains to achieve its aims. While biofuels and CNG boast low carbon dioxide (CO<sub>2</sub>) emissions, the project needed to work on achieving the same performance for diesel engines. It therefore experimented on an enlarged homogeneous

charge compression ignition (HCCI) diesel combustion process, which showed significant potential for success.

In parallel, NICE worked on both diesel-type compression-ignited and spark-ignited variable engines to increase fuel-conversion efficiency and to run on biofuels or bio-blend fuels. Another challenge the project team took on was testing future CNG 'internal combustion engines' (ICEs). These optimised mono-fuel natural gas engines were able to reduce fuel consumption and emissions. An important part of the project involved the development of 'computational fluid dynamics'

(CFD) tools and modelling to support more advanced development of novel combustion processes.

Overall, the project team found that several different engine technologies will be required in the future. Petrol engines will see much improvement thanks to turbo-charging plus downsizing from 2 litres to 1.4 litres, yielding a 15 % reduction in fuel consumption. A combination of many other high-tech advances, such as turbo-charging, DI and lean operation, may also be able to achieve fuel economies of 20 % over today's latest technology.

Importantly, NICE concluded that any further increase in engine efficiency can only be achieved by a very expensive overall hybridisation roll-out, which may not be feasible at this point. In addition, while the project's results are impressive, they may not be able to fulfill the currently discussed carbon dioxide emission demands in total. Nonetheless, NICE has furthered the technology considerably in partnership with many car manufacturers, and the outcome is likely to be better cars over the coming years.

The project was coordinated by DaimlerChrysler AG in Germany.

- 1 'New integrated combustion system for future passenger car engines'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 8185



## ENVIRONMENT AND SOCIETY



© paul prescott, Shutterstock

## Strengthen education to build social cohesion

*Europeans are rising to the challenges of overcoming inequalities and promoting social cohesion, but existing educational differences do not make this easy. EU-funded researchers are investigating the educational strategies that could help Europeans prevail over such challenges. The INCLUD-ED<sup>1</sup> project received EUR 3.36 million under the 'Citizens and governance in a knowledge-based society' Thematic area of the EU's Sixth Framework Programme (FP6).*

The INCLUD-ED consortium, led by the University of Barcelona in Spain, says educational inequalities lead to the risk of poverty, social exclusion and a waste of valuable human resources in the labour market. The INCLUD-ED partners evaluated the interactions between educational systems, agents and policies at the pre-primary, primary and secondary education levels. Special and vocational education programmes were assessed as well.

The INCLUD-ED partners carried out six sub-projects, which reviewed several issues: literature on educational reform, theories and policy developments in Europe; effective educational practices in Europe; the structure of the knowledge society and educational inclusion; overcoming the social and educational exclusion of vulnerable groups; the gender dimension in the processes of social and education exclusion and inclusion among vulnerable groups;

and case studies of local projects around Europe.

Over a 60-month period, the project partners analysed the characteristics of the school systems and the educational reforms that are yielding low rates of educational and social exclusion, as well as those that are yielding high rates. They probed how educational exclusion impacts diverse areas of society, including housing, health, employment and political participation, and evaluated mixed interventions between educational policy and other areas of social policies, to identify which are helping Europeans overcome social exclusion and build social cohesion.

The results of the INCLUD-ED project will contribute to the 'inclusive growth' objectives of the Europe 2020 agenda, including 'promoting social innovation for the most vulnerable, in particular by providing innovative education,

fighting discrimination and integrating migrants'. The findings will play a role in helping Europeans meet the Europe 2020 target of bringing down the school dropout rate.

The project partners are from Belgium, Ireland, Italy, Cyprus, Latvia, Lithuania, Hungary, Malta, Austria, Romania, Slovenia, Finland and the United Kingdom. The project was coordinated by the University of Barcelona in Spain.

1 'Strategies for inclusion and social cohesion in Europe from education'.

Funded under the FP6 programme 'Citizens and governance in a knowledge-based society'.  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 23314





## Interview: a new approach to an entangled history

*The peoples of the Balkan region have long shared an 'entangled' and tumultuous history. A visit to the Western Balkans shows how deep the scars of the bloodshed of the 1990s have been in this part of the world. With the help of the European Research Council (ERC) grant he was awarded in 2008, Professor Roumen Daskalov from the New Bulgarian University of Sofia is taking a new look at Balkan history — studying it from a 'relational' or 'transnational' perspective.*

© Zbynek Jirousek, Shutterstock



'Modern Balkan history has traditionally been studied in the national paradigm as separate national histories taking place within bounded state territories. Such an approach often neglects important transnational aspects which have been forged throughout time from various economic, political and cultural interactions within the region and influences from outside', says Professor Roumen Daskalov.

The complexities of the Balkans and their long-standing relations with Western Europe and Russia have made the 'entangled history' approach, based on a transnational and cross-disciplinary perspective, particularly relevant. For example, it is possible to show how interconnected and entangled the Greek, Romanian, Bulgarian and Macedonian nationalisms were over the years, copying each other and borrowing from each other while also rejecting each other. This happened in other domains as 'entangled' histories were also pervasively present in the way minorities and refugees interacted with the dominant nationalities in this region.

Supported by an ERC grant of EUR 1 560 000 for five years, Professor Roumen Daskalov and his four team members are expected to advance a new vision

of the modern history of the Balkans that will put into relief new features and challenge the habitual historical landscape of the region. Since the start of his project, Professor Roumen Daskalov and his team members have extended the research to cover new areas. Given the richness of the sources, they hope to produce up to four volumes.

He says, 'the "entangled history" approach does not aim to harmonise the past and smooth out past conflict. The contacts, movements, exchanges, transfers, etc. were more often asymmetrical and violent than harmonious and peaceful. Still there is some positive and integrative value in showing how "entangled" the histories of the present-day Balkan nations and states were and still are.'

Professor Roumen Daskalov has good hopes of seeing his research results being used in their wider social and political implications, namely for the reconciliation of the Balkans region and its better integration into a wider Europe: 'I can imagine such research as promoting good neighbour relations rather than fostering divisiveness and separation'.

The project is a bold attempt to refocus the historical lens and

not only explore a variety of older themes and topics in a novel way but bring entirely new problems to the fore and even constitute new objects of research. It will also provide input to the European integration of the region, which will hopefully involve the rest of the Balkans in the near future.

### What were the main themes of the ENTANGLED BALKANS<sup>1</sup> project?

We started with the interconnections and entanglements of the emerging Balkan nationalisms, the formation of literary languages in relation to the neighbours in the push for differentiation, and the transfers and transplantation of ideas and institutions.

### What is new about the ideas you are exploring?

We undertook a recasting of and innovation in the methodology used in the study of the relations and mutual influences between the Balkan peoples, but also between other groups or collectivities — such as nationalist activists, minorities, etc. This entails a different concept of interactions — as two-directional and more or less symmetrical.

The research is cross-disciplinary in the sense that we use vocabulary, ideas and insights from other social sciences and humanities, such as linguistics, sociology and political philosophy — and their various sub-fields — depending on how a particular issue needs to be treated.

### Why has Balkan history not been studied from this perspective before?

There have been studies of Balkan history from a transnational perspective, although under other labels, such as 'influences', 'contributions' (to another nation), 'borrowings' and adaptations (of ideas and institutions), etc. But they usually consider the

influences as one-directional flows and are mostly concerned with the 'receiver' or 'recipient'. In contrast, we are interested in both directions of the interaction and its effects upon both 'sides'.

For example, in transfers, typically there is a prejudice against the adaptation of a borrowed item and its functioning that are seen as somehow inferior to the model — signalled by terms such as 'incomplete', 'distorted', 'malfunctioning' and the like. We consider it more as a process of 'hybridisation' with local practice, in a different environment with specific traditions and needs; what is interesting is precisely how such cultural imports are 'naturalised' and 'domesticated'.

### What first drew you to research in this area – first as a historian, and then to focus on this approach to Balkan history?

I've been teaching Balkan history for a number of years and I published in this field mostly on underdevelopment and nationalism. But I am also interested in theoretical and methodological novelties in history writing in general: novel approaches and ways of doing history, the 'politics of history', etc. This is how I came to appreciate the development of traditional comparative and relational methods towards concepts of interconnected and 'entangled' history. I also felt that a more fair treatment of such 'transfers' in their own right is needed — perhaps under the influence of post-colonial studies.

Besides, the transnational and entangled histories approach seems particularly suited to the study of a region as complex and inter-related as the Balkans, where peoples have lived in a shared space and close cohabitation for centuries before national separation occurred with regard to, and in rivalry



## ENVIRONMENT AND SOCIETY

with, others precisely because of the pervious commonality.

Finally, I wanted to challenge the traditional self-contained national narratives, where peoples are neatly separated and their history evolves by internal dynamics only.

### What are the advantages for your work in participating in an EU-funded ERC project?

Let me state the advantages briefly: scholarly prestige and enhancement of my institutional position, independence, the possibility to select an excellent team of co-researchers, international contacts, and remuneration on a par with colleagues from Western Europe (which is far from the current situation in Eastern European academia).

### What are some of the difficulties you have encountered?

Basing such a research at my home university, the New Bulgarian University (NBU) in Sofia, was a challenge because of the high profile of the project

and the necessity of harmonising some of the university's internal rules with the requirements of the ERC — various procedures had to be adapted and streamlined. Independence had also to be asserted.

### How do you go about solving them?

With patience and persistence! Let me mention that ERC Grants give the scholar the option to change the host institution. Fortunately, I had the full understanding of NBU, but this possibility of changing enhances the scholar's bargaining position and his or her self-assurance.

### What are the concrete results from your research so far — are you nearing a new vision of the modern history of the Balkans?

We have some concrete results already — two volumes of our results are at different stages of technical processing.

A 'new vision of the modern history of the Balkans'? Yes, certainly. It emphasises the relations and

inter-connectedness between entities that are usually treated in isolation and makes us aware of how related and interdependent is the modern world.

But I have to caution against reification of this vision as well — after all, it is one among others and not everything lends itself to it equally well: or rather, it highlights certain features of the events. We promote it as an alternative to the traditional landscape dominated by national histories because there is much to be gained in knowledge, reflection and orientation.

### What are the next steps or topics for your research?

We are planning two more volumes of contributions: one on the 'entanglements' between Balkan historiographies produced in the process of appropriating or rejecting shared legacies: ancient (Hellenic and Thracian, Roman), Byzantine medieval and Ottoman.

In a final volume we will try to formulate our experience from working with these approaches and in

their frameworks and add some deeply contextualised case-studies of 'entanglement'. I would like also to formulate (in a policy paper) some practical recommendations for the use of the entangled history perspective in secondary education.

The project is hosted by the New Bulgarian University in Sofia, Bulgaria.



© Professor Roumen Daskalov

1 'Balkan histories: shared, connected, entangled'.

Funded under the FP7 specific programme Ideas by the European Research Council.



## Slavic languages to go digital

*Under represented in current digital resources, languages of Slavic countries may soon feature in electronic and online channels that give this rich language group its proper place in Europe's knowledge society.*

The diversity of Europe's languages is fascinating, and each should be highlighted for its cultural heritage, academic worth, and intrinsic beauty. Today, Slavic-based languages are spoken by a substantial part of Europe's population, but the language group lacks digital lexical resources. In light of this, the EU-funded Mondilex<sup>1</sup> project is taking action.

Mondilex is drafting a sustainable, scalable infrastructure for institutions involved in building a network of multilingual resources of Slavic languages. It is studying the challenges in developing, managing and reusing lexical resources in a multilingual context. Increased EU participation of countries whose language belongs to the Slavic group and intensified communication with non-EU Slavic

countries has revealed the need for standardising digital bilingual and multilingual resources. Such an initiative has the power to facilitate exchange, particularly in education, business, and research.

The project partners comprise research organisations from European countries whose national languages belong to the Slavic group — Bulgaria, Poland, Russia, Slovakia, Slovenia and Ukraine. Together, the relevant institutes are examining strategies for coordinating, unifying and extending current digital lexical resources, and creating new ones, in line with advances and standards in the field.

Several workshops have been advancing Mondilex's objective. One workshop has analysed the needs



© a-proselov, Shutterstock

of the partners for a common infrastructure supporting scientific and applied activities in digital lexicography. Another has studied the state of the art in digital lexical resources and requirements for their integration. Digital entry was also examined, as well as the representation of semantics, phraseology, etymology and related matters. These workshops and related research are helping to define a concrete plan of action that will realise the project's objectives.

Eventually, a wealth of resources should emerge from this initiative: electronic and online dictionaries, both monolingual and bilingual, as well as

thesauri, ontologies, wordnets, and much more.

