



European
Commission

research^{eu}

RESULTS MAGAZINE

N°35
SEPTEMBER 2014

SPECIAL FEATURE

BACTERIA: SMALL ORGANISMS, BIG IMPACT



BIOLOGY AND MEDICINE
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TREATMENTS FOR
CHILDHOOD
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SOCIAL SCIENCES
AND HUMANITIES

**EU CITIZEN SCIENCE
INITIATIVE ASKS US
ALL TO DO OUR PART**

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Published by

The Community Research and Development Information Service (CORDIS) managed by the Publications Office of the European Union
2, rue Mercier
2985 Luxembourg
LUXEMBOURG
cordis-helpdesk@publications.europa.eu

Editorial coordination

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The *research^{eu} results magazine* is published by the Community Research and Development Information Service (CORDIS) and managed by the Publications Office of the European Union. Content is prepared using several sources, including CORDIS, the Research Information Centre, ERC, as well as original material collected specifically for this publication.

The *research^{eu} magazines* are free of charge.

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ISSN 1831-9947 (printed version)

ISSN 1977-4028 (PDF, EPUB)

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EDITORIAL

by the editorial team

TAPPING INTO THE UNLIMITED POTENTIAL OF BACTERIA

Groundbreaking, major, game changing... The use of superlatives is commonplace when it comes to advances in science. One could think such jaw-dropping discoveries are made possible only through equally sizeable means and resources. But often the real surprises arise from the infinitesimally small, be it artificial — nanotechnology is probably the convincing example lately — or natural, with a considerable number of advances being made thanks to a better understanding of bacteria.

This trend started a long time ago. In 1860, Louis Pasteur discovered that many diseases were caused by bacteria and realised that heat and disinfectant could kill them.

This finding alone — and later, that of antibiotics by Alexander Fleming — has helped save millions of lives while demonstrating that the things we cannot see are sometimes the most impactful for us and for the world we live in.

Since then, the role of bacteria in the likes of our health, food fermentation, degradation of various compounds, chemical production, biotechnology, ecosystem preservation or the

replacement of pesticides has made these microorganisms one of the most exciting sources of inspiration for scientists. And much of this potential still remains untapped, with most bacteria still having to be characterised.

While summertime is often synonymous with sunshine and beaches, it is also the perfect season for most bacteria to thrive. An ideal opportunity for the *research^{eu} results magazine* to look into the latest EU projects making the most of, or fighting the negative effects of, bacteria.

This magazine puts the spotlight on nine projects related to bacteria. One of these is an interview with Dr Edurne Gaston of the Food Industry Association of Austria. She is also the coordinator of SAFEBAG, an EU project which set out to develop a new in-pack decontamination system for fresh produce. The system eliminates the need for chemicals, resulting in products that are safer for human health and the environment.

These 'specials' are followed by our usual seven sections on biology and medicine, social sciences and humanities, energy and transport, the environment, IT and telecommunications, industrial technologies and space. The magazine closes with a list of upcoming events.

We look forward to receiving your feedback. You can send questions or suggestions to: editorial@cordis.europa.eu



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Focus on
Biotech for
longer, healthier
lives

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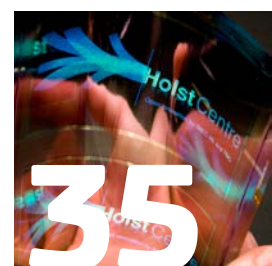
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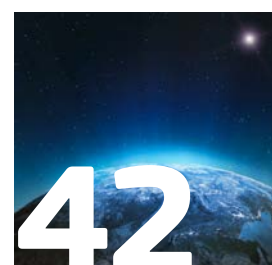
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SPECIAL FEATURE BACTERIA: SMALL ORGANISMS, BIG IMPACT

INTERVIEW

A CHEMICAL-FREE DECONTAMINATION SYSTEM FOR FRUIT AND VEGETABLES

The SAFE BAG project is developing a chemical-free decontamination system for fresh fruit and vegetables that meets consumer demands for safe, nutrient-rich produce with minimal environmental impact.

Globally, we are witnessing an increase in the number of outbreaks of foodborne illness associated with ready-to-eat fruit and vegetables. The treatments currently used, including chlorine washing, often leave a chemical residue and waste water. There is growing demand to reduce the amount of chemicals used in the process, and this can be achieved through the effective yet environmentally-friendly decontamination system currently being developed by SAFE BAG.

With funding from the FP7 programme, the SAFE BAG team is developing a novel in-pack decontamination system that will enable us to reduce the amount of chemicals used in washing. The system is based on a cold atmospheric plasma, generated inside a sealed package containing

the food, which produces highly charged particles (free radicals) to damage or destroy bacteria. Preliminary research has already indicated that this in-pack non-thermal plasma (an energetic ionised gas) can significantly reduce the microbial load of fresh fruits and vegetables.

SAFE BAG is now advancing this knowledge by carrying out further research to maximise potential benefits of this technology. The plasma-based pre-competitive prototype has been built by the team and is ready to be tested by the industry in terms of effectiveness in decontaminating fresh bagged fruits and vegetables.

As the project enters this crucial testing phase, Dr Edurne Gaston Estanga, Group Leader of Food Technologies at IRIS in Spain and Project Coordinator of SAFE BAG, speaks with *research*eu*

magazine about the innovative elements of the technology and the way forward after industry approval.

★ What are the main objectives of the project?

SAFE BAG: The overall objective of the project is to develop a pre-competitive prototype of a novel process to reduce microbial load in packed fresh-cuts, based on cold atmospheric plasma technology. Such a process will ensure food safety and extend the shelf-life of the produce without altering its quality or nutritional profiles.

To achieve this goal, five objectives were set. Firstly, we aimed to use a lab-scale plasma test-rig to optimise the plasma process parameters that lead to maximum antimicrobial efficacy while retaining product quality and nutrition. Our second objective



was to characterise the physical plasma discharge and to correlate it with antimicrobial efficacy, in order to better understand the insides of the process. Thirdly, we aimed to scale up the process to pre-competitive level, i.e. to design and build an industrial prototype unit. Our final two objectives were to validate the performance of the prototype unit in the fresh-cut industry and to demonstrate the viability of the prototype unit.

★ **Why is the improvement of decontamination solutions for vegetables so important?**

Chlorine is one of the most effective sanitisers and its use is widespread in the fresh-cut industry. Despite strict safety & hygiene standards during processing, outbreaks of foodborne illness associated with ready-to-eat fruit and vegetables exist globally. New risks are often encountered because of changing characteristics of relevant micro-organisms and the environment. Increasing the safety of these products is of paramount importance for protecting consumers, especially in view of the growth in the consumption of packaged fresh-cut produce.

★ **What is new or innovative about the project's approach to such decontamination?**

The use of cold atmospheric plasma for food preservation purposes is an innovation in itself, and this technology has recently been added to the list of non-thermal processes for foods. Moreover, the novelty of the SAFE BAG approach lies in generating the plasma inside a sealed package containing the produce, which facilitates rapid treatment and eliminates the risk of post-process contamination. SAFE BAG is a dry, non-thermal and chemical-free

washing technology, compatible with online production and MAP packaging, which leaves no hazardous residues in the treated produce.

★ **How does plasma decontamination work exactly?**

Plasma (also known as the fourth state of matter) is electrically energised gas whereby constituent molecules of the gas split to yield free electrons, radicals, positive and negative ions, quanta of electromagnetic radiation, while some molecules may still remain neutral. There are several types of plasmas depending on the conditions in which they are generated. SAFE BAG uses cold atmospheric (i.e. at near room temperature) plasma with a dielectric barrier discharge approach. The food package is treated between two high voltage electrodes. The high-voltage process ionises the gas within the electric field, including the gas contained within the package. It is this mix of active species which results in the anti-microbial effect. Reactive species interact with the food surface by altering the cell surface structure. This leads to release of cell components, thus affecting cell integrity. DNA damage can also occur depending on the type of bacteria. Crucially the active gas reverts back to stability shortly after, meaning no residual chemicals are left on the product.

★ **Your aim is to increase shelf life while maintaining the product's nutritional value. How successful is the project in this regard?**

Laboratory work has shown promising results for a range of fresh fruits and vegetables, including spinach, cherry tomatoes and strawberries, with significant extensions of shelf-life and

retention of key quality parameters, whereas certain produce has shown less favourable results (e.g. leafy greens). Given the diversity of food products found in the industry, there is no universal approach with regards to food processing.

★ **What are the next steps for the project, and after its end?**

The pre-competitive prototype has been built and is ready for industrial validation, which involves testing the technology for a wide range of industrial products and conditions. The validation trials will take place at the project partner sites, Nature's Best in Ireland and Verdifresh in Spain. The control of the technology under industrial-like conditions is key to the successful adoption of the technology. Additional steps will be geared towards implementing the further development and scale-up recommendations resulting from industry validation trials.

★ **When do you expect the system to be commercialised?**

It is still too early to predict this. There has been significant interest from processors around the world. Testing of the prototype under industrial conditions needs to be completed, followed by a next generation technology aimed at commercial level processing conditions. It is envisaged that this could be completed in 2–3 years.

SAFE BAG

- ★ Coordinated by IRIS in Spain.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/result/rcn/142730_en.html
- ★ Project website: <http://www.safebag-fp7.eu/>



DR EDURNE GASTON ESTANGA



INTELLIGENT WOUND DRESSING FIGHTS INFECTIONS

An innovative wound dressing promises to alert for infections and to tackle bacteria by locally delivering antimicrobial agents on demand. This is achieved by integrating natural biological processes with nanotechnology materials.

Depending on the severity, burning causes injury to the different layers of skin, thereby exposing an individual to potential pathogens. Bacterial infections in burn victims are common and hamper recovery especially in young and old patients.

Scientists of the EU-funded BACTERIOSAFE (Active wound dressings based on biological mimicry) project have set out to develop specialised dressings capable of detecting and tackling bacteria in burn wounds. The innovative design is based on the natural ability of bacteria to secrete virulence factors and rupture the outer membrane of eukaryotic cells. This capacity is being exploited by the BACTERIOSAFE consortium to disrupt novel biomimetic polymer-nanocapsules leading to the release of antimicrobials.

Partners have designed and constructed over 200 variations of nanocapsules. In order to glue them on the dressing material, researchers have tested various methods, including aerosol spraying, adhesion on a sticky film and even embedding nanocapsules in hydrogel layers. The latter approach leads to a higher dosage of reagents and is believed to be more efficacious.

BACTERIOSAFE's innovative wound dressing has been designed not only to exploit natural processes but also to mimic them. As a result, a significant part of the work has been devoted to the biological activity and the biocompatibility of the nanocapsules. This entailed optimising the concentrations of the antiseptics to prevent toxicity, and screening the impact of the nanocapsules on cellular growth and uptake.



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The ultimate aim of the BACTERIOSAFE project is to minimise the need for frequent changes of wound dressings by providing an optical indicator of bacterial infection and offering prompt treatment. This innovative design will be compatible with existing burn dressings as an add-on and is expected to significantly improve burn wound care.

BACTERIOSAFE

- ★ Coordinated by the Max Planck Society in Germany.
- ★ Funded under FP7-NMP.
- ★ http://cordis.europa.eu/projects/rcn/94733_en.html
- ★ Project website: <http://www2.mpip-mainz.mpg.de/eu-projekte/bacteriosafe/>
- ★  <http://bit.ly/1tyMnp8>

A SELF-CLEANING FILTER MEMBRANE

Filtration membranes are used in a wide range of industrial applications, but bacterial films, or biofilms, that grow on such membranes decrease their efficiency. Now, researchers have developed a conductive membrane that can rid itself of biofilms.