The project was coordinated by the Institute of Mathematics and Informatics of the Bulgarian Academy of Science in Bulgaria.

1 'Conceptual modelling of networking of centres for high-quality research in Slavic Lexicography and their digital resources'.

Funded under the FP7 specific programme Capacities under the theme 'Research infrastructures'. <http://cordis.europa.eu/marketplace> > search > offers > 6578



## Helping the Balkans study climate and environment

*An EU initiative to upgrade the meteorological and environmental capabilities of the University of Novi Sad has reinforced the whole Balkan region in this sector.*



© JohnnyWilde, Shutterstock

With Serbia a candidate to join the European Union in the near future, the European Commission is doubling its efforts to enhance the country's research potential in many areas. One of these efforts is related to climate research, in

coordination with the Centre for Meteorology and Environmental Predictions (CMEP) at the University of Novi Sad in Serbia.

The EU-funded RRP-CMEP<sup>1</sup> project worked on boosting Serbia's

capabilities in this respect. It brought together four research groups that focused on environmental forecasts related to air and soil quality control, production of healthy food and public health.

By strengthening the centre's research and development capabilities, the project contributed to reinforcing the European Research Area (ERA). It also helped bring high-tech capabilities to the Western Balkans and disseminate research results of the CMEP and its partners. These efforts involved purchasing new equipment for the centre, an increase in human resources, organisation of an international workshop and establishment of a project website. RRP-CMEP also furthered training in climate monitoring and encouraged young scientists to pursue careers in the field.

A key project achievement included the development of

sophisticated software to help the centre undertake more robust analyses in the field. RRP-CMEP successfully repositioned the centre in the region, raised awareness on environmental issues, supported education in these fields, and reinforced the CMEP in numerous ways. This has enabled the centre to undertake research on a regional scale.

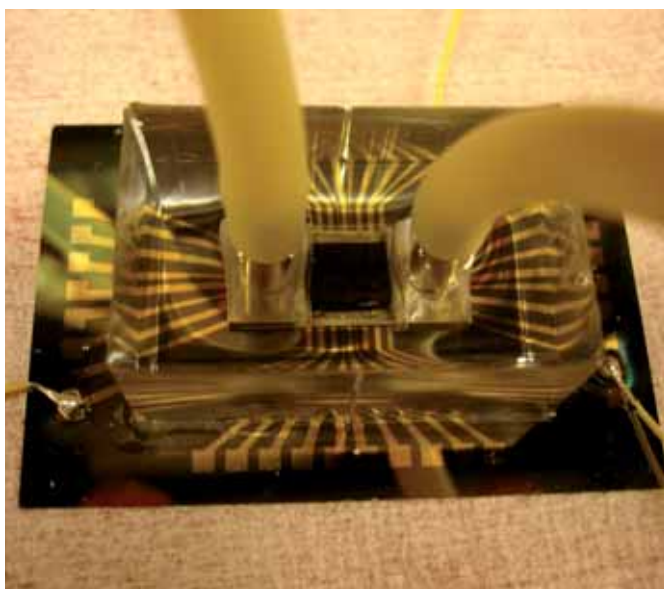
The project was coordinated by the University of Novi Sad in Serbia.

1 'Reinforcement of the research potential in Centre for Meteorology and environmental predictions'.

Funded under the FP6 programme 'International cooperation'.  
[http://cordis.europa.eu/marketplace > search > offers > 7895](http://cordis.europa.eu/marketplace/search)

## Better thermal management promises cheaper, greener, cooler electronics

*At first glance, supercomputers, car parts, entertainment systems and radar antennas may not have much in common, but they all stand to benefit from important advances in thermal management technology being achieved by an EU-funded project. Materials developed under the project have been demonstrated in different application sectors, and some are already in use commercially, or likely to be in the near future.*



© Yifeng Fu

Improving thermal management is essential if processing power is to continue increasing as electronic components get ever smaller. Too much heat that can not be managed effectively puts limits on the performance of chips and other microelectronic components, it reduces reliability, and it also costs money and harms the environment.

A prime example of the problem from a technical, environmental and economic perspective are data centres. These vast buildings — sometimes spreading across the equivalent of several football pitches — are used by a variety of industries to store and process data. The banks of computers inside them produce a

lot of heat. So much in fact that the cooling system accounts for around half the cost of building a new data centre, and in turn it requires more energy to operate, resulting in a larger carbon footprint.

The same problems are true in any industry that uses microelectronics — from telecommunications to aviation. Demand for a better solution is intense therefore. In Europe, companies such as Thales, Bosch and IBM have joined up with research institutes and universities, obtaining funding from the European Commission, to try to develop new materials and processes to solve the thermal management issue.

Their efforts in the Nanopack<sup>1</sup> project have resulted in new 'Thermal interface materials' (TIMs) developed with micro- and nanotechnology to greatly increase heat transfer away from chips >



## ENVIRONMENT AND SOCIETY

and other electronic components, in turn reducing the demands placed on cooling systems, lowering costs and reducing energy consumption. The materials have been showcased in a series of demonstrators with applications across a variety of sectors, some of which are in use commercially or are likely to be in the near future.

'At Thales, we build radar systems for airplanes. Thermal issues are especially important in that environment because the space available is very small and very confined. At present, the cost of the thermal architecture of the radar is something like 40 % of the total cost,' says Afshin Ziaei, a manager of research at Thales Research & Technology in France.

To address that problem, the Nanopack researchers developed prototype high-power amplifiers, thousands of which make up the active phased array antennas of an aircraft radar system, using new materials developed in the project. By applying specially designed thermal conductive greases, and adhesives containing nanoscale micro-fillers, between the chips in the amplifiers and their surrounding packaging, the team are improving heat transfer without the need for additional cooling.

Other, more experimental, technologies are also being tried out with the amplifiers, including tiny carbon nanotubes oriented vertically in a solution so heat is transferred upwards through the centre of the tube.

### The not-so-hot seat

For Thales Avionics, the Nanopack team worked on better thermal management for in-flight entertainment systems, which use a so-called 'Seat electronic box' (SEB) placed under each passenger's seat on modern aircraft to store and manage the movies, music, games and other entertainment features shown on their personal screen.

'This is another example of the problems of having electronics in a small, confined and enclosed space with limited cooling possibilities — it is a real challenge to dissipate the heat in that environment,' Mr Ziaei notes. 'We are using a heat-pipe with the micro-filler grease as a thermal interface to transfer the heat from the components to the SEB and from the SEB to an external heat sink.'

The team is also considering another technology for the demonstrator: a polymer fibre network infiltrated with a metal alloy that somewhat resembles a very fine sheet of aluminium foil and which tests show transfers about twice as much heat as the grease or adhesive.

For Bosch, the Nanopack team is also using grease and adhesive to reduce the heat build-up from the transistors in a power amplifier module from a commercial electrical power steering unit used in cars.

'In this case, better thermal management means the unit can operate at higher temperatures and perform better, or it can operate at the same

temperature with increased reliability,' the project manager says.

IBM, meanwhile, is using materials and techniques developed and advanced in Nanopack on high-performance microprocessors. Grease and a technology known as 'Hierarchical nested channel' (HNC), which uses microstructures to improve conductivity, have since been employed by IBM in its Aquasar Supercomputer which, thanks to a unique cooling system, has an 85 % smaller carbon footprint than comparable systems.

By ensuring that their materials and processes are compatible with high-volume manufacturing techniques, the team has focused not just on research and development but also created materials and processes that are likely to find their way into commercial products and systems in the very near future. In that vein, they also worked on the very important area of materials characterisation, attempting to set a benchmark for testing the thermal conductivity of materials so that their properties are clear to all.

'At the start of the project, we did a blind test and sent the same test materials to all the partners for them to measure with their own characterisation methods. We found that the difference in the results varied between 50% and 100%. Now, at the end of the project and with the characterisation tools and methods we developed, the error band has been brought down to

within a much more acceptable 20%,' Mr Ziaei says.

Similarly, three-dimensional design simulations of materials can provide important insights into material properties before, during and after development. Swedish partner FOAB, for example, used its simulation tools to demonstrate how a chip can be cooled with a heat sink built of carbon nanotubes.

'With this, we are able to simulate the heat transfer beforehand at both the component and the system level,' Mr Ziaei notes.

Some of these characterisation and simulation tools are to be commercialised by the project partners.

Nanopack received EUR 7.4 million (project total of EUR 11.03 million) funding under the EU's Seventh Framework Programme for research (FP7), sub-programme 'Next-generation nanoelectronics components and electronics integration'.

The project was coordinated by Thales Research & Technology, France.

1 'Nano packaging technology for interconnect and heat dissipation'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies' (ICT). <http://cordis.europa.eu/marketplace> > search > offers > 6982

## Managing small fry in the Mediterranean

*A recent study on the humble but important sardine promises to improve the survival of top-dwelling small fish and preserve marine ecosystems.*

Sardines and anchovy, so-called small pelagic fish, are an important marine resource. Disturbances in their biomass affect upper trophic layers, in particular predators. Sardines also form an important part in the fisheries of some regions. Sustainable management within this trophic level is crucial to

prevent a major upheaval in marine food webs.

Drawing up management policies means a thorough understanding of stock assessment and fishery management of pelagic fish. To fill existing knowledge gaps, the EU-funded Sardone<sup>1</sup> project has just completed a





## ENVIRONMENT AND SOCIETY

comprehensive study on anchovy and sardine stocks in the north-west Mediterranean, Adriatic and Aegean seas.

Sardone scientists used acoustic methods and satellite environmental data to characterise and identify essential habitats for juveniles, called 'nursery areas'. Data was entered into a database and analysed using statistical modelling to pinpoint environmental conditions affecting juvenile distribution. Information on nursery areas provided valuable information for workshops on predicting recruitment and to

agree on common protocols for stock management.

For study of larval stages, a special tool was developed by the Sardone team to estimate biomass. Another similar tool is able to simulate the 'advection', or horizontal transfer, of eggs and larval stages from spawning areas using hydrodynamic models.

Project scientists also made advances in fishing gear design to help selectivity of the catch. Existing towed fishing gear selectivity was defined and improved

and equipment adapted to the Italian fishing fleet. Able to separate different species during the process, its performance could be enhanced by use in combination with instruments to detect and therefore focus on pelagic schools.

Results of the Sardone project represent a very comprehensive overhaul of information for sustainable fishing of pelagic fish. Not only is this good news for the marine ecosystem and the fishing industry but consumers who enjoy a plate of delicious, inexpensive, nutritious oily fish stand to benefit too.

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

- 1 'Improving assessment and management of small pelagic species in the Mediterranean'.

Funded under the FP6 programme  
'Research for policy support'.  
<http://cordis.europa.eu/marketplace>  
search > offers > 7800

## Facilitating good governance for our future

*The concept of sustainability cannot be applied to our societies if it is not accompanied by good governance. Understanding knowledge gathering to enhance governance has become crucial in enhancing sustainability.*

Sustainability has become perhaps the most important issue of the 21st century, necessary to ensure the well-being and continuity of society and ecosystems on our planet. The EU-funded project G-FORS<sup>1</sup> studied how knowledge was acquired and exploited in the 'knowledge society' to govern sustainability. It looked at how policies regarding the environment

and sustainability are drafted and implemented.

G-FORS analysed new government modes, different forms of knowledge and evolution of a knowledge society. It looked at the different forms of knowledge and their interaction in understanding sustainability, with particular focus on decisions vs. risks. Researchers looked at

problem-solving capacities, and policy implementation, related to the areas of emissions trade, air quality management and strategic environmental assessment.

The project also articulated indicators to measure political, economic and administrative processes to help develop sustainable policies in environmental, social and economic

spheres, among others. It assessed the key economic, social and political roles that sub-national actors could play in governance. G-FORS examined the concepts of sustainability and policymaking in this regard, noting that the three dimensions of sustainability (consistency, comprehensiveness and aggregation) were difficult to reconcile. This often led to dominance of one dimension or certain policy incoherence.

The project's strategy involved gathering information about target audiences, creating a database and establishing a website for the project. All workshop results and project findings were disseminated to stakeholders, fostering good practice in sustainable governance across Europe.

The project was coordinated by the Landeshauptstadt Hannover, Germany.

- 1 'Governance for sustainability'.