Biofilms can reduce the efficiency of membranes by up to 50%, and increase cleaning costs. In addition, membranes need to be replaced often due to fouling, increased membrane pressure or constant cleaning.


The EU-funded CONDUCTMEM (Development of a conductive membrane that generates oxidising surface

to prevent biofilm formation and fouling) project was envisioned to build a conductive membrane that destroys biofilms through the production of oxidising chemicals on the membrane surface. The project first developed 10 different conductive membranes with differing pore sizes, conductivity and flow rates. These were tested to see if they could remove biofilms as researchers expected.

The best membrane was chosen and installed in a laboratory-scale prototype filtration device, which successfully destroyed biofilms during short filtering runs. A demonstration-scale prototype with an automated control system was then built and installed in an industrial wastewater filtering plant.

After several adjustments to operating conditions, the prototype was deemed successful in destroying biofilms during continuous operation. When implemented, the CONDUCTMEM device will save operational costs and help companies comply with increasingly stringent water use regulations in the EU.

CONDUCTMEM

- ★ Coordinated by Fraunhofer in Germany.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/projects/rcn/100444_en.html
- ★ Project website: <http://www.conductmem.fraunhofer.eu>
- ★  <http://bit.ly/1p9EAd6>



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A HIGH-TECH SOLUTION FOR DETECTING BACTERIA IN WATER

Water quality and safety can never be taken for granted. Every day, millions of tons of inadequately treated sewage, industrial and agricultural wastes are poured into the world's lakes, rivers and oceans — the equivalent of the weight of the entire human population in the form of pollution.

Many industries, from food to metal working, require huge quantities of water for their processes, and water quality may seriously affect the quality of finished products, sometimes resulting in waterborne death and illness. Researchers on an EU-funded project have devised an innovative new way for them to tackle this issue.

They have developed a high-tech device designed to detect bacteria in water. The new system will be able to monitor, in real time, the quality of industrial process

“The system will be able to detect a range of bacteria strains in water, including salmonella, listeria monocytogenes and campylobacter.”

water and effluents using an ‘opto-ultrasonic’ device and lipid-based diagnostic kit.

This is the result of the AQUALITY (Online industrial water quality analysis system for

rapid and accurate detection of pathogens) initiative, a project launched in December 2011 and funded under the EU's Seventh Framework Programme. The research ended in February and the device is currently undergoing field tests in Norway.

These field tests are of crucial importance for the industry, where water quality impacts directly on production performances, operational costs and sustainability.

The danger posed by pollutants is illustrated by the fact that fresh water contaminated with pathogens used in the preparation of food has been the source of foodborne disease. It is estimated to cause 76 million illnesses, 325 000 serious illnesses resulting in hospitalisation and 5 000 deaths each year in the USA alone. The situation in Europe is similar — in the UK, for example, foodborne and waterborne illness affected one in every 1 000 in 2005, doubling the number of reported cases in 1995.

Identifying pollutants in water is, currently, mostly carried out manually through sampling and laboratory analysis (off-line analysis). But existing methods are time consuming and costly, meaning that the number of analyses has to be kept to an absolute minimum.

This is why industry called for both novel and cost-effective solutions and more rapid methods, online and at laboratory scale, for detecting major waterborne pathogens.

The online water monitoring device developed under the AQUALITY project is the first of its kind and is designed to replace routine sampling and lab testing of pathogens. The system will be able to detect a range of bacteria

strains in water, including salmonella, listeria monocytogenes and campylobacter.

The US Department of Agriculture estimates the medical costs and productivity losses associated with these three types of bacteria alone amount to at least USD 6.9 billion annually.

AQUALITY involved a multi-Member State consortium, coordinated by the Spanish company ENSATEC.

Jose Manuel Ochoa Martínez, from the project, said the three-year research had produced tangible results, notably a new method for microbiological contamination analysis which will ‘rapidly’ detect the presence of bacteria strains in water and wastewater. Preliminary results, he noted, are ‘really promising and in line with expectations.’

He added, ‘The novelty of our approach is the use of engineered liposomes for detecting bacteria in water. This achievement represents a potentially huge competitive advantage for the enterprise proposing it and could open up a significant international market.’

AQUALITY

★ Coordinated by ENSATEC in Spain.

★ Funded under FP7-SME.

★ http://cordis.europa.eu/news/rcn/36501_en.html

★ Project website:
<http://aquality-project.eu/>





CELL FACTORIES 'À LA CARTE'

Using microbes as cell factories is nothing new, but an EU project has developed means to genetically streamline bacteria to produce vitamins and industrial proteins. Cutting out unnecessary DNA and inserting desired genes will enable researchers to create microbes with the lowest possible energy use but maximum productivity.

Bacillus subtilis (*B. subtilis*), found naturally in soil and hay as well as the human gut is highly amenable to genetic manipulation. As a result, it is now used as a model organism for research and industrial production of nutraceuticals like vitamin B.

"The research team stepped up the efficiency of vitamin B5 production by 40%."

The BASYNTHETIC (Bacterial synthetic minimal genomes for biotechnology) project has cut to the minimum the genetic content of *B. subtilis* to create the ultimate cell factory. This has allowed the research team to step up efficiency of vitamin B5 production by 40%. The door to exploration into the effects of removing genes on cell regulation and survival has also been opened up.

Massively cutting genetic material from a cell can lead to an unacceptable reduction in product output. BASYNTHETIC researchers got around this problem by using computer modelling to select genes crucial for optimal production. The next step was to take the basic streamlined bacterium and add 'plug-ins', groups of genes that control the desired function.

A total of 290 new vitamin B5-producing strains and 405 strains that produced alpha-amylase were cut and then built back up for high-throughput screening. Alpha-amylase is an enzyme with many industrial uses, including production of syrups from basic crops such as wheat, rice and potato.

When so many potential strains can be developed, a rapid screening process to select the best possible microbe is essential. A BASYNTHETIC partner has filed two patent applications for the use of high-throughput technology for screening *B. subtilis*

strains with improved vitamin B5 production.

The BASYNTHETIC team also made headway in researching the mechanisms behind resistance to a broad-spectrum antibiotic, sublancin. Deleting genes is one way of determining exactly what job they do, and the researchers identified many genes involved in sublancin resistance and transport. This is a major step towards disease treatment in the face of antimicrobial resistance.

BASYNTHETIC research has laid the foundation for production of microbes with the basics for survival and the ability to be modified according to production requirements. The ultimate in designer bacterial cell factories is just around the corner.

BASYNTHETIC

- ★ Coordinated by INRA in France.
- ★ Funded under FP7-KBBE.
- ★ http://cordis.europa.eu/projects/rcn/94294_en.html

BACTERIA TO FIGHT THE WAR AGAINST CORROSION

The financial impact of metal corrosion exceeds EUR 1.32 trillion annually, with up to 50% of cases associated with microorganisms. An eco-friendly inhibitor developed with EU funding promises billions of euro in savings.

Corrosion is the primary means of metal deterioration, affecting the safety and function of critical infrastructure and equipment around the world. EU-funded scientists are developing eco-friendly technology to combat 'Microbial-influenced corrosion' (MIC) within the scope of the project BIOCORIN (New biocoating for corrosion inhibition in metal surfaces).

When microorganisms adhere to and thrive on metal surfaces they create a biofilm that serves as the first stage of biofouling. Because current anti-fouling solutions have raised concerns about negative environmental impact, researchers turned to nature to 'fight fire with fire'. Anti-fouling microorganisms that secrete anti-MIC compounds in response to the presence of MIC as a result of the natural antagonism among microbial populations are the key.





The BIOCORIN team used genetic techniques to identify bacteria, fungi and yeast associated with fouling and MIC in samples obtained from four different climatic zones. They also identified two candidate bacteria with anti-MIC properties that were confirmed to be present in the analysed environments and active on corroded steel plates.

“The BIOCORIN technology is expected to increase infrastructure durability by up to 30% and decrease costs by 20% compared to currently available solutions.”

Scientists have incorporated these microorganisms in a sol-gel matrix and applied the coating with various techniques. Preliminary tests of chemical corrosion resistance, mechanical stability and anti-fouling microorganism viability have yielded promising results. Specifically, the coating retained corrosion resistance after immersion in saline solution for 40 days and all microorganisms were still viable after the 11-day test point.

A life-cycle assessment is underway to evaluate the environmental aspects and potential impacts of the BIOCORIN solution over the entire product life cycle. A political,

economic, social and technological analysis of external factors that can affect the product's performance has pointed to important considerations for future product development.

The BIOCORIN technology is expected to increase infrastructure durability by up to 30% and decrease costs by 20% compared to currently available solutions. The overall economic impact is estimated at approximately EUR 612 billion of savings on direct costs of MIC. Environmental benefits abound as well, ranging from minimising the use of hazardous substances to decreasing material usage and energy consumption.

BIOCORIN

- ★ Coordinated by Acciona Infraestructuras in Spain.
- ★ Funded under FP7-ENVIRONMENT.
- ★ http://cordis.europa.eu/projects/rcn/102601_en.html
- ★ Project website: <http://www.biocorin.eu>

HUNDREDS OF NEW ENZYMES DISCOVERED

Marine microorganisms are a promising and still mostly untapped source of enzymes for commercial use. Now, researchers have developed a way to screen for enzyme activity, finding hundreds of new enzymes in the process.

Microorganisms, and particularly bacteria, represent a large portion of the genetic diversity on Earth. But scientists cannot grow most of these microorganisms in laboratory conditions, thus limiting our access to the enzymes (biological catalysts that speed up various reactions) they produce.

“This novel approach identified more than 1 100 potential new enzymes, of which 600 were selected for more in-depth studies.”

The EU-funded MAMBA (Marine metagenomics for new biotechnological applications) project set out to develop and apply a new way to screen microorganisms for useful enzyme activity.



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A high-throughput method was successfully devised at the start of the project. Samples were taken from

various extreme marine locations and used to create 'expression libraries' — a well-established method for

SPECIAL FEATURE

screening all expressed genes in a given sample of microorganisms. These libraries were then screened directly for enzyme activity on specific enzyme targets known as substrates.

This novel approach identified more than 1 100 potential new enzymes, of which 600 were selected for more in-depth studies. Half of those were isolated to be investigated further, and more than 40 new enzyme structures were elucidated.

These figures mean that MAMBA researchers effectively doubled the number of known enzymes that operate at extreme temperatures, high salinity and pH values. The protocols and screening platform used in the project have been commercialised, and several enzymes identified have been earmarked for commercial development. Exploration of the full scope of marine biodiversity is still at an early stage, but an important step

in identifying the potential of microbial diversity has been made.

MAMBA

- ★ Coordinated by Bangor University in the United Kingdom.
- ★ Funded under FP7-KBBE.
- ★ http://cordis.europa.eu/projects/rcn/91262_en.html
- ★ Project website: <http://mamba.bangor.ac.uk>

REINVENTING THE OLIVE

Olives are without doubt an asset in any diet. European research has improved the health status of this important ingredient of a Mediterranean-style menu.



© olgakr, Thinkstock

The olive it seems is a miracle food. According to world-wide research, the black or green fruit is nutritious, protects the heart, improves memory, can control appetite and is delicious in a wide range of dishes. Olive processing involves fermentation to enhance taste and improve preservation.

The EU-funded PROBIOLIVES (Table olive fermentation with selected strains of probiotic lactic acid bacteria. Towards a new functional food) project is honing the biochemistry of the fermentation process and turning the olive into even more of a functional food. Using specially selected strains of bacteria, the researchers are adding microbes that act as probiotics to improve consumer health.

During the natural fermentation of olives, 'Lactic acid bacteria' (LAB) are the dominant microbes. Health benefits of these microorganisms include improved nutritional value of food, control of intestinal infections, better digestion of lactose,

control of some types of cancer and lowering of serum cholesterol levels.