Funded under the FP6 programme  
'Citizens and governance in a knowledge-based society'.  
<http://cordis.europa.eu/marketplace>  
search > offers > 7774



## ENVIRONMENT AND SOCIETY

# The state can help families balance work and home

*A team of European researchers took an innovative approach to researching how public policy influences working families in their organisation of home and professional life. Project findings spotlight viable models for supporting active employment on the part of both mothers and fathers.*

The Workcare<sup>1</sup> project explored, at the macro level, the relationships between structural changes in the labour market, demography, and welfare and economic policies. The micro level analysis included changes in personal orientations regarding work and care. The focus of the EU-funded project was on measuring both the quality of society and the quality of life through a social quality assessment.

Extending the scope throughout Europe, including new Member States, project partners worked to integrate perspectives of gender and care into their analyses of how national and EU policies support working parents with young children. EU policy aims to encourage the active and gainful employment of as many women and men as possible. However, this raises several questions: How can work and care best

be combined? How can mothers and fathers benefit from equal opportunities? Can high employment rates for women and men be maintained while encouraging family building? How can seemingly conflicting policy objectives related to these issues be reconciled?

Research involved analysing cross-European datasets to gain a better understanding of European patterns of work and care, national- and European-level childcare, and flexibility and workplace policies. In-depth interviews were also carried out in countries with contrasting traditions of work and care.

Project work resulted in offering pointers on how to achieve key policy objectives as well as recommendations for EU evidence-based public policy development that will enable European citizens to improve the quality of their lives. Workcare's

research findings highlighted that the costs of an extended family leave model are not decidedly lower than those of the extensive family care model, i.e. long leave for mothers. As such, the extensive family policy model is most likely to fulfil European policy objectives as well as parents' aspirations for combining work and care.

Through an innovative methodological and theoretical approach combining policy analysis and qualitative and quantitative research, the Workcare project contributed to key European issues and offered novel insight into the impact of social policies on work and care. The findings can be used to further examine how employment flexibility affects the organisation of work, care and welfare, as well as the effects of competing demands of work and care on fertility decisions across the EU.



© c12, Shutterstock

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

- 1 'Social quality and the changing relationships between work, care and welfare in Europe'.

Funded under the FP6 programme 'Citizens and governance in a knowledge-based society'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 7770

# Mining quarries with less environmental impact

*Down-the-hole (DTH) drilling is a method of opening a borehole using a percussive hammer that breaks the rock with repeated impact. European researchers have enhanced the design and performance of water-powered DTH drills, leading to reduced energy consumption in the process.*

The Stream<sup>1</sup> project was initiated to develop an innovative water-powered DTH hammer of small dimension for use in mines and quarries.

Specifically, the researchers sought to develop a diamond-like carbon (DLC) coating, both cost-efficient and wear- and water-resistant when produced via an innovative 'Plasma-enhanced (assisted) chemical vapour deposition' (PECVD) technique.

In initial pilot studies, the researchers demonstrated that the DLC coating adhered quite well to the drill percussion piston/cylinder sliding surfaces. In addition, they found that the coating was resistant to corrosion and wear and it decreased friction among machine parts.

Decreased friction means a lot of important things for moving machinery. For a percussive drill, the drill can move up and down more quickly and thus finish its job sooner and there is less wear on the machine. These two advantages mean cost-savings related to time, repair and energy usage.

Although not in the original grant proposal, given the success of the lab model, the researchers then scaled up production to an industrial-sized DLC plant. They optimised the PECVD process and designed and fabricated two DTH hammer drilling demonstrators with different diameters for field tests.

The tests — employing various stones, drilling angles and site

conditions — demonstrated the success of the process and product. The low friction coefficient prolonged the working life of the drill equipment and also reduced energy consumption. In addition, overall performance was often superior to that of conventional drills and drilling methods.

In summary, the Stream project contributed new knowledge and technology to the mining field. In addition, the technologies developed are particularly pertinent to civil engineering applications such as tunnel drilling, an important market given the need for new roads and rail routes through mountainous European terrain. Finally, the project contributed to sustainable development by creating a low-friction



© a\_v\_d, Shutterstock

drilling process with decreased energy consumption.

The project was coordinated by Ditta Ripamonti Dr. Gianni s.a.s. in Italy.

- 1 'Novel drilling system for cost effective extraction of the 30 million tons of ornamental stone blocks in Europe with lower environmental impact'.

Funded under the FP6 programme 'SME activities'.  
<http://cordis.europa.eu/marketplace> >  
 search > offers > 7805





© Antermitte, Shutterstock

# Gigabit wireless data coming to your home, car... or flight

*A radio technology that transmits data at speeds of up to one gigabit-per-second (Gbps), uses very little power, and can even determine the location of a person or object to within 50 cm, promises to revolutionise wireless communications. EU-funded research is helping to make the leap from laboratory to market. New applications could include automated controls in vehicles and wireless communications on planes.*

Ultra-wideband (UWB) radio, also known as ultraband, uses a broad segment of the radio spectrum to transmit and receive data, giving it versatility that, over short distances at least, few other wireless communications technologies can match. At very high data rates it can be used to stream huge amounts of data extremely quickly — substituting and surpassing USB cables for interconnecting computers and mobile devices, for example. At low data rates, it offers a robust communications channel and, uniquely, real-time and precise positioning features, all at a fraction of the power consumption of Wi-Fi, Bluetooth or other wireless technologies.

It sounds like a dream solution for anyone who wants to stream video from their mobile phone, have their sound system automatically adjust to where they are sitting in the room, or wirelessly connect sensors and actuators in a car. Until now, however, its commercial roll-out has been hindered by regulatory hurdles. Using a large segment of the radio spectrum — between 3 and 10 gigahertz — makes UWB versatile, but it also means that devices using the technology may operate at frequencies assigned to other services, such as WiMAX, satellite communications or radar. Regulators

have therefore feared that UWB could cause interference with other technologies. These concerns are now being addressed through research, trials and demonstrations.

'The regulatory issue and concerns about interference have been the biggest challenges facing UWB but — thanks to revolutionary "new thinking" in the regulatory environment in the very recent past — the take-off of this disruptive radio technology has now been enabled for a wide range of applications,' says Sven Zeisberg, professor of telecommunication technology at the University of Applied Sciences (HTW) in Dresden, Germany.

Zeisberg has long been a proponent of UWB, helping launch a series of EU-funded initiatives over the last decade to develop and deploy the radio technology, which most recently culminated in the EUWB1 project. Coordinated by German technology firm GWT-TUD and involving 26 industrial, academic and consulting partners from Europe and Israel, the project has implemented UWB in a diverse range of applications, proving its potential as a future wireless communications technology that is not only extremely useful in many environments, but is also robust, safe and does

not cause harmful interference to other radio services.

'Together with project partner EADS, we were able to demonstrate applications of UWB for communications in an aircraft cabin. If we can demonstrate that it is safe to use UWB in planes, which is one of the most sensitive radio environments, then we can show that UWB can be used almost anywhere,' Zeisberg, the EUWB quality manager and former project coordinator explains.

Admittedly, it will probably be a few years before UWB technology is used for communications in aircraft, because of the aviation sector's strict regulatory environment, but there are many applications that are both closer to the ground and closer to market. Some are even being commercialised today.

## Wireless location detection and longer battery life

In parallel to participating in EUWB, project partner Veebeam developed and brought to market a UWB transmitter that wirelessly streams content from computer to television. Meanwhile, HTW Dresden has set up a spin-off company, ZIGPOS, to





## IT AND TELECOMMUNICATIONS

commercialise UWB-based sensor networking applications.

Another group of partners are planning a second spin-off to offer a UWB-based alternative to Wi-Fi. They are working to implement it with the forthcoming IPv6 Internet protocol to create an access point — the first of its kind in the world — with data rates of up to 1 Gb/s using only one-hundredth of the radio power of existing Wi-Fi.

'There are many commercial applications for UWB in many industries, and many companies are very keen on the technology,' Prof. Zeisberg says.

In addition to the demonstration of the technology in aircraft cabin communications, the EUWB team members have also demonstrated it in a car for control systems. In collaboration with project partner Bosch, the EUWB team showed how UWB can be used for wireless command and control functions and how its unique location-awareness features could play a role in smart vehicles. For example, if a couple owns one car and each has a key, UWB technology could be used to unlock the doors and automatically position the seat, mirrors and steering wheel depending on which key — and key-holder — approaches or enters the vehicle.

'The location-detection is so accurate that it could even determine who is in the driver's seat and who is the passenger,' Prof. Zeisberg continues. 'And because the power used to transmit data is so low, the battery in the key would last for an extremely long time.'

Those two unique features of UWB — highly accurate location detection to within half a metre and very low power consumption — were further emphasised in two other demonstrations by the project.

In one demonstration, installed in a Philips future home, UWB enabled a home-theatre system to track a person around a room and adjust the sound and speaker balance accordingly.

'With UWB, location detection is not just possible in active mode but also in passive mode. Due to the very wide radio frequency UWB uses, we can transpose from the frequency to the time domain with high timing precision. That enables UWB devices to determine where an object or person is located based on the different radio propagation ratios and the "echoes" that are sent back — similar to how a bat uses echolocation,' Prof. Zeisberg explains.

In another demonstration, UWB was integrated by Spanish project partner Telefónica I+D into access network equipment and mobile devices to send large amounts of data over relatively short distances. UWB's low energy-per-bit consumption makes it an ideal technology for future mobile devices as it promises to dramatically extend battery life — critical at a time when data-intensive applications such as streaming video are becoming more popular. At throughputs of around 30 Mb/s, transmitters using the current 802.11n Wi-Fi standard consume around 350 milliwatts, whereas UWB transmitters transmit 10 times faster with the same power, thus completing transmissions in one-tenth of the time and saving an enormous amount of energy.

'With the Telefónica trials, we not only demonstrated the benefits of UWB for faster data transfer but we also proved that it can operate and coexist alongside other radio technologies without causing harmful interference,' Prof. Zeisberg says.

The key to avoiding interference which could be harmful to other wireless technologies, despite sharing parts of the radio band with

them, is UWB's low transmission power. 'A vacuum cleaner or an electric shaver is actually allowed to emit the same out-of-band energy that UWB transmits in-band,' he notes.

The downside of this is UWB's short range — at most around 30 metres. However, this low-power, low-range feature is essential to ensuring non-interference with other radio technologies, and makes securing regulatory approval for new applications of UWB possible.

'The EUWB partners have been involved in all the recent European regulatory and standardisation efforts regarding UWB radio technology. We are trying to convince regulators further that UWB can coexist alongside other radio technologies, even in aircraft,' Prof. Zeisberg notes.

In light of the results of the EUWB project, there is a good chance they will achieve that goal.

The EUWB project received research funding from the EU's Seventh Framework Programme (FP7), under the ICT 'Network of the future' theme. It was awarded the 'Best Demonstration Stand 2011' award at the Future Network and Mobile Summit conference in Poland in June.

The project was coordinated by the University of Applied Sciences (HTW), Dresden, Germany.

The ALPHA project was coordinated by Acreo AB in Sweden.

1 'European ultra-wideband'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 6871

## Graphene and a new dimension

*A growing number of scientists recognise how graphene, an allotrope of carbon, is the next silicon. But they also know graphene is too conductive to be used in computer chips. Now a research team from the University of Manchester in the United Kingdom may have found a way to address this problem. Presented in the journal Science, the study demonstrates how a transistor could indeed be the missing link for graphene to become the next silicon. Their discovery opens a third dimension in graphene research.*



The Manchester group, led by Nobel laureate professors Andre Geim and Konstantin Novoselov, both of whom were knighted earlier this year, notes how graphene is a fascinating material with myriad properties, namely optical, mechanical, electronic and chemical.

Experts say graphene can be used to form the basis of computer chips, overtaking silicon as the material of choice. Companies all over the world, such as Samsung, Intel and IBM, have already expressed an interest in graphene. In addition, single transistors with very high

## IT AND TELECOMMUNICATIONS

frequencies (up to 300 GHz) have been demonstrated by a number of groups around the world.

The problem with these transistors, however, is that they cannot be packed densely in a computer chip because they 'leak' too much current, even in the most insulating state of graphene. This electric current quickly leads to the melting of the chip.

Despite the various studies performed to solve this problem in the last eight years, no solid solution has ever emerged. But the Manchester team may have found the missing piece to this puzzle. According to the researchers, graphene should be used in the vertical instead of the lateral direction (in plane). The team used graphene as an electrode from which electrons tunneled through a dielectric into another metal. The researchers call this a tunnelling diode.

They focused primarily on a unique feature of graphene: how an external voltage can strongly change the energy of tunnelling electrons. What they got was a new type of a device, that is, a vertical field-effect tunnelling transistor where graphene is the key ingredient.

'We have proved a conceptually new approach to graphene electronics,' says the senior author of the study, Dr Leonid Ponomarenko of the University of Manchester's School of Physics and Astronomy. 'Our transistors already work pretty well. I believe they can be improved much further, scaled down to nanometre sizes and work at sub-THz frequencies.'

For his part, Professor Novoselov says: 'It is a new vista for graphene research and chances for graphene-based electronics never looked better than they are now.'

But graphene cannot work alone; other materials are needed as well. The Manchester group combined graphene and atomic planes boron nitride and molybdenum disulfide to develop the transistors. These transistors were made layer by layer in a desired sequence, on an atomic scale. These types of 'layer-cake' superstructures do not exist in nature, the researchers say. This innovative concept offers new degrees of functionality, with the tunnelling transistor being a vital component.

'The demonstrated transistor is important but the concept of atomic layer assembly is probably even more important,' says Professor Geim.

Professor Novoselov adds: 'A tunnelling transistor is just one example of the inexhaustible collection of layered structures and novel devices which can now be

created by such assembly. It really offers endless opportunities both for fundamental physics and for applications. Other possible examples include light-emission diodes, photovoltaic devices, and so on.'

The University of Manchester is currently part of the Graphene Flagship project — coordinated by the Chalmers University of Technology in Sweden — funded under the FP7 specific programme Cooperation theme 'Information and communication technologies' and sub-theme 'Future & emerging technologies (FET)'.

Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 24133



## Extending the potential of the web

*A group of European researchers have worked to strengthen industry, service providers and research bodies across the West Balkans. The focus of the project was the semantic web, one of the most important and fastest developing areas of current computer technology.*

The Web4web<sup>1</sup> project was established to set up a regional centre of excellence (CoE) for semantic web technologies within one of the region's oldest and largest research institutes in information and communication technologies (ICT), the Institute Mihailo Pupin (IMP) in Belgrade.

Project partners worked to raise awareness and assist the faster uptake of the semantic web and other advanced web technologies and standards in West Balkan countries. They also endeavoured to boost the level of competence of all the region's stakeholders and contribute to sustainable research development for the region's better integration into the European Research Area (ERA).

To start with, the EU's most prominent research centres, universities, networks of excellence

(NoEs) and other institutions were identified along with the most relevant journals, websites, conferences and related events. Team members also observed the activities of the World Wide Web Consortium (W3C) standardisation body, assessed latest products from respected vendors, and followed publications in international journals and conferences. A major effort was made to identify trends and priorities in the field of modern and semantic web technologies.

Progressing to networking activities, Web4web partners worked to establish contacts with research centres, NoEs, international organisations and respected researchers. Young researchers participating in summer schools established contacts with distinguished European researchers, while professors and



© Tom Pingel, Shutterstock

researchers visited IPM, giving lectures during training courses organised by the institute.

IPM team members and researchers visited other EU institutions and also took part in conferences ranging in outreach from local to international standing. Such activities helped establish contacts with leading EU researchers and set the groundwork for future cooperation on joint projects. During the project, IPM also contributed to the preparation of several Seventh Framework Programme (FP7) project proposals, two of which have already been approved.

Other project activities included developing the Web4web

semantic web portal, and implementing an e-collaboration tool, mailing lists and Web4web ontology-based content management, among other applications. The portal offers itself to the West Balkan's ICT community as an example of how to exploit the latest semantic web technologies.

The project was coordinated by the Institute Mihailo Pupin in Belgrade, Serbia.

1 'Web technologies for West Balkan countries'.

Funded under the FP6 programme 'International cooperation'.  
<http://cordis.europa.eu/marketplace> > search > offers > 8138

## IT AND TELECOMMUNICATIONS



## Data mining 3.0 — from info to ‘collective intelligence’

*An EU-funded project has developed a platform that converts vast user-generated content from a problem of information overload into a new, collective intelligence with a range of applications, from handling emergencies to enhanced city tourism. The project has filed for several patents, and a handful of products and results are destined for public or commercial release. Is this the beginning of data mining 3.0?*



© hignou, Shutterstock

Information and knowledge are increasing at great speed. Our capacity to store, transmit and compute information has grown at an annual rate of 23 % since 1986. By 2007, the average Internet user transmitted about six newspapers worth of information every day, and received 174 newspapers of data, according to a study published in *Science* last February.

Social media sharing websites are also adding to the information load, hosting billions of images and videos, most of which have been annotated and shared among friends, or published in groups that cover a specific topic of interest.

Data is increasing at such a rate that it is outpacing our capacity to organise it. ‘It is easy for users and organisations to generate and share content, individually or within communities, thanks to advanced communication devices like laptops, tablets and smart phones,’ explains Yiannis Kompatsiaris, coordinator of the EU-funded project WeKnowIt<sup>1</sup>.

With all this content, it makes extracting useful information extremely complex and costly, and current applications do not fully support intelligent processing and management of the data, suggests Dr Kompatsiaris. ‘Users are failing to process information efficiently

and cannot exploit the underlying knowledge,’ he says.

The WeKnowIt integrated project set out to change all that, starting out with a vision that conceptualises the different forms of data we encounter daily and gathering it into cohesive, actionable information that the WeKnowIt team calls ‘collective intelligence’.

The project focused for the most part on mining the type of data generated by social bookmarking, tagging and networking, where collective opinions and input create a highly detailed dataset.

‘There are different types of intelligence we receive and process every day,’ says Dr Kompatsiaris. ‘There is the digital content and contextual information we call “media intelligence”. User feedback on a large scale constitutes “mass intelligence”, while personal interactions engage “social intelligence”, all leading to the personal and organisational intelligence of individuals and companies.’

The WeKnowIt vision started from the conviction that, combined, these various information sources could create an emergent ‘collective intelligence’ that can powerfully enhance the capacity of individuals and institutions to find and act upon relevant information at the right time. It was a hugely ambitious goal when

WeKnowIt started work in 2008, but now the vision is a lot closer.

The project recruited some of the world’s leading names in data management and integration, like the Brno University of Technology in the Czech Republic, the Koblenz-Landau University in Germany, Yahoo! in Spain, and Vodafone and the Centre for Research and Technology Hellas (CERTH) in Greece. The company Software Mind in Poland provided software development and integration, while the University of Sheffield and Sheffield City Council in the UK developed key tools for use-case scenarios.

In all, 10 partner organisations from the Czech Republic, Germany, Spain, Greece, Poland and the UK spent three years and EUR 7.5 million, EUR 5.37 million provided by the EU, to develop a platform and a series of associated tools to help people handle many different types and sources of information in a cohesive way.

### Core platform

‘Using a wide variety of tools, the WeKnowIt platform transforms large-scale and poorly structured information into meaningful topics, entities, points of interest, social connections and events,’ notes Dr Kompatsiaris.

To do this, the project developed a core platform in the form of a

middleware application that can be deployed on servers to process incoming data and route it effectively.

The project’s various partners then developed a very large number of tools — over 20 in all — that can be deployed and combined in the different ways, either directly or via the core WeKnowIt platform. ‘We developed seven tools for the case studies — an emergency response scenario and a consumer social group scenario — and the partners created another 13 for specific tasks,’ explains Dr Kompatsiaris.

‘City exploration by use of hybrid clustering’ (ClustTour) is an example of a standalone tool developed by CERTH-ITI for a specific task. It is an online exploration application that helps users find interesting places using groups of photos, called clusters, which correspond to landmarks and events.

ClustTour uses both visual and tag information with a ‘cluster classification’ and ‘merging module’ to identify photos that belong together, then it places the object on a map. Users can simply click the photos to see what is there.

This can dramatically enhance the information available to people exploring a city, as Dr Kompatsiaris explains. A conventional travel guide would highlight the National Archaeological Museum of Athens as a ‘point of interest’ (POI). But the ClustTour generated far more detail by identifying interesting photos relevant to exhibits within the museum, such as the Arkhagetas Inscription, the collection of Early Cycladic Art, a collection of well-known sculptures and even a collection of golden treasures discovered by Schliemann, a German archaeologist.

‘It becomes obvious that the ClustTour tool, developed in WeKnowIt, can offer a fine-grained and media-rich exploration and



## IT AND TELECOMMUNICATIONS

travel preparation experience,' notes Dr Kompatsiaris.

And that is just one of many tools. Moreover, tools can be combined. For example, the consumer social group case study sought to help people to plan a day trip with a PC and then guide them via mobile phone during the tour itself. It used a variety of WeKnowIt tools to accomplish this, including ClustTour, Fannr (a Flickr annotator) and VIRaL, a visual retrieval and localisation tool, among others.

The emergency response scenario also combined various WeKnowIt tools to help provide relevant, timely information for emergency services. It used an intelligent uploading process that could, for example, identify a location based on a photo sent by a user. The system can even assess the level of urgency by assessing the severity of an incident from photos.

Both case studies were successfully completed, with the project finishing its formal phase earlier this year. But the project has since taken on a life of its own. 'Many of the partners are continuing to develop software and tools around the model and architecture that WeKnowIt defined, and the partners are staying in contact and sharing

information on an ongoing basis,' Dr Kompatsiaris reveals.

For example, CErTH-ITI, Yahoo! and Koblenz University are continuing their research activities and collaboration on real-time aspects of information extraction from social media. They are also looking at new applications, including the news sector and large events, such as music and film festivals. At the same time, the University of Sheffield and Sheffield City Council are discussing updated emergency response versions of the project.

CERTH-ITI is participating in a new spin-out company, called Veribin, which will act as a content aggregator in various sectors and business areas. The two main markets targeted will be the news and e-learning areas, and CERTH-ITI will apply and further develop the social media clustering techniques developed in WeKnowIt. Veribin is a spin-out company of ATC S.A. Information Technology Company and start-up funding was recently approved by the Greek Secretariat for Research and Development, according to Dr Kompatsiaris.

Meanwhile, Software Mind is developing new semantic web



© wacharukun Shutterstock

tools for the telecommunications and financial sectors and Vodafone will use the knowledge gained in the project to exploit network infrastructure for new services. The University of Koblenz has established a spin-off company, called Kreuzverweis, exploiting WeKnowIt project results from the organisational intelligence layer.

The project also filed for nine patents. These are just a handful of the products and results that are slated for public release. Others will emerge over time, particularly with the establishment of the WeKnowIt user group, which helps interested parties stay informed about the latest developments related to the project.

The WeKnowIt project received research funding under the EU's

Seventh Framework Programme, under the 'Intelligent content and semantics' sub-programme.

The project was coordinated by the Centre for Technology and Research Hellas in Greece.

The project was coordinated by the Free University Berlin in Germany.

- 1 'Emerging, collective intelligence for personal, organizational and social use'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace/search/offers/6961>



## Services and linked data feed Future Internet

*EU-funded researchers have developed much-needed tools and an 'ecosystem approach' to harness the Internet's evolution towards the semantic web concept. This involves a move away from web pages to the semi-automated use of business and software services spanning a diverse range of applications, from football to real estate. The project results, including a web-based management platform and a range of development tools, are feeding into various new industry applications.*

With tens of billions of devices networked together, a figure that is growing daily, the world is seeing a fundamental shift in the way that data is produced, stored, used and shared. As a result, we are witnessing a new era where data is being linked in an open and altogether more usable way. And we are seeing a blurring of the boundaries between content providers and consumers, as social networking sites,

blogs and other platforms proliferate on the Internet, leading to a new generation of so-called 'prosumers'.

To many observers, this 'web of data' is what the Internet was destined to become, an alternative to the current 'web of pages' which may or may not be meaningful or useful to the average user. So, the scene is set for the Future Internet to evolve into an internet of things — sensors,

devices, everyday objects — and an internet of functional and simple online services which make new uses of linked data.

'The web of data, initially an academic endeavour, is gradually capturing the attention of companies and institutions,' state Carlos Pedrinaci and John Domingue of The Open University's Knowledge Media Institute in a recent paper entitled 'Web services are dead. Long live internet services'. This seminal paper was a contribution to the EU-funded SOA4All<sup>1</sup> project, which set out to give service-oriented technologies a boost to meet the demands of the Future Internet.

Service-oriented architecture (SOA) is a set of design principles for

developing better, more flexible and more interoperable services for widespread use and reuse in different computing and web environments. The just completed three-year SOA4All project has produced web-based tools designed for both technical and non-technical users, allowing them to interact with services in different ways. Industrial partners have already demonstrated the benefits of SOA4All technology and the project has produced components that will promote greater take-up of SOA as a whole.

SOA4All thus provides the basis for a powerful impact among the Internet research and developer communities and, according to its coordinator Elies



## IT AND TELECOMMUNICATIONS

Prunés Soler of ATOS Research & Innovation: 'SOA4All's work can also have a significant impact on the competitiveness of the European software and services industry in the Future Internet.'