Project scientists screened and isolated 38 LAB strains that have probiotic properties for further testing. The screening process included chemical analysis for the sensory and taste properties of the olives, and traditional microbial screening for the nutritional benefit aspect. Every country's olives are unique and each member of the PROBIOLIVES project selected the best cultures according to this criterion. Altogether, partners in Greece, Italy, Portugal, Spain and Tunisia selected 10 optimal strains.

PROBIOLIVES' researchers developed modelling tools to simulate the results of fermentation using the selected strains along with other predictive models for assessing the risk of pathogen survival. The strains showing normal fermentation can then be included in EU food safety trials.

Packaging and storage systems were also tested to ensure the survival of the unique strains and the overall quality of the final product on the shelf. Successful scaling up from lab to industrial level was achieved for certain strains, including the validation of one strain of *Lactobacillus pentosus*.

Dissemination has been maximised through the web page, press releases, TV and radio interviews, and workshops. PROBIOLIVES' work has not only made way for production of an even healthier health food, but also promises a more competitive European olive industry.

PROBIOLIVES

- ★ Coordinated by the Hellenic Agricultural Organisation in Greece.
- ★ Funded under FP7-SME.
- ★ Project website: <http://www.probiolives.eu>

"The researchers are adding microbes that act as probiotics to improve consumer health."

PLANTS AND BACTERIA GENERATE ELECTRICITY

A recent EU research project developed a proof-of-concept 'fuel cell' (FC) that generated power using growing plants and bacteria. Scientists are now looking at advancing this concept towards commercial application.

A 'Plant microbial fuel cell' (Plant-MFC) is an electrochemical system in which plants harvest light and carbon dioxide (CO₂), and release small amounts of chemicals into the growth medium. There, specific bacteria convert the chemicals into chemical potential energy. While early results in this field have been promising, work is needed to improve energy output.

As such, the EU-funded PLANTPOWER (Living plants in microbial fuel cells for clean, renewable, sustainable, efficient, *in-situ* bioenergy production) project aimed to improve the net power output of the Plant-MFC from 0.0067 watts per square metre (W/m²) to 3.2 W/m². To achieve this, scientists needed to optimise every aspect of the system and improve knowledge of how the various components interact.

Researchers settled on grasses as the most promising type of plant as they are fast-growing, abundant and did not lose vitality while growing in the Plant-MFC. In addition, Plant-MFCs with grasses produced high power and high biomass for other applications.

Genetic differences in the rate of chemical release by the plants were investigated, and point to physical root traits as being the most important factor. The team also chose the most promising bacterial species in order to develop a Plant-MFC inoculum.

Modelling was used to optimise and speed up the Plant-MFC system. The model included growth rates, exudation (the release of the chemicals into the medium), root turnover and energy performance.

More work is needed to produce a useful Plant-MFC, including improving the electrodes, upscaling and real-world testing. Environmental and economic analyses are also required to help PLANTPOWER produce a commercial FC.



"Researchers settled on grasses as the most promising type of plant as they are fast-growing, abundant and did not lose vitality while growing in the Plant-MFC."

PLANTPOWER

- ★ Coordinated by Wageningen University in the Netherlands.
- ★ Funded under FP7-ENERGY.
- ★ Project website: <http://www.plantpower.eu>
- ★  <http://bit.ly/1uej9Qe>

BIOLOGY AND MEDICINE

A NEW LOOK AT TREATMENTS FOR CHILDHOOD CANCERS

Children rarely develop tumours, but if they do, the prognosis is uncertain. Sometimes, the growth just disappears, without therapy. Unfortunately, few families are so lucky, and there are only a handful of specifically developed treatments. The EU-funded ASSET project is finding better ways to tackle some of the cancers that can appear in early life.

Medulloblastoma and neuroblastoma are tumours that mainly affect small children; Ewing sarcoma is a disease that peaks in the teenage years. At the moment, it is hard to tell how such tumours, once diagnosed, are likely to progress, and how best to treat them.

ASSET (Analysing and Striking the Sensitivities of Embryonal Tumours)

set out to address this challenge. Three years into the project, the team has already proposed new combinations of existing drugs that are expected to treat specific childhood cancers more effectively and produce fewer side effects.

These advances may reach clinics in as little as two years. Admittedly, this may seem like a very long time for

patients facing cancer today. But it is considerably faster than the development of new drugs, where the lead times can exceed a decade.

Speed, says project coordinator Professor Walter Kolch of University College Dublin, is one of the team's priorities, which is why the researchers are determined to refine the use of existing drugs. But, of course,

ASSET is also exploring options for new treatments. It is doing so through an in-depth investigation of the molecular mechanisms that cause tumours.

To identify these mechanisms, the partners are using a systems biology approach. 'Instead of analysing single molecules,' says Kolch, 'the systems biology approach analyses how molecules interact with each other and with other processes. So it's not so much about what's wrong with a single molecule, but more about how what's wrong with a single molecule impacts on a wide network of molecules in the cell.'

"These advances may reach clinics in as little as two years."

To explain, he uses the metaphor of an orchestra: a symphony is a collective effort. If a single instrument plays out of tune, cacophony could ensue.

Detecting dissonances

ASSET is establishing how many discordant instruments it takes for this to

happen. Or rather, how many genetic mutations are needed to cause a tumour.

'The mutations that occur in tumours mainly impinge on so-called signal construction networks, the regulatory networks which control what the cell does: whether a cell grows, whether it dies, whether it differentiates,' Kolch explains. If there is something wrong in this communication, the cell ends up following a different beat.

That said, he adds, the human system is fairly robust and, depending on their nature or extent, mutations don't necessarily spell trouble. As we age, we acquire an increasing number of them, and it is much harder to work out which ones are actually related to disease.

Hence the emphasis on childhood tumours, where the key mutations can be more readily observed than in tumours that are more likely to develop in later life. 'Colorectal cancers can have up to 1 000 or more mutations,' says Kolch. 'Medulloblastomas on average have around 10.'

All together now

The partners involved in ASSET combine expertise that covers the

whole process, from fundamental research to clinical application. This complementarity, says Kolch, is crucial. 'Our work,' he adds, 'shows how computational modelling can help to elucidate the causes of diseases and guide the development of new therapies.'

The implications of the team's work extend well beyond its remit. ASSET is also looking into the similarities of the molecular miscommunication causing childhood cancers and a number of other tumours, such as melanomas.

In doing so, the project is helping to consolidate a new understanding of tumours that approaches them as resulting from disruptions in cellular communication. This new approach could pave the way to more effective therapies across the board.

ASSET

★ Coordinated by University College Dublin in Ireland.

★ Funded under FP7-HEALTH.

★ http://ec.europa.eu/research/infocentre/article_en.cfm?artid=32256

★ Project website: <http://www.ucd.ie/sbi/asset/>

ADVANCING CHILDCARE PRODUCT DEVELOPMENT

European childcare industries joined forces to develop a set of knowledge-based tools for designing high-added-value products based on improved comfort and performance that better match users' needs.

Fashion and price have always been the major driving force when it comes to purchasing children's products. However, parents are increasingly interested in comfort, health and usability as well as the features, characteristics and science information related to these products.

Children's needs differ significantly from those of adults and they evolve as the child develops. Apart from the physical parameters, when designing children's products one should also bear in mind comfort and motor aspects as well as the cognitive impact these products have on children.

The key objective of the EU-funded DESIGN4CHILDREN (Development of innovative and cost-effective design support tools for the European childcare products industry promoting the enhancement of children's comfort and extending products' lifespan) initiative was to advance the field of children's products through the development of knowledge-based tools. The consortium consisted of small and medium-sized enterprises (SMEs), with the scope being to offer innovative knowledge about ergonomics and

comfort to companies working on children's products. For this purpose, a set of three tools was designed to implement this knowledge in the product development and market launch processes.

Considerable research and development effort was put into understanding the biomechanical, ergonomic and physiological interactions between children's products and their users. Through focus group conversations, children-relevant blogs, published studies, anthropometric databases and experimentation with users, the consortium collected all the knowledge needed to develop a design-support application. This knowledge was used to define a set of fitting and usability criteria to enable manufacturers to incorporate all necessary features and add enhanced functionalities to children's products.

Additionally, a virtual tester was constructed to evaluate the performance of a given product design without it being manufactured. This system is aimed at designers of childcare products and could benefit manufacturers by reducing production costs.

"The consortium generated a web-based interactive purchase adviser."

Finally, the consortium generated a web-based interactive purchase adviser. The scope of this platform was to help both customers and retailers to select the products that better match the children's needs.

With a number of press releases and participation in innovation-related events, the DESIGN4CHILDREN project disseminated its electronic design platform. Apart from the nearly 1 000 participating SMEs, this virtual design system is expected to benefit the entire European sector of SMEs associated with manufacturing and selling children's products. Last but not least, this novel tool boasts the ability to improve the quality, comfort and usability of childcare products in Europe.

DESIGN4CHILDREN

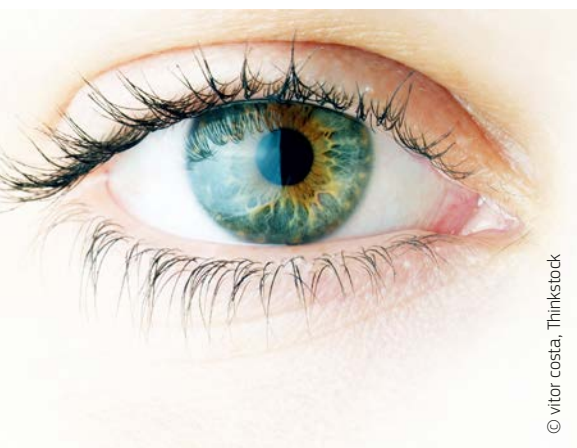
- ★ Coordinated by ASEPRI in Spain.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/95762_en.html
- ★ Project website:
<http://www.design4children.eu>
- ★ <http://bit.ly/1oKLjOA>



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NOVEL TREATMENTS FOR VISION DISORDERS

Retinitis pigmentosa (RP) is a group of hereditary disorders that lead to vision loss. Preserving the function of the degenerating cone photoreceptors was explored as a potential therapeutic intervention in RP patients.



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Affecting over 1 million people worldwide, the genetically heterogeneous RP diseases stem from the degeneration of photoreceptors — the specialised neuronal cells in the eye capable of transducing light into a signal to the brain. In RP, rod photoreceptors that are responsible for night vision degenerate first, followed by cones, which mediate central and light-adapted vision.

The 'Rod-derived cone viability factor' (RdCVF), a protein expressed and secreted by rod photoreceptors, sustains the viability of cone photoreceptors and has been shown

experimentally to correct RP. Given that even 5% of functional cones provide substantial vision, the EU-funded RDCVF (Rod-derived cone viability factor) project proposed to administer RdCVF as a therapeutic strategy against the secondary degeneration of cones in RP.

In order to achieve clinical applicability, the consortium had to ensure that it was able to produce good manufacturing practices-level functional RdCVF protein in mammalian cell lines. For this purpose, analytical methods were developed and specific polyclonal antibodies were produced. In addition, partners established a culture system from chick embryos that enabled them to assess the functional outcome of RdCVF protein expression in terms of cone photoreceptor cell viability. Assays for evaluating the impact of RdCVF protein *in vivo* were also set up, including an automated cone counting system that essentially measured cone density by scanning the retinal surface.

However, the hydrophobic nature of the protein hampered its scalable production and purification using standard methods. As a result, researchers explored the Nxn11 gene for

maintaining photoreceptor integrity by responding to oxidative stress.