This success is largely due to SOA4All's integrated approach to the challenge of unlocking the power of public data and publicly available services within an 'open ecosystem', explains Mr Prunés Soler: 'The open ecosystem is based on the idea of "a web of billions of services" in an open environment, where an unlimited number of services can be offered, found, consumed and created, and where the interaction of different services and actors is enabled by SOA4All technology.'

Compare this, for example, to 'service ecosystems', which can already be found around some companies. These are confined in scope to an enterprise or group of enterprises, optimising application and service life cycles internally in cases where they need to be available in a closed environment.

### Web-based tools

SOA4All offers added value in the open ecosystem approach via its service delivery platform and, in particular, the 'Studio'. The Studio is a web-based framework that supports end-users throughout the entire life cycle of services. As a web-based tool, the Studio's functionalities can be accessed via a browser, and it is designed for both technical and non-technical users, allowing them to interact with services in different

ways. For instance, it allows end-users to find the services they need, to compose them in a mash-up-like manner, to use them, and to monitor and analyse them in a single, unified view.

The project coordinator asserts: 'SOA4All's idea is that prosumers can find and consume services of different providers through a single platform.'

Industrial partners, such as SAP, BT and the Dutch SME TIE have already demonstrated the benefits of SOA4All technology in the public sector, telecommunications and e-commerce. But SOA4All has done much more than that. Among SOA4All's results, or 'assets', are 22 individual components and eight combinations of components that will promote greater take-up of SOA as a whole. For example:

- SWEET, a web application to annotate the semantic description of web APIs and RESTful services (based on HTML) to make them machine-readable and therefore available to be found and used automatically by other web services.
  - SOWER does the same for the WSDL-based web services that provide business services online. WSDL is a format for describing such web services using XML, defining the operations, inputs and outputs involved.
- Both tools offer an easy way to generate semantic descriptions of web APIs and services using a simplified form of WSMO, the W3C's ontology for web services. The project has therefore
- been able to unify the world of HTML- and WSDL-based services by defining a 'Minimal service model' which describes services in terms of RDF<sup>2</sup> triples according to the W3C standard.
  - Other state-of-the-art tools comprising the Studio include:
    - iServe: a service repository for annotations and their publication which follows Linked Data principles;
    - Feedback management framework to handle user feedback on services;
    - SOA4All Composer which graphically combines semantic web services via data flow and control flow. The backend is a powerful engine that supports service composition and helps overcome the gap among business users, process experts and IT experts;
    - SPICES automates the consumption of semantically enriched services, both WSDL and RESTful, by making use of annotations;
    - Studio Dashboard and UI Widgets allow for the interactive drawing and modelling of API and widgets to support development work using other Studio modules;
    - Analysis Platform to extract knowledge from service and process execution, as well as user feedback, at different levels of abstraction;
    - Recommender system which provides suggestions based on user behaviour.

It also includes further innovations to the backend to support the discovery and ranking of services and a distributed semantic space infrastructure.

### Business opportunities

Many business opportunities have also emerged from the project and its results, according to Mr Prunés Soler. Knowledge management specialists Ontotext, for instance, successfully applied SOA4All's results in its development of a real-time semantic publishing platform behind the BBC's 2010 World Cup website. And Seekda, which develops apps for e-commerce, is exploiting a service crawler (finder) tool developed within SOA4All.

Internet services company Hanival is developing an application that draws

on SOA4All's e-commerce framework, services, annotations, processes and ontologies which help define and describe a field of knowledge. Meanwhile, French research institute INRIA used project results in the latest GCM/ProActive implementation by OW2, the 'OpenWeb' Consortium which promotes open-source components for the likes of distributed web applications and grid computing.

'ATOS is launching an internal proof of concept related to SOA Business Process Management technology. Its purpose is to validate the use of SOA4All technology as a cheaper alternative for our client solutions in some particular cases and to what extent it reduces the need of technical staff when business processes are modified,' concludes Mr Prunés Soler.

The SOA4All platform, along with its constellation of web-based tools, certainly seems to have the potential to make developing services on the Future Internet easier and more cost effective.

SOA4All received EUR 9.47 million (of the project's total budget of EUR 13.49 million) in funding under the EU's Seventh Framework Programme (FP7), sub-programme 'Service and software architectures, infrastructures and engineering'.

The project was coordinated by ATOS Research & Innovation in Spain.

- 1 'Service oriented architectures for all'.
- 2 'Resource description framework' (RDF) is a family of World Wide Web Consortium (W3C) specifications first designed as a metadata model. It is based on the idea of making statements about resources (i.e. web resources) in the form of subject-predicate-object expressions, or triples. For example, in the statement 'The sky has the colour blue', the triple breaks down into subject (sky), predicate (has the colour) and object (blue).

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7627





## Putting knowledge in context to end information overload

*Too many e-mails? Too many phone calls? Too much time spent searching the Internet? Knowledge workers, from sales staff and consultants to designers and engineers, all know what information overload feels like: stress, confusion and reduced productivity are just some of the side effects. An EU-funded research project has developed and deployed a promising solution that makes handling these tasks much easier.*

These days, most people in Europe and the rest of the developed world are, in one way or another, knowledge workers. From customer-support representatives fielding calls about products to architects drafting new projects, millions of people spend much of their working lives dealing with information: in e-mails, documents and databases, on the phone, on the Internet or searching their corporate intranet. But often the information they need to do their job efficiently is not at their fingertips.

'One study found that the average corporate worker spends a quarter of their time on e-mail-related activities alone and that doesn't include the time spent searching for material on the web or on their corporate intranet,' notes John Davies, the chief researcher for Future Business Applications & Services at BT Innovate & Design.

Dr Davies and a team of researchers from seven countries identified three key areas where knowledge workers need help and where ICT can be of assistance: accessing and sharing formal knowledge, accessing and sharing informal knowledge, and ensuring quick access to information specifically related to the task they are carrying out, their so-called task context.

Working in the Active<sup>1</sup> project, supported by EUR 8.25 million in funding from the European Commission, the team developed a set of innovative tools and applications to make knowledge workers' jobs easier, help them work more efficiently and, in turn, increase productivity — in line with the EU's goal of becoming the world's leading knowledge-based economy.

Using a range of technologies, from data mining and semantic search to machine learning and process modelling, the tools make up the 'Active knowledge workspace' (AKWS): a set of applications to enable users to manage their task context and prioritise information delivery, while also

helping them share and access the informal knowledge of colleagues. The system, which integrates easily with common e-mail, word processing and knowledge management software, is currently being used by Accenture, one of the project partners, and on a trial basis by BT and Cadence, another partner.

'We didn't want to create another new tool that users would have to install and run separately from their existing systems. AKWS embeds itself in commonly used Windows and Office software,' Dr Davies, the Active project coordinator, says.

First, it allows users to define their context and can automatically suggest a context for them. For example, when a sales person receives an e-mail from a client, the system would automatically provide them with links to information related to that client within their workspace, dramatically reducing the time they need to spend finding information. Web 2.0 technologies and semantic tagging further enhance the performance of the system.

### Multitasking made easy

'One of the hardest things for workers to do is switch context. They're working on one project and an e-mail comes in that needs to be dealt with urgently and they suddenly find themselves off down another path. The Active system helps them switch between task contexts quickly, improving their productivity,' the project coordinator explains.

It also learns from how they perform certain tasks. Intelligent software, developed by Slovenian project partner JSI, looks for patterns of repetition in how they go about their work and stores them as processes to be used in the future, not just by the worker themselves but also by other workers.

'While companies have formal processes for certain tasks, we all have our own ways of doing things. A worker might find a short cut, a more efficient way, or develop a process to

get a task done that isn't documented anywhere,' Dr Davies says.

A consultant working on patent applications might first search a certain database, then check with an expert, or fill out an application form, all in a given order. 'This kind of knowledge is rarely written down,' he notes.

The Active tools intelligently and automatically store this knowledge and make it reusable so the worker does not need to 'reinvent the wheel' every time a new project comes in. And, instead of sharing this knowledge informally, in chats around the water cooler, for example, the knowledge can be shared formally with other co-workers.

The response of workers to the system has been very positive, the coordinator notes, pointing to the results of three trials conducted by the project at Accenture, BT and Cadence.

At Accenture in France, the Active tools have been used to augment the consultancy and technology services company's existing knowledge-management systems, primarily in the enterprise search sector.

'Consultants, as you can imagine, work within very tight time constraints and are therefore highly motivated to reuse knowledge. We had 104 consultants involved in the trial, and the vast majority said they wanted to continue using the Active tools,' Dr Davies notes. The company has since started using the system commercially.

Similarly, BT has extended the trial and continues to use the AKWS system with members of its sales team in the United Kingdom. 'Sales people often have to switch context very quickly and our evaluations showed that the tools really helped,' the coordinator says.

At German semi-conductor design company Cadence, meanwhile, the Active tools were used to document and reuse complex design processes



© Bruce Rolff Shutterstock

followed by electronic design engineers, so the knowledge could be passed on to new employees.

The Active team have made some of their software available under an open-source licence so that other companies and researchers can benefit from the technology, and they have published a book, *Context and semantics for knowledge management: technologies for personal productivity*, based on the project results.

'If workers can reuse knowledge more effectively and work more efficiently, everyone benefits: the workers themselves as they are able to get more done, their companies through increased productivity and, evidently, the economy and society in general,' notes Dr Davies.

The project was coordinated by BT Innovate & Design in the United Kingdom.

1 'Enabling the knowledge powered enterprise'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7406



## IT AND TELECOMMUNICATIONS



## EU project develops advanced data management system

*An EU-funded team of researchers has succeeded in developing a novel accounting framework that uses sophisticated tools for policy analysis. The Exiopol<sup>1</sup> project is backed under the 'Sustainable development, global change and ecosystems' thematic area of the EU's Sixth Framework Programme (FP6) to the sum of EUR 5 million.*

Because every country is inter-related with others in the global economy, it is important to understand the true impacts of consumption in each country. However, many impacts of consumption are generated abroad. The tools developed by Exiopol support our need to comprehend the complex pattern between cause and effect, and to understand the trade and competitiveness implications for policies.

The Exiopol consortium transformed and harmonised data,

and developed an advanced data management and analysis system. The project partners linked data on external costs that were established at the micro level, with estimates at the national level. For the first time ever, the databases then incorporated information on the environmental impacts.

The project partners developed the detailed global input-output database that impacts all countries, where 43 countries represent 95 % of the global economy

and 160 countries make up the remainder. Exiopol distinguished 130 sectors and products, and recorded 30 emissions and 80 types of primary resource extractions for each industry. The team also inventoried the use of 60 energy carriers by industry, using the database.

The consortium also updated and detailed external costs by type of emissions, industry sector and country, and for a range of themes: health, agriculture, biodiversity, forestry and wastes.

Coordinated by the Fondazione Eni Enrico Mattei (FEEM) in Italy, the Exiopol partners set out with three objectives in mind. The first was to synthesise and develop estimates of the external costs of key environmental impacts for Europe. The second was to establish an operational and detailed output table for 25 EU Member States that includes environmental extensions comprising as many of these estimates as possible. The third objective was to apply the findings of the external cost estimates and environmentally extended input-output analysis in order to evaluate key policy questions, and assess the value and effect of past research in external costs on policy-making.

Going beyond the EU-25, however, the Exiopol team said the

input-output table would be embedded in a global context as well. This would allow policy-makers to assess the effects of Europe-based sustainability measures on the economic competitiveness of the 25 EU Member States.

The project team has made it possible to make worldwide estimates of external costs of global production, to evaluate how final consumption in a country also affects the global value chains, and how the effects vary across countries.

Ultimately, the project helped expand and synthesise the database on environmental costs within the EU, measured in monetary terms.

The Exiopol team comprised experts from Austria, Belgium, China, the Czech Republic, Denmark, Finland, France, Germany, India, the Netherlands, Norway, Poland, Spain, Sweden and the United Kingdom. The project was coordinated by the Fondazione Eni Enrico Mattei (FEEM) in Italy.

1 'A new environmental accounting framework using externality data and input-output tools for policy analysis'.

Funded under the FP6 programme 'Sustainable development, global change and ecosystems'. Promoted through the Research Information Centre. <http://ec.europa.eu/research/infocentre> > search > 23336



© wong yu liang, Shutterstock



## Multimedia at your fingertips

*New online search technology and algorithms are set to help users find what they want more easily in the growing sea of online multimedia content.*

The Internet has become a huge repository for multimedia information, i.e. a combination of audio, video and photos, from

scientific presentations to music video clips. As this online treasure grows, it is important to develop easier and more efficient ways to

search for relevant multimedia content.