Pharmacokinetic and toxicology studies into the fate of intravitreal injection of marker proteins revealed that they enter the bloodstream and could potentially induce thrombocyte activation. In order for this administration route to be clinically viable, partners proposed an alternative approach using nanoparticles that ensures stable release of the protein.

RdCVF protein administration as a therapy for RP has enormous potential provided its clinical-grade production overcomes certain technical hurdles. The pharmacological, pharmacokinetics and toxicological studies proposed by the RDCVF study should still pave the way to a protein therapy.

RDCVF

- ★ Coordinated by INSERM in France.
- ★ Funded under FP7-HEALTH.
- ★ http://cordis.europa.eu/project/rcn/94464_en.html
- ★ Project website:
<http://www.rdcvf.eu>

NEW HEALTH PRODUCTS FROM OLIVE TREES

A method for the purification of several olive compounds that may have health benefits has recently been created.

The olive tree (*Olea europaea*) is a major European crop, covering some 8.6 million cultivated hectares. Olive and olive leaf extracts are rich in biologically active compounds and have long been associated with reduced mortality and improved cardiovascular health.

The EU-funded OLITEC (Bioactive natural compounds extracted and isolated from olive tree using modern technologies: Probing into their therapeutic potential) project was established to develop new ways to extract chemical compounds from olive trees and study them for potential health effects. Academic and industry researchers collaborated with the aim of producing commercial health products.

Traditional methods were used to isolate well known compounds such as oleacein, oleocanthal, hydroxytyrosol and oleuropein. These were tested for anti-inflammatory activity, and also to find out whether they could be used to treat or prevent metabolic syndromes.

OLITEC piloted new methods to enrich extracts for specific compounds: olive leaf extracts were enriched for

oleuropein; olive wastewater was enriched for hydroxytyrosol; and an olive oil extract was enriched for polyphenols. For the first two extracts, researchers carried out a feasibility study for commercialisation.

This project has developed several new health products from olive waste streams. This may help the olive industry remain competitive, indirectly contributing to long-term human health.

“OLITEC piloted new methods to enrich extracts for specific compounds.”

OLITEC

- ★ Coordinated by the University of Athens in Greece.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/90638_en.html
- ★ Project website: <http://olitec.pharm.uoa.gr/>

REGENERATE BETA CELLS — PREVENT DIABETES

Diabetes constitutes a serious global health issue that has reached epidemic proportions over recent years. Understanding how the disease develops will help identify potential therapeutic targets.

Type 2 diabetes (T2D) is an autoimmune disease that develops after destruction of the insulin-producing pancreatic beta cells. The disease commences with insulin resistance, a stage where the body tries to compensate for its inability to use insulin effectively. This gradually leads to either a decrease in beta cell numbers or impaired insulin production.

To shed light on the molecular mechanisms responsible for the impaired beta cell proliferation, the EU-funded BCELL-T2D (Role of pancreatic beta-cell regeneration in the pathophysiology and treatment of insulin resistance and type 2 diabetes) project conducted a time course analysis on a diabetic transgenic mouse model. The idea was to identify molecular targets that could be exploited therapeutically to regenerate the impaired beta cell mass.

The different stages observed in human diabetes were recapitulated in the mouse model. At 4–9 weeks of age, animals developed insulin resistance, frank diabetes was seen at

10–18 weeks of age, while advanced diabetes and its complications were observed only in animals over 19 weeks old.

Interestingly, during the insulin resistance phase an increase in beta cell mass was observed. This proliferative expansion of beta cells coincided with an increase in cells expressing glucagon. Glucagon is a hormone that converts glycogen into glucose and stimulates the release of insulin. Mice expressing glucagon managed to compensate for insulin resistance and did not develop diabetes.

Based on this interesting finding, BCELL-T2D researchers explored various approaches for inducing beta cell proliferation, including cell cycle inducers (cyclin C). Furthermore, through a library of small molecules, the coral-based compound epoxy-pukalide emerged as a candidate for supporting beta cell proliferation and function.

Taken together, the outcomes of the BCELL-T2D study emphasised the potential of beta cell proliferation to



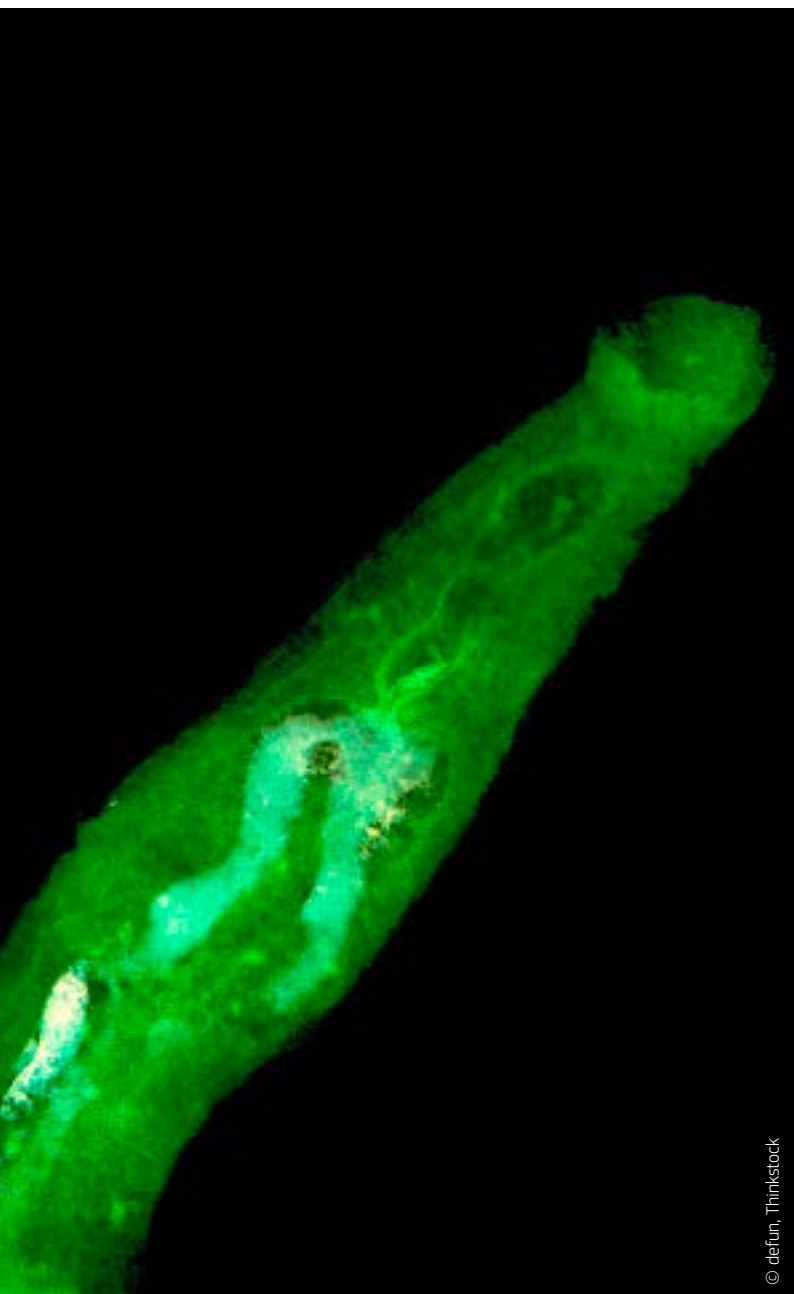
revert the diabetic phenotype. Clinical validation of this approach may help prevent the onset of diabetes. Success would considerably reduce the health-care burden associated with this disease and improve the quality of life of diabetic patients.

BCELL-T2D

- ★ Coordinated by Fundación Biomédica Cádiz in Spain.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/94023_en.html

NOVEL TREATMENT FOR SCHISTOSOMIASIS

Schistosomiasis is a serious chronic infectious disease afflicting millions of sufferers in the developing world. A European study aimed to find ways of treating the disease or preventing its spread.



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key objective of the EU-funded SCHISTOSOMA PROTEASE (Bioactive serine proteases from human parasite *Schistosoma mansoni*) project was to investigate alternative therapeutic approaches.

Scientists explored the option of targeting the parasite's proteolytic enzymes whose normal function is to break down other proteins in various processes. These proteolytic enzymes are highly similar to their mammalian counterparts. Thus, they can interfere with the hosts' normal processes by facilitating immune evasion or affecting anticoagulation and vasodilatation.

Researchers sequenced and verified the function of four *S. mansoni* proteolytic enzyme genes and determined their expression levels at different parasite life-cycle stages. High levels of these enzymes coincided with parasite host evasion, underscoring their importance in the host-parasite interaction.

Selective silencing of these protease genes at the infective larvae stage (schistosomula) provided further evidence confirming their role in parasite infectivity.

Researchers devoted significant effort to the production of recombinant proteolytic enzymes as well as the generation of antibodies against these molecules. These tools could serve as the basis for the pharmacological targeting of the *S. mansoni* enzymes or for the design of prophylactic vaccines. Overall, the SCHISTOSOMA PROTEASE study provided a scientific platform for the translational research and development of schistosomiasis therapeutic interventions.

*“These tools could serve as the basis for the pharmacological targeting of the *S. mansoni* enzymes or for the design of prophylactic vaccines.”*

Caused by the blood parasite *Schistosoma mansoni*, schistosomiasis impacts physiological processes by modulating the host's immune responses. As a result, parasites infect the urinary tract and intestine, inducing a series of symptoms that — depending on severity and duration — could lead to organ failure.

Disrupting the parasite's ability to evade or disrupt physiological processes by modulating specific molecules constitutes an attractive approach for treatment. Given that current options rely solely on the drug praziquantel, the

SCHISTOSOMA PROTEASE

- ★ Coordinated by the Institute of Molecular Genetics of the ASCR in the Czech Republic.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/93028_en.html



SOCIAL SCIENCES AND HUMANITIES

EU CITIZEN SCIENCE INITIATIVE ASKS US ALL TO DO OUR PART

Would you like to help researchers understand the workings of our sun, or discover how large crowds of people can work together? While you may think such breakthroughs are the preserve of highly-specialised scientists with expensive equipment, the EU-funded project SOCIENTIZE allows you to lend your skills and time to some exciting research.

SOCIENTIZE (SOciety as Infrastructure for E-science via Technology, Innovation and Creativity) builds on the concept of 'Citizen Science', which sees thousands of volunteers, teachers, researchers and developers put together their skills, time and resources to advance scientific research. Thanks to open source tools developed under the project, participants can help scientists collect data — which will then be analysed by professional researchers — or even perform tasks that require human

cognition or intelligence like image classification or analysis.

Every citizen can be a scientist

The project helps usher in new advances in everything from astronomy to social science.

'One breakthrough is our increased capacity to reproduce, analyse and understand complex issues thanks to the

engagement of large groups of volunteers,' says Mr Fermin Serrano Sanz, researcher at the University of Zaragoza and Project Coordinator of SOCIENTIZE. 'And everyone can be a neuron in our digitally-enabled brain.'

But how can ordinary citizens help with such extraordinary science? The key, says Mr Serrano Sanz, is in harnessing the efforts of thousands of volunteers to collect and classify data. 'We are already gathering huge amounts of user-generated data from the participants using their mobile phones and surrounding knowledge,' he says.

For example, the experiment 'SavingEnergy@Home' asks users to submit data about the temperatures in their homes and neighbourhoods in order to build up a clearer picture of temperatures in cities across the EU, while in Spain, GripeNet.es asks citizens to report when they catch the flu in order to monitor outbreaks and predict possible epidemics.

Many hands make light work

But citizens can also help analyse data. Even the most advanced computers are not very good at recognising things like sun spots or cells, whereas people can tell the difference between living and dying cells very easily, given only short training.