The EU-funded SOMIR<sup>1</sup> project sought to address the challenge of obtaining desired multimedia information. It employed a semantic-oriented approach that considered a combination of

multimedia metadata, indexing algorithms and user queries to achieve accurate searches.

In more detail, the project investigated how a user's query is executed to develop more efficient content indexation, which is crucial for managing and retrieving

relevant information. It looked at indexing based on algorithms that generate diverse, heterogeneous multimedia metadata. The latter could refer to the language the content is written in, tools used to create it and links on the subject, enabling browsers to improve the user experience.

SOMIR improved the relevance of query results through query enhancement and/or query rewriting, as well as by identifying the relevant algorithms to improve indexation and querying. Finally, the technology used query histories to create personalised search recommendations for users.

The results of the project were published in numerous articles, recognised journals and papers. They may ultimately help third parties upgrade the way multimedia content reaches its audience and enhance the information age in many ways.

The project was coordinated by the Université Paul Sabatier Toulouse III in France.

- 1 'Semantic oriented multimedia indexation and retrieval'.

Funded under the FP7 specific programme People (Marie-Curie actions).  
<http://cordis.europa.eu/marketplace> > search > offers > 7741



© Sergey Khakimullin, Shutterstock



## Saving ecosystems with open data and e-infrastructure ecosystems

*Take maps of marine biodiversity and cross-reference them with records of fish catches and you should get a clear picture of where fish stocks are most at risk. Doing so could help save the world's oceans, but needs a huge amount of complex data to be processed and analysed. EU-funded researchers are solving the problem with an innovative, inspired-by-nature approach to e-infrastructures and looking at ways open data initiatives can be integrated.*

E-infrastructures use grid and cloud computing to harness the storage, processing and software functionality of a multitude of distributed resources. An e-infrastructure could be set up by a group of biology researchers, for example, to study a specific problem. Using an e-infrastructure, the biologists might create a Virtual

Research Environment (VRE) for collaboration while harnessing grid-computing resources to process information from one source and analyse it with data-mining software tools from another. But what if, during the course of their work, they want to cross-reference their data with information from other researchers using

different data, software and computing systems, or even public open data resources?

'Integrating resources across different e-infrastructures is very difficult and time-consuming, and in many cases requires a new e-infrastructure to be built, which is neither time- nor cost-effective,'

explains Donatella Castelli, a researcher at the Institute of information science and technology 'Alessandro Faedo' of Italy's National Research Council.

If those different e-infrastructures exist in an ecosystem where, as in nature, they are aware of each other >

## IT AND TELECOMMUNICATIONS

and are able to cooperate or even compete, sharing resources among them becomes dramatically simpler, easier and cheaper. It was this vision that led a consortium of universities, research institutes, companies and a UN body to launch the D4Science-II project. Supported by EUR 4.3 million in funding from the European Commission, the project created an interoperable framework for e-infrastructures — an e-infra-structure ecosystem in which data, computing and software resources belonging to different e-infrastructures can be shared regardless of location, technology, format, language, protocol or workflow.

Interoperability between e-infrastructures in the D4Science-II 'Knowledge Ecosystem' is provided in two ways: through the use of common standards among e-infrastructures and, most importantly, through so-called 'mediation frameworks'. These mediation frameworks consist of software that translates and transforms heterogeneous data and processes in such a way that they can be used in different contexts by different e-infrastructures, making cooperation possible. The backbone of the system is gCube, a scalable software framework that enables interoperability and which underwent testing by Hungarian project partner 4D SOFT.

The D4Science e-infrastructure not only aggregates resources

and makes them interoperable but also offers them back to other e-infrastructures, allowing them to dynamically access data, software tools and computing power.

'In this sense, the e-infrastructures in the ecosystem can be competitive. Researchers can choose from among the resources available those that best suit their needs at any given time,' Dr Castelli notes.

The strength of such an approach is visible in the VREs and in the gCube applications (open access VREs) set up as part of the D4Science-II project and available on the D4Science portal.

'D4Science-II has its origins in two earlier projects, Diligent and D4Science, which started developing infrastructures for digital libraries built on grid-enabled e-infrastructure. However, we saw that a lot of e-infrastructures already exist for specific purposes and realised that it is better to use the resources they have and make them work together, rather than building a new e-infrastructure each time. Our focus in D4Science-II therefore changed from enabling e-infrastructures to building an e-infrastructure ecosystem,' Dr Castelli explains.

### From biodiversity and fishing to high-energy physics

The ecosystem has been used for supporting VREs in fields such as high-energy physics, biodiversity, fisheries and aquaculture resources.

It has helped open up new areas of research between them and is now being extended to new domains.

AquaMaps, a project to create global distribution maps of the world's marine species, utilises grid and data e-infrastructure resources through a VRE set up on the D4Science infrastructure.

Generating high-resolution maps showing the distribution of fish species is a computationally intense task: drawing a single multi-species map requires 125 million computations. Without a grid-enabled e-infrastructure, generating the collection of maps required to support a research activity might take days; with grid computing it takes just hours. Within the D4Science ecosystem, three separate but related VREs working with fisheries data have been able to use information and resources provided by different data e-infrastructures (GENES-DEC for Earth observation data, GBIF for biodiversity data, and FIGIS for fisheries information). With this capability, they have been able to carry out innovative statistical analysis processes that were simply impossible before, combining information about fish species and location of catches with environmental and geospatial data, for example.

'We collect statistics on all sorts of fisheries from all sorts of countries and of a wide diversity of data qualities. D4Science helps us bring all this data together,'

notes Anton Ellenbroek of the FAO's Fisheries and Aquaculture Department in Rome. 'It's a really important infrastructure... it allows us to analyse statistics in ways that were not possible before and we can easily share with other virtual research environments.'

The FAO also hosted a workshop with the project on 'Digital Repositories - Linked Open Data' to examine solutions to publishing digital repositories as linked open data using advanced tools such as the D4Science VREs.

The success of VREs dealing with fisheries and biodiversity data in D4Science-II has inspired two follow-up projects in the field.

In 'i-Marine', researchers are applying the ecosystem approach to fisheries management and conservation of the marine environment, using an open platform based on the D4Science infrastructure to work with a set of knowledge and data sources much broader than that used in conventional fisheries management.

And in the 'EU-Brazil open data and cloud computing e-Infrastructure for biodiversity' (EUBrazilOpenBio) project, European and Brazilian researchers are using the e-infra-structure ecosystem approach to set up an open access platform integrating existing European and Brazilian e-infrastructures and resources for biodiversity science.

'Cooperation across e-infrastructures opens up entirely new possibilities and areas of research. We can analyse scientific data against economic statistics, for example, to get an entirely new perspective that was not available before,' Dr Castelli says.

The project was coordinated by the Institute of Science and Information Technology, CNR, Italy.

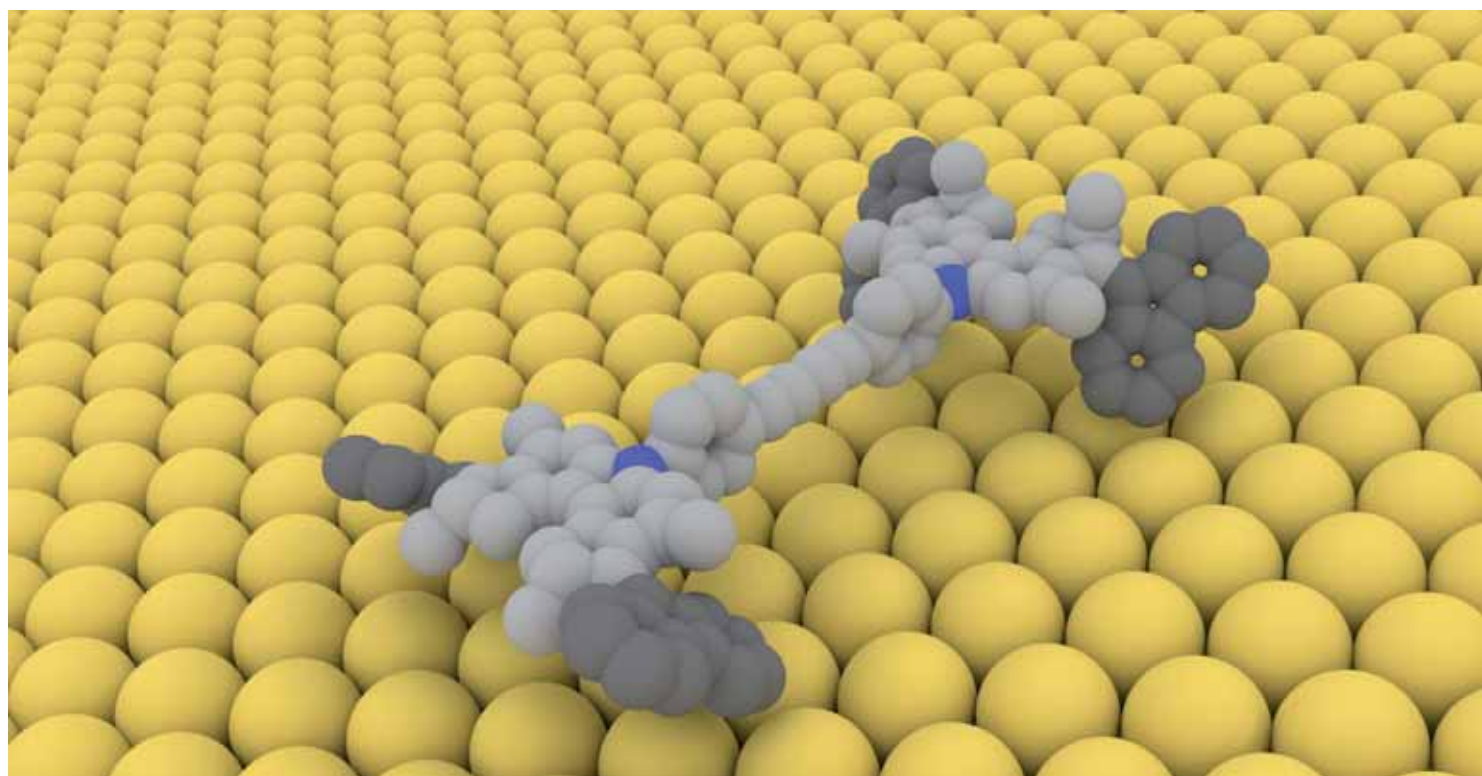


© Rich Carey, Shutterstock

1 'Data infrastructures ecosystem for science'.

Funded under the FP7 specific programme Cooperation under the theme 'Information and communication technologies'.  
<http://cordis.europa.eu/marketplace/search/offers/7946>





© EMPA

## A noiseless, emission-free car? Europeans are on the right track

*Dutch and Swiss researchers have developed a four-wheel drive car that produces no noise and no emissions. Presented in the journal Nature, the study was funded in part by the Molecular Motors<sup>1</sup> project, which is supported through a European Research Council (ERC) Advanced Grant worth EUR 2.18 million under the EU's Seventh Framework Programme (FP7). The researchers say this prototype symbolises lightweight construction at its most extreme.*

Engines can transform chemical, thermal or electrical energy into kinetic energy to allow movement of goods from points A to B. In this same vein, Mother Nature does the same thing. Motor proteins such as kinesin and the muscle protein actin perform this task. Researchers say these proteins usually glide along other proteins and 'burn' adenosine triphosphate (ATP).

Scientists from the University of Groningen and the University of Twente in the Netherlands, as well as the Swiss Federal Laboratories for Materials Science and Technology (EMPA) and the University of Zurich in Switzerland developed this nano car that contains only one molecule and travels on four electrically driven wheels in an almost straight line over a copper surface.

By synthesising a molecule from four rotating motor units, the team has brought Europe one step closer to the development of artificial nanoscale transport systems. 'To do this, our car needs neither rails nor petrol; it runs on electricity,' explains EMPA researcher Karl-Heinz Ernst, who is also a professor at the

University of Zurich. 'It must be the smallest electric car in the world — and it even comes with a four-wheel drive.'

The challenge in developing this car is to improve its refuelling capacity. According to the researchers, because it measures 4x2 nanometres (nm), which is about 500 million times smaller than a Volkswagen Golf, it needs to be refilled with power after every half revolution of the wheels. This is achieved through the tip of a scanning tunnelling microscope (STM). Its molecular design also limits the wheels' turning ability; it can only turn in one direction. 'In other words, there's no reverse gear,' Professor Ernst continues.