The SOCIENTIZE projects 'Sun4All' and 'Cell Spotting' ask volunteers to label images of solar activity and cancer cells from an application on their phone or computer. With

Cell Spotting, for instance, participants can observe cell cultures being studied with a microscope in order to determine their state and the

effectiveness of medicines. Analysing this data would take years and cost hundreds of thousands of euro if left to a small team of scientists — but with thousands of volunteers helping the effort, researchers can make important breakthroughs quickly and more cheaply than ever before.

"The project helps usher in new advances in everything from astronomy to social science."

But in addition to bringing citizens closer to science, SOCIENTIZE also brings science closer to citizens. On 12–14 June, the project participated in the SONAR festival with a 'Collective music experiment' (CME). 'Two hundred people joined professional DJs and created musical patterns using a web tool; participants shared their creations and re-used other parts in real time. The activity at the festival also included a live show of R de Rumba and Mercadal playing amateur rhythms', Mr Serrano Sanz explains.

The experiment — which will be presented in a mini-documentary to raise awareness about citizen science — is expected to help understand other innovation processes observed in emergent social, technological, economic or political transformations. 'This kind of event brings together a really diverse set of participants. The diversity not only enriches the data; it also improves the dialogue between professionals and volunteers. As a result, we see some new and innovative approaches to research.'

The EUR 0.7 million project brings together six partners from four countries: Spain (University of Zaragoza and TECNARA), Portugal (Museu da Ciência-Coimbra, MUSC; Universidade de Coimbra), Austria (Zentrum für Soziale Innovation) and Brazil (Universidade Federal de Campina Grande, UFCG).

SOCIENTIZE will end in October 2014 after bringing together 12 000 citizens in different phases of research activities over 24 months.

SOCIENTIZE

- ★ Coordinated by the University of Zaragoza in Spain.
- ★ Funded under FP7-INFRASTRUCTURES.
- ★ http://cordis.europa.eu/project/rcn/105972_en.html
- ★ Project website: <http://www.socientize.eu/>
- ★  <http://bit.ly/1n3cPl7>

LANGUAGE DEVELOPMENT IN DEAF CHILDREN

'Cochlear implants' (CIs) have helped countless deaf children learn to speak, allowing them to lead less challenging lives. But, there may still be differences in spoken language between such deaf children and normally-hearing children — a phenomenon that scientists have recently shed light on.

Morphosyntax, or the way different forms of a word are related, is one of the more challenging aspects of learning a language. However, whether this is more challenging for a child with a CI than a normally-hearing child has not been understood.



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“MORLAS found that only minor differences existed between German- and Dutch-speaking children.”

The EU-funded MORLAS (Morpho-syntactic language skills in deaf children with a cochlear implant: a cross-linguistic study on Dutch and German) project aimed to study the speech level of CI children entering primary school by examining their grasp of morphosyntax. The study

included German- and Dutch-speaking children to see whether there was any variation between different languages.

Researchers first developed a theoretical framework that quantified the differences in morphosyntactic structure between the two languages. This allowed them to compare results between German- and Dutch-speaking children. The data collection protocols from the Dutch study group were adapted for the German part of the study.

Data were collected from 10 CI children and 10 normally-hearing children in Flanders (Dutch), and 10 CI children and 30 normally-hearing children in Vienna (German). MORLAS

found that only minor differences existed between German- and Dutch-speaking children.

For the most part, CI children showed the same learning patterns as normally-hearing children, with the exception of noun plural formation, where CI children lagged behind. This information will help educators and parents improve the linguistic development of children with CIs.

MORLAS

- ★ Coordinated by the University of Antwerp in Belgium.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/103018_en.html

PROMOTING PROSPERITY IN THE MEDITERRANEAN

The Union of the Mediterranean is an alliance between the EU and several Mediterranean countries that aims to promote peace and prosperity in the region. Researchers have investigated the impact of both EU and local trade, sustainability and rural development policies.

Since 1995, the EU and several ‘Mediterranean partner countries’ (MPCs) have cooperated to shape trade policies. However, it has recently become clear that traditional trade liberalisation approaches have not been enough to provide sustainable economic development.

The EU-funded SUSTAINMED (Sustainable agri-food systems and rural development in the Mediterranean Partner Countries) project investigated local and EU policies in the fields of agriculture, poverty prevention, sustainability, food security and trade. Researchers focused on Egypt, Morocco and Tunisia, as well as Turkey, an important non-MPC.

Studies into poverty revealed that the situation has improved over the last two decades, but remains a persistent and significant problem in these countries. Researchers

also found that poverty had a knock-on effect on all other sectors studied.

SUSTAINMED furthermore determined that policies were generally skewed to cater to economic sustaina-

bility concerns, while disregarding resource management, conservation efforts and social aspects.

In order to study the effects of trade liberalisation policy, researchers used the Global Value Chain Analysis approach. They concluded that efforts need to be focused on improving the value of goods rather than decreasing cost of production.



These and other findings were communicated through a series of workshops and seminars, and will be summarised and published in a book. SUSTAINMED will help both EU and MPC policymakers create relevant policies with regards to rural development and sustainability.

SUSTAINMED

- ★ Coordinated by IAMM in France.
- ★ Funded under FP7-KBBE.
- ★ http://cordis.europa.eu/project/rcn/94700_en.html
- ★ Project website: <http://sustainmed.iamm.fr>



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ENERGY AND TRANSPORT

MORE EFFICIENT IN-FLIGHT AIRCRAFT TESTING METHODS

EU-funded researchers are bringing important in-flight aircraft testing technologies from the lab bench to the production line, for substantial cost, time and safety benefits.

All aircraft and aircraft structural parts have to be certified as flightworthy before they can be used in real operations. Flight testing is a key step in the certification process, but it is also one of the most expensive and time-consuming — and it has a significant impact on the environment, burning fuel and producing polluting emissions.

The EU-funded AIM2 (Advanced In-flight Measurement Techniques 2) project, coordinated by Fritz Boden of Germany's DLR, is applying new and more efficient methods to measuring the behaviour of aircraft structures,

and it is bringing these methods to the aircraft manufacturing industry where they are needed.

'Classic, physically based measurements, using pressure probes, strain gauges, accelerometers and the like, require a lengthy installation process and often irreversible modifications to the tested structures,' says Boden. 'In contrast, the new methods we are applying under AIM2 are non-intrusive, they are optically based.'

Boden explains how researchers are using special camera installations and dot patterns, for example, to record

the operation of aircraft propellers during flight tests. Then, with the help of powerful computer tools, researchers can analyse the resulting images to determine the shape and deformation of propeller blades in flight by means of a measurement system called Image Pattern Correlation Technique.

Other AIM2 testing methods involve fibre-optic sensors that can detect changes in pressure, strain and temperature. Infrared imagery is being used to visualise the surface temperature of wings and other flight structures, while laser technologies enable precise determination of air velocity.

AIM2 research represents the logical extension of previous work carried out under research conducted by its predecessor, the AIM project. AIM2 ends in September 2014.

'AIM demonstrated the feasibility of using optical measurement techniques in wind-tunnel and in-flight testing for certification,' Boden says. 'With AIM2, we are continuing to make substantial improvements in the AIM technologies, but we are also taking the next important step, that is

bringing these technologies from the lab bench to industry, to enable their more routine use for in-flight measurement and testing.'

Most of these techniques have been demonstrated in a research environment, says Boden, but they are not yet 'user-friendly' enough to be useful to technicians working in the real world.

'Therefore we are defining application rules and setup parameters for each technique,' he adds. 'And we are preparing tools and software and a special handbook to help teach inexperienced users how to undertake advanced in-flight measurements properly.'

The project's teaching exercise also included a flight-testing workshop in

Poland in September 2013. There, AIM2 partners delivered presentations and demonstrated their techniques on a PW-6 sailplane at the Rzeszów University of Technology.


'The new AIM2 methods enable fast and cost-efficient flight testing and thus save time, money and fuel. The whole process requires less time at the flight test bed compared to conventional methods,' Boden says. 'Furthermore, unexpected aircraft behavioural issues can be investigated *in-situ*, while the aircraft are actually in operation, impacting directly on flight safety.'

Boden says the AIM2 testing techniques can also potentially be used in other sectors, including wind turbine

and automobile manufacturing and in the construction of tall buildings.

The new in-flight techniques have been assessed by AIM2's industrial partners, including small aircraft manufacturers such as Evektor (Czech Republic) and Piaggio (Italy), as well as Airbus, one of the world's largest aircraft manufacturers based in Europe.

AIM2

- ★ Coordinated by the German Aerospace Centre (DLR) in Germany.
- ★ Funded under FP7-TRANSPORT.
- ★ http://ec.europa.eu/research/infocentre/article_en.cfm?artid=32259
- ★ Project website: <http://aim2.dlr.de>
- ★  <http://bit.ly/1zvNcS>

NEW MOTORS TO BOOST ELECTRIC AND HYBRID CARS

An initiative to advance and unify drivetrain technology for electric and hybrid cars could help European businesses in the field significantly. It will also bring the continent closer to a greener land transport model.

About 1 600 European small and medium-sized enterprises (SMEs), mostly automotive industry manufacturers and suppliers, are working on developing cutting-edge hybrid, electric and fuel cell technology for vehicles. These businesses face many challenges, particularly since there is no common drivetrain platform for applications under development, giving an advantage to larger multinational vehicle manufacturers.

The EU-funded project SAFEDRIVE (A platform power management system and low voltage drive train for hybrid and

electric vehicles) supported

European SME electric vehicle manufacturers in penetrating the electric vehicle market. It worked on developing a

"SAFEDRIVE worked on a new split-Pi DC-to-DC converter and a power management/distribution system."

scalable, modular electric drivetrain to suit different types of electric and hybrid vehicles such as small cars, trucks and utility vehicles.

Envisioning a new motor design that requires lowering the voltage of 'direct current' (DC) systems, SAFEDRIVE worked on a new split-Pi DC-to-DC converter and a power management/distribution system. The modular DC motor would eliminate the need for a gearbox, enabling direct drive operation through a drive shaft or as a hub motor. The project team developed an efficient bi-directional DC-to-DC converter in the drivetrain between the modular motors and power sources (super capacitor, lithium-ion batteries, motor-generator set).

To achieve its aims, SAFEDRIVE brought together SME supply chain partners, associations and end-users from across Europe. The project partners investigated existing technologies and developed the software behind the control and power management of the drivetrain. This was followed by the production of new circuit boards, design of the drivetrain component parts and integration into a prototype.

Towards the end of the project the team was very close to completing a fully functional electric vehicle drivetrain with an innovative modular DC motor that produces the desired torque. All the project's results have been disseminated to stakeholders, laying the groundwork for a unified drivetrain that could boost SME results in the field. Thanks to this initiative, Europe has come one step closer to becoming a leader in producing cleaner vehicles.

SAFEDRIVE

- ★ Coordinated by AVERE in Belgium.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/95937_en.html
- ★ Project website: <http://www.safedrive-fp7.eu>



SMART DESIGN AND NANOTECHNOLOGY TO CUT AIRCRAFT OPERATIONAL COSTS

Continuous innovation in aircraft design has led to fuel savings, noise reductions and lower fares for passengers by making flights more efficient. Now an EU-funded project aims to take Europe's aircraft industry to the next level by combining smart new design techniques to further cut development time and costs.



"SARISTU represents a major step forward in successfully integrating smart intelligent structural concepts into traditional aircraft design."

Other innovations have been incorporated to ensure that this development functions properly. After all, a gap between the flap and the fixed aircraft wing would cancel out any positive effect, which is why the team has developed an elastic connecting element. This element is essentially a resin containing carbon nanotubes — nanoscale structures that possess immense strength — which retains its elasticity at incredibly cold temperatures. The resin has also been manufactured to cope with high wind speeds.

Another significant advantage of using carbon nanotubes in these new resins is the potential for weight reduction. Weight savings of up to 3% are possible when compared to traditional fixed systems. And by combining a range of other new technologies, the cost of electrical network installations in planes could be reduced by 15%.

All in all, SARISTU represents a major step forward in successfully integrating smart, intelligent structural concepts into traditional aircraft design, and reflects the potential of nanotechnology in aircraft manufacturing applications. Furthermore, the project has shown that incremental improvements taken together can lead to significant weight and operational cost reductions and lead to improved aerodynamic performance.

The EU-funded SARISTU (Smart Intelligent Aircraft Structures) project, which was launched in September 2011, has focused on the potential application of new materials at specific design phases. By integrating different materials for the wing for example, the consortium has demonstrated that they can achieve a 6% reduction in drag, meaning that less fuel is needed to complete a flight. New aerodynamic designs are also lighter and generate less noise. This will help reduce the impact of overhead aircraft on neighbourhoods near airports.

While such improvements might appear to be merely small-scale adjustments in one aspect of aircraft design, they could have major implications. Some 2.2 billion people a year take to the skies for business or pleasure, which means that pollution

and noise from air travel present the industry with a significant challenge. This is why airlines, aircraft manufacturers and researchers are constantly on the lookout for new ways to make their planes lighter, more aerodynamic and achieve greater fuel efficiency, and why the SARISTU project is of such potential importance.

A specific goal of the SARISTU project, which is due for completion in August 2015 and has received just over EUR 32 million in EU funding, is to combine various technologies in order to achieve manoeuvrable wing-tips. So far, the SARISTU consortium has developed a tab using new materials and technology that can actually change shape during flight. This enables pilots to keep air resistance as low as possible.

SARISTU

- ★ Coordinated by Airbus in Germany.
- ★ Funded under FP7-TRANSPORT.
- ★ http://cordis.europa.eu/news/rcn/36614_en.html
- ★ Project website: <http://www.saristu.eu/>

MULTIFUNCTIONAL AIRCRAFT COMPOSITES

Vibration and acoustic emissions are major concerns when it comes to aircraft. Novel multifunctional materials for structural components promise to reduce both while enhancing protection against the elements.

Composites that combine different materials in one structure allow engineers to optimise multiple properties by combining the strengths of individual constituents. This provides the opportunity for space, weight and cost savings with enhanced performance.

Two important performance criteria are minimised vibrations and acoustic emissions. Vibration causes critical aircraft components to degrade and potentially crack or fail. It can affect everything from electronics and instrumentation to the airframe itself, so vibration reduction is a key goal of any multifunctional structural component. Decreasing acoustic emissions is a pillar of the ambitious European Clean Sky research initiative to reduce the impact of air transportation.

EU-funded scientists working on the project COMPASS (Functional laminates development. Components compatibility and feasibility assessment. Industrialisation) investigated the potential of integrating vibro-acoustic damping materials into carbon fibre-reinforced plastic laminates for a multifunctional solution. Scientists selected various damping materials and manufacturing processes to study and optimise. Although vibration and noise were the main targets, reductions in both had to be accomplished without compromising on mechanical properties. Further, the team evaluated the materials' performance with respect to erosion, lightning protection and sealing against ingress of moisture.

Having determined the optimal materials and processing methods at lab scale, researchers upscaled to deliver

several technology demonstrators. With an eye on future industrialisation, the team took the opportunity during the final stage to prepare its industrialisation strategy.

Commercial implementation of COMPASS's multifunctional materials for aircraft promises a host of important benefits for the aircraft industry, passengers and the environment. Technology will reduce production costs and component weights, the latter reducing fuel consumption, emissions and operating costs. Improved vibration and acoustic performance of aircraft will reduce maintenance costs, increase safety and enhance passenger comfort. Overall, these concepts should enhance the EU's economy and position in the aerospace sector.



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COMPASS

- ★ Coordinated by the Composites Research, Development and Application Centre in Spain.
- ★ Funded under FP7-JTI.
- ★ http://cordis.europa.eu/project/rcn/101624_en.html

NEW SOFTWARE BRINGS THE RIGHT WIND FARM TO THE RIGHT SPOT

Wind farms are springing up all across Europe, covering some 8% of the EU's electricity needs in 2013 according to the European Wind Energy Association (EWEA). But several drawbacks have so far prevented this share from growing as much as it could: most notably, citizens have complained about the noise, disturbances in telecommunications and the impact on ecosystems. But what if a single piece of software could solve all these problems?

The SOPCAWIND (Software for the Optimal Place CALCulation for WIND-farms) project has developed new software to optimise wind farm placement in Europe, taking into account criteria as varied as wind power, local environment characteristics, potential interference with communication systems, noise, nearby housing exposure to the sun, visual impact or even the existence of archaeological artefacts on site.

The software — the first ever to integrate such a complex and

multidisciplinary database — was presented recently at the EWEA 2014 Annual Event. It aims to facilitate the design of wind farms by ensuring that all the above-mentioned aspects are taken into consideration in the wind farm design process, thus avoiding post-construction trouble and reducing cost. Multiple stakeholders from both the public and private sectors provided precious data to feed the system.

'Thanks to this tool, firstly the design process of the wind farm is much

"The developer knows in advance if there is any trouble and can include modifications in the wind farm in order to avoid it."

more fluid, and secondly, the developer knows in advance if there is any trouble and can include modifications in the wind farm in order to avoid it, which is a key aspect,' explained Daniel de la Vega from Tecnalia's


Signal Processing and Radio-communications Group (TSR). Screening development opportunities and optimising wind farm design indeed require extensive knowledge of the local legislation, development constraints and extensive knowledge of the trade-off between capital cost and production yield. SOPCAWIND accelerates the process and makes it less costly by performing tasks which previously required the combination of expensive software tools.

Tecnalia led the project, while TSR specifically helped create the algorithms that enable a thorough evaluation of possible impacts on radars, air navigation system aids and other telecommunications. 'Although interference is not common, a wind farm can alter a radar signal that is 10–20 kilometres away,' de la Vega stressed. 'Because these impact studies are conducted before the wind farm is built, they allow potential interference to be detected if it does in fact exist, and so the wind farm developer will be able to include modifications in the design of the wind farm in order to prevent such trouble.'

In addition to optimising the design of wind farms and reducing the time necessary to undertake viability

studies, the project is expected to impact future legislation in the field of telecommunication interference. The characterisation of the signal emitted by wind turbines over the UHF waveband and its influence on the quality of the television signal could be used for drafting future international regulation, Tecnalia noted.

SOPCAWIND

- ★ Coordinated by Tecnalia in Spain.
- ★ Funded under FP7-ICT.
- ★ http://cordis.europa.eu/news/rcn/36628_en.html
- ★ Project website: <http://www.sopcawind.eu>
- ★  <http://bit.ly/1ldAX4S>



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MODELLING AEROPLANE POWER SYSTEMS

The EU is moving towards all-electric aeroplanes in order to improve operating efficiency and decrease fossil fuel use. In line with this move, researchers have improved models of power and energy usage in aircraft.



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Since modern aeroplanes need more electrical power than their predecessors, it is crucial that models of energy use are accurate and reliable. The EU-funded SIMEAD (Suite of integrated models for electrical aircraft drives) project was established to

develop interconnected models of electrical and mechanical power systems for aeroplanes, with the aim of optimising power and energy use.

Researchers succeeded in developing improved models for both the mechanical and electrical systems. The mechanical models predict energy losses from a generator (e.g. thermal energy), while the electrical models cover different energy conversion processes.

Models were created for AC:DC, DC:AC and DC:DC converters, and all were compared with real data for validation.

Several case studies were also completed to show the application of these models to real design challenges.

SIMEAD researchers found their newly defined models to be more accurate than the previous SABER models. This work has thus advanced the state of power system models in the aviation industry, contributing to more efficient and sustainable aircraft in the future.

"SIMEAD researchers found their newly defined models to be more accurate than the previous SABER models."

SIMEAD

- ★ Coordinated by the University of Manchester in the United Kingdom.
- ★ Funded under FP7-JTI.
- ★ http://cordis.europa.eu/project/rcn/101093_en.html
- ★ Project website: <http://www.simead.manchester.ac.uk>

GREENER AND CHEAPER PHOTOVOLTAICS

European scientists have developed a new manufacturing process for 'photovoltaic' (PV) technology, which improves their efficiency and dramatically reduces water usage by the solar cell industry.

PVs are solar cells that have the potential to meet the world's growing electricity needs, if they can compete with the cost of current energy generation. This could be achieved by reducing the cost of these solar cells, increasing their efficiency and reducing their environmental impact.

"SOLNOWAT clearly demonstrates the benefits associated with the new PV manufacturing process and disseminated the results to cell manufacturers."

The EU-funded SOLNOWAT (Development of a competitive 0 GWP dry process to reduce the dramatic water consumption in the ever-expanding solar cells manufacturing industry) project developed a new 'dry' process to reduce the very high level of water consumption by PV manufacturing plants. This will help reduce 'Global warming potential' (GWP) emissions, while increasing PV cell efficiency and production levels.

Silicon etching is a key technology in the production of PV cells. The dry etching process results in a highly uniform silicon wafer with a surface texture that has low reflectivity and is extremely efficient at absorbing light. The amount of silicon removed to achieve these textures is minimal but resulted in significant cost savings. Project partners created a range of textures and non-contact handling processes that demonstrated the technology's versatility.

SOLNOWAT clearly demonstrates the benefits associated with the new PV manufacturing process and disseminated the results to cell manufacturers. All participating small and medium-sized enterprises increased their level of European collaboration and added significant value through the development of new manufacturing equipment for PVs.

New environment-friendly production technologies that comply with European emissions regulations are vital for the continuation of PV manufacturing in the EU. By removing the industry's reliance on high levels of labour, water and GWP chemicals, SOLNOWAT was able to provide a cleaner, greener alternative for solar cell manufacturers.

The process also increases high throughput, thereby enabling the solar cell industry to fulfil European targets for implementing technology and improving competitiveness.

SOLNOWAT

- ★ Coordinated by Ultra High Vacuum Solutions in Ireland.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/result/rcn/142691_en.html
- ★ Project website:
<http://www.nines-pv.com/solnowat>



ENVIRONMENT AND SOCIETY

MAPPING GREENHOUSE EMISSIONS TO PREVENT CLIMATE CHANGE

EU-funded researchers have used advanced modelling and geo-spatial information to compile more accurate greenhouse gas inventories for Poland and Ukraine. The approach could substantially improve the accuracy of national inventories of greenhouse gases and boost Europe's efforts to reduce emissions.

The work carried out by the researchers in the GESAPU (Geoinformation technologies, spatio-temporal approaches, and full carbon account for improving accuracy of GHG inventories) project aims to plug information gaps in existing methods for assessing greenhouse gas emissions. This gap is especially true for countries that are heavily forested or have large areas of variable landscape, where it is more difficult to measure emissions using current techniques, says project coordinator Professor Zbigniew Nahorski of the Systems Research Institute, Polish Academy of Sciences.

Using the latest satellite geo-information and modelling techniques developed by Austria's International Institute for Applied Systems Analysis (IIASA), a project partner, the project has resulted in a comprehensive

methodology and software tools for improving the accuracy of data collected on greenhouse gas emissions.

The project, which is due to be completed in June 2014, has so far produced more detailed greenhouse gas emission maps of Poland and the western parts of Ukraine compared to traditional inventories, says Prof. Nahorski. The maps specify emissions by source (for example industry, residential sector, agriculture or transport) and distinguish by type (for example, electricity or heat production). The team's high-resolution maps also show the impact of regional economic activity, fossil fuel use and new technological processes on as detailed a scale as 2 x 2 km.