The researchers point out that based on its 'construction plan', the drive of the complex organic molecule functions in the following way: after sublimating it on to a copper surface, positioning an STM tip over it and leaving a reasonable gap, a medium voltage of no less than 500 millivolts (mV) is applied. Electrons then 'tunnel' through the molecule, generating reversible structural changes in each of the

four motor units. A cis-trans isomerisation emerges at a double bond. Both side groups tilt to pass each other and return to their original position. If all four wheels turn simultaneously, the car travels forward.

After performing 10 STM simulations, the researchers found that the molecule had moved forward by 6 nanometres. 'The deviations from the predicted trajectory result from the fact that it is not at all a trivial matter to stimulate all four motor units at the same time,' says Professor Ernst.

The project was coordinated by the University of Groningen in the Netherlands.

1 "Molecular motors — controlling movement at the nanoscale".

Funded under the FP7 specific programme Ideas by the European Research Council.  
Promoted through the Research Information Centre.  
<http://ec.europa.eu/research/infocentre> > search > 23373

## INDUSTRIAL TECHNOLOGIES



### Cheaper alloy material in the pipeline

*An international team of scientists led by the University of Zagreb in Croatia have developed materials that remember their original shape and switch from one form to another at a much lower cost. Backed by EUREKA, a platform for research and development (R&D)-performing entrepreneurs in Europe which comprises 39 partners, including the European Commission, Professor Mirko Gojic of the University of Zagreb and his team investigated how to drop the price of 'smart metals' and develop a product that could be brought to market by 2013.*

Researchers recognise the high cost of alloy used to produce shape memory materials based on nickel and titanium. The development of a cheaper product could lead to the manufacturing of a cheaper alloy for use in aerospace engineering or electronics. Enter the RSSMA<sup>1</sup> project, which has developed an inexpensive alternative.

The flexible characteristic of shape memory alloys can result in the production of various shapes and sizes for various uses. While they are not as strong as steel, their elasticity and properties make them a select choice for shapes that are exposed to high temperatures. These can be used in robotics, smart phones and even medical equipment. Nickel-titanium alloy balloons, that expand and adapt to the shape of a blood vessel when exposed to body temperatures, are used in stent grafts and surgery, for instance.

The cheaper alloy produced by Professor Gojic and colleagues is based on copper. Today's most popular alloy, and also the most expensive one, is produced on a 50:50 mix of titanium and nickel called 'Nitinol'. Professor Gojic and his team's latest product is just what the industry needs.

'We are not the only ones to put our efforts into research on copper alloys,' says Professor Gojic. 'We contributed to the extent of the possibilities offered by our infrastructure and benefited greatly from collaborations with international partners.'

Because the Croatian team lacked the facilities to manufacture the new alloy, the EUREKA grant enabled them to expand an existing collaboration with colleagues from the Faculty of Mechanical Engineering at the University of Maribor, Slovenia. The latter helped the Croatian team



© Alaska, Shutterstock

to produce the alloys, which were then tested and examined for their characteristics in Croatia. Professor Gojic and colleagues also worked with experts at Montanuniversität Leoben in Austria, and the Faculty of Natural Science and Engineering at the University of Ljubljana in Slovenia.

'It is difficult to know exactly how much cheaper the final product will be — it is an important economic parameter to evaluate the success of the project — and it depends partly on techniques used to produce the alloy,' Professor Gojic points out, 'but it would certainly be a cost-effective alternative, as titanium and nickel are far more expensive raw materials than copper and aluminium.' He goes on to say: 'Tests so far have shown that we are on the right way and we should soon be able to enter into the production phase. We have successfully reached the final stages of the research and

testing, notably in setting up a process of "continuous casting", which is crucial for commercial production. It is important because it allows you to get an important quantity of semi-product — you can make it without interruptions, allowing for mass production, as is done with other common metallic materials, such as steel'

Following further research, the team will be able to deliver a final product and launch it on the market.

The project was coordinated by the University of Zagreb in Croatia.

- 1 'Rapidly solidified shape memory alloys'.

Supported by the EUREKA programme.  
Promoted through the Research  
Information Centre.  
<http://ec.europa.eu/research/infocentre> >  
search > 23113

## Micro-manufacturing in the spotlight

*An ongoing research effort has developed a pioneering micro-manufacturing system for LED lights. The innovative concept brings high-speed and self-assembling methods to production lines for small structures, with potential applications in a wide range of sectors.*

The Light-Rolls<sup>1</sup> project brings together researchers from industry and research institutes in eight countries. They will set up a pilot production line to make flexible LED display systems.

Their manufacturing platform is based on RMPD<sup>®</sup>-rotation, a patented process technology to generate three-dimensional (3D) polymer structures using a fast generative manufacturing process. Other innovations to be

incorporated are new self-assembling chip methods and high-resolution and speed-conductive track generation and interconnection based on ink-jet and laser printing technologies.

The team has built a prototype for the rotation unit and confirmed the validity of the concept. They have also developed a suitable surface functionalisation process for the self-assembly of dies, and selected and tested suitable inks



© nikkyok, Shutterstock

## INDUSTRIAL TECHNOLOGIES

and print heads that are compatible with other system parts.

The team has successfully validated the integration of a 2x2 array of 0.25 mm, blue GaN LED chips on to a flexible substrate using the RMPD®-mask process. The overall thickness of the part is 1 mm. The researchers will test key parameters including the flexibility, efficiency, colour, operating life and thermal-management capabilities.

Another important issue is defining the architecture of the process-control software. The researchers are analysing the needs of the production line and setting out the main parameters of the information technology (IT) systems needed to control it.

Work on the EU-funded project will continue until the end of 2012. The opportunities for the European manufacturing industry

are potentially significant, with one partner alone estimating their products derived from the technologies have the potential to bring revenues of EUR 100 million over a five-year period.

The project is being coordinated by Edificio Centros Tecnológicos Parque Científico y Tecnológico in Spain.

- 1 'High-throughput production platform for the manufacture of light emitting components'.

Funded under the FP6 programme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'.  
<http://cordis.europa.eu/marketplace> > search > offers > 7557

## Shedding light on material wonders

*Synchrotrons and 'free electron lasers' (FELs) are typically huge particle accelerators that produce very intense beams of light millions of times brighter than the sun. Manipulating this light enables scientists to investigate molecular structures of materials from organic tissues to metals and more.*

Europe has 17 operating facilities employing synchrotrons and FELs, making it the largest and most advanced network in the world. The ELISA<sup>1</sup> project was designed to integrate European research activities related to synchrotrons and FELs and to open it up to the entire European community. Synchrotrons and FELs have important applications to a variety of fields, including the biosciences and medicine, environmental sciences, agriculture, forensics and engineering.

ELISA fostered smaller and more specialised networks within the umbrella network. For example, NA1-Communicators focuses on providing support to scientists, engineers and staff involved in communicating synchrotron science to the public. NA2-VEDAC was established to develop the Virtual European Data Analysis Centre to provide an integrated software environment for European scientists, while NA3-PUSH supports networking among users and builders of pulsed X-ray sources. For its part, NA4-HERCULES held an annual session and two special courses related to synchrotron radiation techniques, neutrons and nanoscience.

Joint research activities included feasibility studies of novel FEL instrumentation and methods, development of high-Z semiconductor sensors and creation of modelling

and analysis tools relative to manufacturing nano-focusing optics.

Within the first year alone, ELISA network partners published over 120 papers in peer reviewed journals and made over 50 presentations at scientific conferences. ELISA partners were requested to use X-ray techniques to validate the authenticity of nine gold Dacian bracelets, part of one of the most spectacular Romanian archaeological finds in the last 100 years.

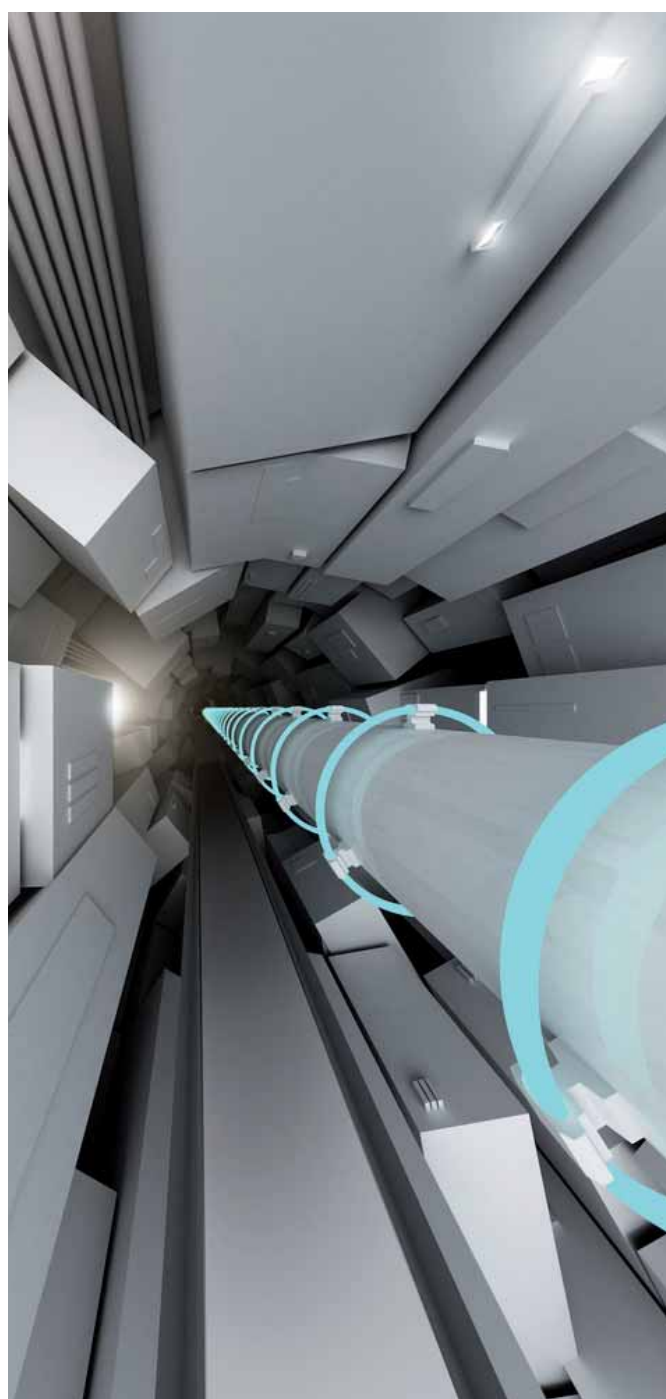
ELISA has a dedicated website serving as the portal to all activities and information for partners, research collaborators and potential users. Project efforts eventually led to the establishment of the 'European Synchrotron Users Organisation' (ESUO), including synchrotron and FEL user representatives from 18 EU Member States plus Israel, Norway, Serbia and Switzerland.

The project was coordinated by Sincrotrone Trieste SCPA in Italy.

- 1 'European light sources activities — synchrotrons and free electron lasers'.

Funded under the FP7 specific programme Capacities under the theme 'Research infrastructures'.

<http://cordis.europa.eu/marketplace> > search > offers > 7676





## INDUSTRIAL TECHNOLOGIES

# Ground-breaking risk assessment of nanomaterials

*An EU-funded initiative is paving the way for identification and rating of nanotechnology-based pollution and health hazards.*

In the last 20 years, a new class of materials has been developed that utilises nano-sized substances to reinforce polymers. Although little work has been done to classify risks associated with nanotechnology-based products, initial research suggests these materials can have a

negative impact on living organisms and the environment.

The NEPHH<sup>1</sup> project is working to evaluate important nanotechnology-related safety risks resulting from production, use and degradation of silicon-based polymer nanocomposites. The researchers

are also seeking ways to reduce or eliminate the negative impact of these materials on personnel, consumers and the environment.

The investigators have reviewed current health and safety procedures regarding silicon-based nanomaterials. This has led to the identification of an urgent need for research, legislation and information dissemination regarding risks associated with the handling of these materials.

NEPHH went on to develop new procedures for production, storage and handling of nanomaterials. Team members then synthesised selected nanomaterials and engineered large-scale structures with these. The investigators subjected the structures to low-velocity impact and evaluated the resulting particle dust.

Results obtained from the NEPHH project thus far provide new insight into nanoparticle behaviour and suggest a framework for

establishment of efficient management and risk-minimisation policy regarding use of selected nanomaterials. This framework could be extended to other classes of nanomaterials, thus improving human and environmental safety and enhancing public perception of nanotechnology and its value.