To produce a more accurate greenhouse gas account for Ukraine's forests the team has integrated ground

data and new remote sensing information, for example, from radar. The project has also developed new software that combines different mathematical models, digital maps and geo-referenced databases.

'There is a clear need to improve greenhouse gas accounting methods to ensure reliable information is provided on industrial, land-use, land-use change and forestry categories in national reporting,' says Prof. Nahorski. 'Our teams are working on advanced methods to resolve this problem.'

Taking stock

The accurate accounting of greenhouse gas emissions is key to the functioning of the European Union 'Emissions trading scheme' (ETS). This is a market-based approach that established a quantifiable, legally enforceable limit on emissions. The

scheme came into force in 2005 and covers heavy industry and power generation in the EU.

"The team's high-resolution maps also show the impact of regional economic activity, fossil fuel use and new technological processes on as detailed a scale as 2 x 2 km."

While Ukraine is not in the EU, it has agreed to cut emissions under the Kyoto Protocol, an international agreement linked to the UN's Framework Convention on Climate Change.

But due to gaps in the data and the use of imperfect accounting methods (such as those related to the forestry sector), the scheme does not provide a reliable account (equivalent to that of the Kyoto Protocol) of all

man-made sources of emissions, says Prof. Nahorski.

For example, productive and sustainably managed forests can absorb more carbon from the atmosphere. For this advantage to be captured, new methods are required that are based on more thorough studies of the carbon cycle in forest ecosystems, he adds.

To achieve the required accuracy in the inventory of industrial emissions, GESAPU's researchers are working with advanced information technologies and scaled statistical modelling services provided by IIASA and Ukraine's Lviv Polytechnic National University.

The application of this kind of technique to large regions in West Ukraine resulted in a substantial decrease of uncertainties in accounting for greenhouse gas emissions, says Prof. Nahorski, for example by applying distributed emission factors. GESAPU researchers are currently applying and adapting the approach for Poland.

Carbon cycling

The team is also studying the carbon cycle of forest ecosystems in Ukraine. Using remote-sensing data, new models and other tailored methods, GESAPU is building on IIASA's carbon-accounting model for ecosystems so as to provide a more reliable and comprehensive assessment. The project will result in a valuable and more accurate stocktaking tool for greenhouse gases in Europe and beyond, says Prof. Nahorski. The team is also developing a database that will provide a more detailed measurement of the impact of forest ecosystems in reducing greenhouse gas.

GESAPU

- ★ Coordinated by the Systems Research Institute, Polish Academy of Sciences in Poland.
- ★ Funded under FP7-PEOPLE.
- ★ http://ec.europa.eu/research/infocentre/article_en.cfm?artid=32356
- ★ Project website: <http://www.iiasa.ac.at/web/home/research/researchProjects/GESAPU/GESAPU.html>

A GENETIC TEST TO SCREEN HEALTHY PIGS

The European pig industry loses an estimated EUR 200 million per year due to congenital defects. Finding the genetic aetiology of these disorders could help breeders choose unaffected strains.

Congenital diseases are quite common in swine and they cover a wide range of undesirable conditions, including hernias, anatomical defect and ataxia. These abnormalities lead to poor animal welfare and economic losses, posing a significant problem for pig producers and breeding companies.

The aim of the EU-funded PIGENDEF (Towards marker assisted selection against genetic defects in pigs) project was to provide insight into the genetic background of congenital genetic defects in pigs. The consortium consisted of scientific groups and companies active in pig breeding. The research was focused on three swine defects, namely inguinal hernia, umbilical hernia and cryptorchidism, the plan being to identify associated genes.

To this end, researchers conducted 'Genome-wide association studies' (GWASs) in porcine samples from Belgium and Norway, looking at genetic markers ('Single nucleotide polymorphisms' (SNPs)) linked with a predisposition to the aforementioned defects. Over 120 SNPs associated with umbilical hernia were located on chromosomes 5 and 14, which were identified as significant quantitative trait locus regions. Two genes on chromosome 14 were found to contain some significant SNPs in the Norwegian swine lines.



This SNP panel was formulated into a genetic test and will be implemented to counter the prevalence of umbilical hernia in Norway's breeding programmes. This is expected to improve the efficiency and profitability of animal production and, therefore, the competitiveness of the small business partners. Under the general framework of European policies on sustainability and on animal health and welfare, PIGENDEF partners expect a causative mutation for umbilical hernia to be identified in the near future.

PIGENDEF

- ★ Coordinated by the University of Leuven in Belgium.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/100169_en.html
- ★ Project website: <http://www.pigendef.eu>

EU PROJECT DEVELOPS STATE-OF-THE-ART IN MARINE ECOSYSTEM MODELLING

Phytoplankton and zooplankton biomass are expected to decrease by 6 % and 11 % respectively by the end of the century due to climate change. This is just one of the conclusions drawn from the work of the EU-funded MEECE project that was recently published in the *Global Change Biology Journal*.

The MEECE (Marine Ecosystem Evolution in a Changing Environment) project was completed in 2013, but clearly its conclusions continue to draw attention from the research community. The MEECE team, led by Plymouth Marine Laboratory, used predictive models to explore the impacts of both climate drivers such as acidification and temperature, and human-induced drivers like fishing, invasive species and pollution on marine ecosystems.

The project succeeded in advancing the state-of-the-art in marine ecosystem modelling and providing tools to help support decision making.

The team achieved this by developing a library of modelling tools and a generic model-coupler (FABM). This represented a major step towards integrated end-to-end modelling tools which include a range of feedback between drivers and ecosystems from both physiological and population scale processes.

These modelling tools were used to investigate the response of European regional seas' ecosystems to climate change, direct anthropogenic perturbations and combinations.

The results are complex and variable from region to region. For example, the ecosystems of enclosed basins such as the Adriatic, Black and Baltic Seas are highly responsive to wind stress and eutrophication. In contrast, the ecosystems of shelf seas with connections to the open ocean (for example, the North-East Atlantic and Biscay) are responsive to changes in the nutrient supply from the open ocean.

MEECE findings on phytoplankton and zooplankton reduction, from research led by Azti-Tecnalia and recently published in the *Global Change Biology Journal*, show that different regions will be affected in different ways.

In the seas in Central and Southern Europe, higher thermal stratification of the ocean water layers and, consequently, a lower presence of nutrients

used by phytoplankton to grow, will reduce primary production. In the Baltic, Barents and Black Seas, phytoplankton production is expected to increase.

Guillem Chust from Azti-Tecnalia, leader of the scientific work and main author of the paper, noted, 'In the ocean regions that lose more phytoplankton and zooplankton biomass, that is, with a negative amplification, fish biomass may also decrease dramatically, especially pelagic species (i.e. those living in the water column, excluding the seabed).'

Chust continued, 'Climate regulation will also be affected negatively by the primary and secondary production decrease globally because, as there will be less phytoplankton, absorption of CO₂ from the atmosphere by the oceans will be lower, as plankton is

responsible for half of the planet's photosynthetic activity. This in turn will reduce the ocean's capacity to regulate the climate.'

The MEECE project comprised 22 European partners. The MEECE model atlas is still available online and shows information from ecosystem models. The numerical models presented in the atlas offer mathematical descriptions of the real world, allowing users to explore how the world works and to make projections of how the future may evolve.

MEECE

- ★ Coordinated by Plymouth Marine Laboratory in the United Kingdom.
- ★ Funded under FP7-ENVIRONMENT.
- ★ http://cordis.europa.eu/news/rcn/36604_en.html
- ★ Project website: <http://www.meece.eu/>



"In the ocean regions that lose more phytoplankton and zooplankton biomass, that is, with a negative amplification, fish biomass may also decrease dramatically."

CATTLE CONSERVATION IN THE MEDITERRANEAN

Local cattle breeds in Egypt and the Iberian Peninsula are threatened due to the popularity of international breeds. To help remedy the situation, researchers have dedicated their time to improving local knowledge and skills for molecular research into local cattle breeds.

In comparison to international breeds, local cattle breeds are often well-adapted to local conditions. Despite this inherent advantage, Egypt and other Mediterranean countries have not protected the diversity of their local breeds, which are now threatened with extinction.

The EU-funded CATTLECON IKTA (Improving, transference and applicability of knowledge in conservation and characterisation technologies in cattle breeds from Egypt and the Iberian Peninsula) project was established to build research capacity in this field. The universities involved were the University of Córdoba (Spain) and Ain Shams University (Egypt).

CATTLECON IKTA has created a permanent research network between these institutions for sharing molecular and

genetic knowledge and tools. This includes a web-based training platform that can be found on the project website.

Two training courses were also held at Ain Shams University for graduate and postgraduate researchers. One focused on the conservation of cattle genetic resources, and the other on genetic techniques for livestock conservation.

In addition, several researcher exchanges have taken place between the two universities to build research capacity and strengthen institutional ties. Taken together, the CATTLECON IKTA initiatives have contributed greatly to regional capacity for cattle conservation research in the Mediterranean.

CATTLECON IKTA

- ★ Coordinated by the University of Córdoba in Spain.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/98297_en.html
- ★ Project website: <https://sites.google.com/site/cattleconikta>

THE AUTOMATED FLY TRAP

Two kinds of fruit fly are damaging European crops. To combat this, an effective fly trap is needed that automatically identifies suspects and issues warnings.

Insect pests, including the Mediterranean and Olive fruit flies, threaten European agriculture. The industry-standard warning system for fruit fly infestation, the McPhail trap, is sub-optimal for various reasons, creating demand for an improvement.

Aiming to make this improvement was the E-FLYWATCH (Development of an innovative automated and wireless trap with warning and monitoring modules for integrated management of the Mediterranean (Ceratitis Capitata) & Olive (Dacus oleae) fruit flies) project. The eight-member project ran for three years and received over EUR 1.1 million in EU funding. The project worked to

given region and thus assist individual producers in limiting their pesticide use.

The project began by studying the main approaches of end users in terms of trapping, monitoring, warning, usage of pesticides and other practices. Next, the project set out to establish a method for automated recognition of trapped insects, and to evaluate its feasibility. The stage involved development and testing of optical processing algorithms that recognise insect anatomical features. Field tests demonstrated an identification success rate of about 80%. The project also tested various transmission technologies and incorporation of the data into an online GIS. Such tests yielded the specifications for the complete E-FLYWATCH prototype.

Further testing led to redesign of the optical recognition and communication modules, and a new trap design. The second prototype was field-tested at three locations in Cyprus. The testing coincided with a workshop demonstration for interested parties, who gave excellent feedback.

In addition, E-FLYWATCH developed training materials, a website and a patent application. The project presented its results at various symposia and



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other conferences. Lastly, the project has developed a comprehensive business and marketing plan, which will determine the market viability of the system up to two years post-project.

The resulting E-FLYWATCH system should help improve production, limit pesticide usage and lower the labour costs for spraying. The system is also expected to improve profitability and sustainability in the sector.

E-FLYWATCH

- ★ Coordinated by CNE Technology in Cyprus.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/96182_en.html
- ★ Project website: <http://www.e-flywatch.com>

“Field tests demonstrated an identification success rate of about 80%.”

improve on the McPhail trap by enabling it to automatically identify caught insects and link related information to a web-based ‘Geographic information system’ (GIS). Such a system would facilitate insect monitoring, while also being cheaper, simpler and more reliable than current warning methods. Furthermore, the project’s GIS would contain records of pesticide usage in a

PREDICTING OZONE LAYER DEPLETION

Scientists are now better able to predict the effect of climate change on the Earth's ozone layer. An EU-funded project has investigated the impact of naturally occurring substances containing halogens.