The project was coordinated by Ekotek Ingenieri y Consultoria Medioambiental in Spain.



© Peter Eggemann, Shutterstock

- 1 'Nanomaterials-related environmental pollution and health hazards throughout their life-cycle'.

Funded under the FP7 specific programme Cooperation under the theme 'Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices'. <http://cordis.europa.eu/marketplace> > search > offers > 7381

## Indium nitride: materials for the future

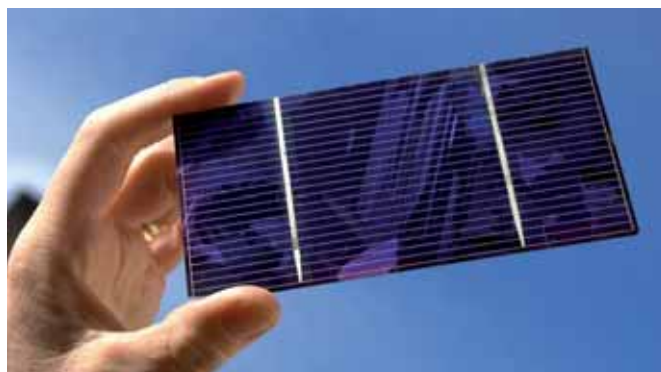
*Industrial and academic researchers are collaborating to carry out fundamental research into indium nitride-based materials. With potential applications in highly efficient solar cells and devices needing high electron mobility, the work is looking at layer-growth mechanisms and optimising material properties.*

The Rainbow<sup>1</sup> project is an EU-funded initiative combining theoretical and applied research into indium nitride (InN)-based materials and alloys.

InN is a new narrow gap semiconductor (<0.7eV) which alloys with GaN (3.5eV) and AlN (6.2eV), enabling coverage of the spectral range from telecom to hard UV wavelengths. Its narrow band makes it an exciting material to develop the highest efficiency solar cells, whilst an electron mobility of 4 000 cm<sup>2</sup>/Vs and very high saturation velocities make InN an ideal material to develop

high-electron mobility devices capable of operating in the terahertz range. However, more research is needed to understand many basic properties of InN and achieve device-quality materials.

Work on the project, which began in 2008, is looking into a number of areas, such as the growth of high-quality InN materials using various techniques, the surface and interface properties of indium nitride and its alloys, and the growth and properties of InN and its alloys' wells and heterostructures, including defects and doping.



© ason, Shutterstock

Considerable progress has been made in different epitaxial growth and layer-characterisation techniques. An important aspect of the project is providing training to early-stage researchers, passing on knowledge from experienced researchers in areas including spectroscopic ellipsometry, quantitative transmission electron microscopy, photoemission, electron channelling contrast imaging and positron annihilation.

The project runs until September 2012 and is coordinated by the Centre national de la recherche scientifique (CNRS) in France.

- 1 'High quality material and intrinsic properties of InN and indium rich nitride alloys (The RAINBOW ITN)'.

Funded under the FP7 specific programme People (Marie-Curie actions). <http://cordis.europa.eu/marketplace> > search > offers > 7583

## Minimising complexity and enhancing competitiveness

*Tight control of both safety and quality in manufacturing is of paramount interest to producers and consumers alike. An EU-funded initiative has decreased the immense computational burden associated with conventional controllers and may make many European manufacturers more competitive in the process.*

Optimisation-based controllers currently use a full online optimisation approach that entails a tremendous computational burden linked to increased cost of supercomputing hardware and software. EU-funded researchers set out to simplify the complex mathematics conventionally used to define a control system in certain applications.

The Connect<sup>1</sup> project was conceived to use parametric optimisation in the development of advanced controllers that shift the computational burden offline. Such controllers are of particular interest in a broad range of applications presently exhibiting significant operational difficulties and limitations. These include industrial systems requiring fast control actions, safety-critical applications in automotive or chemical reactor control, and energy applications.

Imagine a digital picture on your computer represented by a very large number of pixels. The first step in simplifying the computation needed to represent the original picture is to determine the minimum number of pixels required to adequately recreate the original to the user's eye. In other words, after a certain point increased resolution does not produce a visibly detectable enhancement in perception and is thus unnecessary. In the case of the controller algorithm, the researchers defined a minimum number of so-called basis functions that capture all of the system's dynamics without loss of information contained in the original multidimensional representation.

The second step in the digital picture recreation analogy is to determine the spacing of the pixels such that certain features are not smoothed

out entirely (e.g. a nose represented by two points becomes a line and not a curved surface). In the case of the controller, the researchers sought to use powerful linear multi-parametric predictive controller (MPC) algorithms on highly non-linear systems by reducing the non-linear problem to a linear one via piece-wise linear approximations — like creating an apparent curve by joining very small line segments together.

The result of the explicit MPC algorithm was the ability to solve the optimisation process offline in advance, making control implementation possible via inexpensive microcontrollers or programmable logic controllers.

Thus, the Connect project advanced the design of optimisation-based controllers by significantly decreasing the computational burden and



© Nataliya Hora, Shutterstock

cost without sacrificing integrity. The innovative MPC algorithms could thus enhance the competitiveness of small and medium-sized enterprises (SMEs) in fields as diverse as the automotive and wire-manufacturing industries.

The project was coordinated by Process Systems Enterprise Ltd in the United Kingdom.

- 1 'Design of advanced controllers for economic, robust and safe manufacturing performance'.

Funded under the FP6 programme  
'SME activities'.  
<http://cordis.europa.eu/marketplace> >  
search > offers > 7625

## Taking the guesswork out of thermoforming

*European researchers have developed a user-friendly web-based database of important technical parameters in the thermoforming process that, until now, were determined by trial and error. Use of the database should decrease cost, turnaround time and energy use and thus significantly enhance the competitiveness of European enterprises in the thermoform sector.*

Thermoforming is a method of processing plastic sheets by heating them ('thermo') to make them pliable and them 'forming' them into useful shapes for specific products, including cups, lids, trays, as well as dashboards and refrigerator liners. Plug-assists are used to help stretch the plastic materials.

Currently, the thermoform-process parameters and plug properties for use in developing a specific product are largely determined by trial and error, making the process highly inefficient and simultaneously stifling innovation and competitiveness.

The Plugin<sup>1</sup> project was designed to develop a user-friendly database of plug/sheet combinations from

extensive literature searches, simulation trials and actual thermoforming tests carried out by industrial partners. The goal was to promote faster time to market, optimisation of product properties and reduced material and energy costs for the thermoform industry.

Specifically, extensive collaboration among consortium members resulted in a 'Plug Selector' expert system of rules regarding selection and operation of plug materials for thermoforming. Virtual trials or simulations exhibited high correlation with industrial test measurements, demonstrating improved predictive capability and significant reduction in the dependence on trial-and-error methods.

The final expert system was implemented using Adobe Authorware 7, due to its user-friendly web-based interface. Currently, it is password accessible only by partners in the Plugin project. However, a bootable, stand-alone CD has also been developed with the goal of widespread dissemination in the future.

Continued simulation and industrial trial implementation will expand the database to a much wider range of plug/sheet combinations and process settings. Thus, the Plugin project made significant advances in scientific determination of thermoform-process parameters and plug properties. The database should reduce costs and time significantly while increasing the future



© PeterG, Shutterstock

competitiveness of European SMEs in the thermoform sector.

The project was coordinated by Manfred Jacob Kunststofftechnik GmbH in Germany.

- 1 'Plug materials influence on final part quality in thermoforming process'.

Funded under the FP6 programme  
'SME activities'.  
<http://cordis.europa.eu/marketplace> >  
search > offers > 7624

## EVENTS

### International Laser Technology Congress (AKL'12)

*The International Laser Technology Congress will be held from 9 to 11 May 2012 in Aachen, Germany.*

Featuring over 500 participants, around 70 conference speakers and over 30 sponsors, this event has established a reputation as one of Germany's leading forums for applications of laser technology in the production environment. All lectures are available in both German and English. In addition, typical future applications of the latest laser systems and processes will be presented in the applications centre of the Fraunhofer ILT.

For further information, please visit:  
<http://www.lasercongress.org/en/index.html>

### Potential Use of Biomarkers of Inflammation and Early Immunological Events to Assess Vaccine Safety

*An event entitled 'Potential Use of Biomarkers of Inflammation and Early Immunological Events to Assess Vaccine Safety' will be held from 10 to 11 May 2012 in Baltimore, USA.*

This meeting will bring together experts from the biological industry, academia and regulatory agencies to review the possibility of introducing new selected biomarkers in the assessment of vaccine safety at preclinical and early clinical stages (inflammation and early immunological events).

For further information, please visit:  
<http://biomarkers-of-inflammation-2012.iabs.org/>

### 8th edition of AR&PA

*The 8th edition of the Biennial of Heritage Restoration and Management (AR&PA) will be held from 24 to 27 May 2012 in Valladolid, Spain.*

The general theme of this edition and of the 8th International Congress is 'Innovation in cultural heritage'. With the support of UNESCO and in close liaison with the European Commission's DG Research, AR&PA is a major cultural heritage event, with interest for researchers in the field.

For further information, please visit:  
[http://www.jcyl.es/web/jcyl/ARPA/en/Plantilla100Detalle/1267295103271/\\_/1284193953181/Comunicacion?plantillaObligatoria=PlantillaContenidoNoticiaHome](http://www.jcyl.es/web/jcyl/ARPA/en/Plantilla100Detalle/1267295103271/_/1284193953181/Comunicacion?plantillaObligatoria=PlantillaContenidoNoticiaHome)

### 16th International Forum on Advanced Microsystems for Automotive Applications (AMAA 2012) — Smart Systems for Safe, Sustainable, and Networked Vehicles

*AMAA 2012 will be held from 30 to 31 May 2012 in Berlin, Germany.*

ICT, components and smart systems have been essential for a multitude of recent innovations in road mobility. They are expected to be key enabling technologies for changes ahead, both inside the vehicle and at its interfaces for the communication of data and energy (i.e. fuel efficiency, reduced emissions, and zero accidents).

It has been the objective of the International Forum on Advanced Microsystems for Automotive Applications (AMAA) for more than 15 years to detect novel trends and to discuss the technological implications and innovation potential from the very beginning. In 2012, the topic of the AMAA conference will be 'Smart Systems for Safe, Sustainable and Networked Vehicles'.

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



## Week of Innovative Regions in Europe 2012 (WIRE2012)

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

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

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

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

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

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

*For further information, please visit:*

<http://www.wire2012.eu/>

## 5th Familial Cancer Conference

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

The conference will include learning objectives such as:

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

It will cover topics including:

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

*For further information, please visit:*

<http://www.eso.net/events-2.html>

## Industrial Technologies 2012

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

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

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

*For further information, please visit:*

<http://industrialtechnologies2012.eu/>

## The 'Energy and Materials Research' Conference (EMR2012)

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

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

*For further information, please visit:*

<http://www.formatex.org/emr2012>

# CORDIS is the Community Research & Development Information Service

[cordis.europa.eu](http://cordis.europa.eu)

## Key services:

- Browse and find: all the EU-funded research projects, results and reports, multilingual summaries and National Contact Points.
- News and events: available daily in six EU languages from the European Commission or distributed by the research community through CORDIS Wire.
- Partners Service: an interactive platform to promote your organisation and expertise, find business or research partners, create groups and join networks, with search and filtering facilities to find the collaborators best matching your needs.
- *research\*eu results magazine*: to keep up with the latest exploitable outcomes, with regular *research\*eu focus* editions on themes of interest.
- National and regional: a gateway to research and innovation in EU Member States and associated countries.



- User services: email notifications, RSS feeds, forums, facilities for reuse, helpdesk.
- Web publishing platform: for specific programmes, EU research activities and hosted applications.
- The transparent record of EU research projects and results.
- Document library and publication references dating back to 1990.



## Online subscription form

To subscribe to either *research\*eu results magazine* or *research\*eu focus*, please go to:

[http://surveys.publications.europa.eu/formserver/po\\_cordis\\_publications\\_subscription](http://surveys.publications.europa.eu/formserver/po_cordis_publications_subscription)

To order a single issue of a *research\*eu results magazine* or *research\*eu focus*, please go to EU-bookshop:

<http://bookshop.europa.eu/en/home/>



Publications Office

Online services offered by the Publications Office

- [eur-lex.europa.eu](http://eur-lex.europa.eu): EU law
- [bookshop.europa.eu](http://bookshop.europa.eu): EU publications
- [ted.europa.eu](http://ted.europa.eu): Public procurement
- [cordis.europa.eu](http://cordis.europa.eu): Research and development



EN