Halogens (e.g. chlorine, bromine and iodine) have contributed to the decline of the ozone layer above the Arctic, which absorbs most of the Sun's ultraviolet radiation. The Montreal Protocol (1987) was responsible for phasing out the production of various 'Ozone-depleting substances' (ODSs) such as halogenated hydrocarbons.

"Air measurements were taken from land, ships, aircraft, balloons and satellites and combined with computer models."

Naturally occurring 'Medium short-lived substances' (MSLSs) and 'Very short-lived substances' (VSLs) containing bromine and iodine can enter the stratosphere. Here, in the second major layer of Earth's atmosphere, they are broken down by sunlight to

release the halogen elements that degrade ozone.

The SHIVA (Stratospheric ozone: Halogen impacts in a varying atmosphere) initiative aimed to increase understanding of the role of VSLs. This will ensure that predictions of the future state of the global stratospheric ozone can be made with greater certainty for a changing climate. Determining the uncertain contribution of MSLSs and VSLs to the production of ozone-depleting halogens is challenging due to their sensitivity to climate changes.

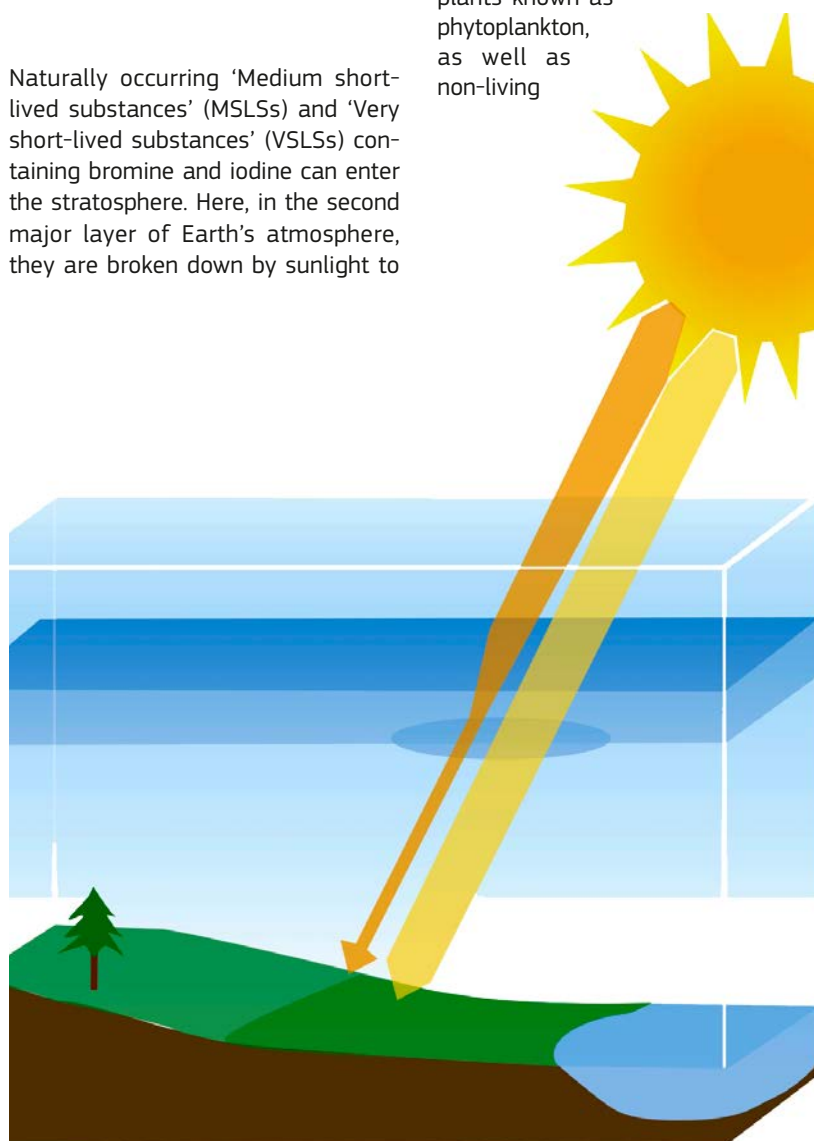
Sources of VSLs include minute marine plants known as phytoplankton, as well as non-living

chemical and physical processes that occur near the surface of the oceans. VSL emissions from natural or cultivated seaweed are also potentially important, particularly in tropical regions of the world.

Tropical weather is warm and helps carry ODSs into the stratosphere, thus contributing to ozone loss. The consortium therefore conducted long-term measurements in conjunction with Malaysian research partners in the South China Sea and along the coastline of the Malaysian Peninsula and Borneo.

Air measurements were taken from land, ships, aircraft, balloons and satellites and combined with computer models. Data from the SHIVA initiative will reduce uncertainty in predicting climate changes and ozone recovery or losses. In addition, the project will increase understanding of the future oxidation capacity of the lower atmosphere, as well as the composition and dynamics of the overlaying stratosphere.

The work conducted by the SHIVA consortium contributed to the scientific basis of the United Nations (UN) Montreal Protocol on Substances that Deplete the Ozone Layer, the UN Convention on Climate Change and global climate change research.



SHIVA

- ★ Coordinated by Heidelberg University in Germany.
- ★ Funded under FP7-ENVIRONMENT.
- ★ http://cordis.europa.eu/project/rcn/90968_en.html
- ★ Project website: <http://shiva.iup.uni-heidelberg.de>



BIG DATA

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IT AND TELECOMMUNICATIONS

HELPING SMES FISH THE BIG DATA OCEAN

In its Communication on the data-driven economy, the European Commission outlines a raft of measures aimed at helping SMEs exploit Big Data to win new commercial opportunities.

Think of Big Data and the image is of oceans of infinitesimal bytes of disparate information even the largest corporations struggle to manage. The stats are overwhelming. Every single minute, the world is said to generate 1.7 million billion bytes of data, equal to 360 000 DVDs or over six megabytes for each man, woman and child on this planet every day.

If Big Business has its work cut out to wade through Big Data in an effort to turn research into profit, what hope can there be for small companies swimming in the tides of knowledge overload. Well, thanks to modern, cost-effective data mining techniques, and like-minded souls across Europe fishing for the same opportunities, quite a lot, actually.

It's the exciting realisation that Big Data can mean a big break, for small and medium-sized enterprises (SMEs)

in the EU, which is driving the European Commission to promote a wealth of learning and innovation opportunities for SMEs in its Horizon 2020 research programme.

Vast opportunities for non-ICT companies

A myth has developed that the art of analysing and making sense of Big Data is the preserve of ICT specialists. While it does offer new prospects for ICT companies, the opportunities are also vast for producers and users of data in all other economic sectors. For example, manufacturing companies can make use of Big Data analytics to render their production processes more efficient. Retailers who need to face the challenge of meeting the demand of a new generation of customers who expect information to be available anytime and anywhere, can effectively use the new technologies.

But SMEs need a helping hand here in order to understand concretely how they can profit from Big Data. They need convincing that it needn't be such an expensive and complex process. This is where the European Commission can play a role.

'The key here is better data analytics enabling more reliable predictions and evidence-based business decisions with regard to the SMEs' own market, own customers' needs and behaviours and business opportunities,' explained Katalin Imrei, policy officer at the European Commission, dealing with Big Data. But to bring this about, SMEs, which produce smaller and fewer datasets than their larger counterparts, need high-quality, reliable data and services to run new experiments leading to innovative products and services. Networking of data processing facilities, an essential component of the Commission's plans, will

be crucial in transferring knowledge and tools to them.

The Commission has been helping SMEs in this area for almost a decade. The 2012 CODE project, for example, helped several small companies set up tools to manage and share research papers. German start-up RapidMiner, founded in 2006 as Rapid-I, developed its software in the e-LICO and VISTA-TV projects and now sells it in 50 countries worldwide. The FP7-funded DOPA project pooled data to provide SMEs with financial and economic data they previously had no access to.

'Cooperation with large companies, universities and research institutes is key for SMEs to make use of the latest R&I on data while being offered

new business opportunities, for example, by larger companies that assign specialised tasks to the SMEs,' said Katalin.

Open data incubator to 'prime the pump'

Big Data projects are getting EUR 89 million in 2014 and 2015 from the H2020 programme. They include research and innovation in business intelligence, decision support processes and systems supporting SMEs and web entrepreneurs. H2020 is also setting up an 'open data incubator' next year to help SMEs develop their prototype data applications. The incubator, linked to local ones across Europe, will also help the companies set up supply chains for products and

services based on open data resources and attract others to contribute some of their own data assets for experimentation.

But SMEs themselves also need to embark on a cultural change if they are to exploit the potential of Big Data. This requires them to investigate data-handling tools and methods outside their small structures, and be prepared to use Big Data actively in their decision-making processes. They need to be ready to dive in and explore the growing ocean of information that is waiting for them out there.

★ <http://ec.europa.eu/digital-agenda/en/news/helping-smes-fish-big-data-ocean>

PARALLEL COMPUTING OPTIMISES DESKTOPS

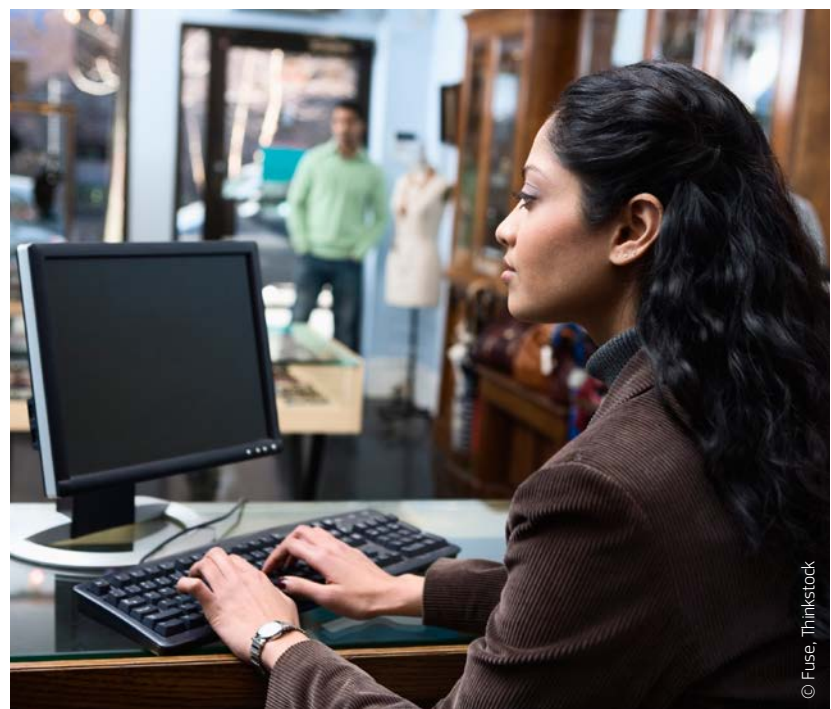
To develop new products, small and medium-sized enterprises (SMEs) may need expensive computer resources. An alternative is to convert existing machines into parallel processors, which would provide the power but at low cost.

Parallel computing means dividing computer tasks between two or more processing chips. This results in a tremendous speed improvement compared to single-chip machines.

"GPSME's work improves conventional automatic parallel conversion methods."

The EU-funded project GPSME (A general toolkit for GPU utilisation in SME applications) brought super-computing concepts to the office. Modern computers generally have an under-utilised second processor in the form of the 'Graphics processing unit' (GPU). The eight-member project aimed to network the GPU with the main processor. GPSME ran for two years to the end of September 2013.

GPSME developed and tested tools for converting existing application code to utilise both processors. The resulting project software automatically recognises sections of application code suitable for conversion, and efficiently carries out the conversion. GPSME's work improves conventional automatic parallel conversion methods. The result is high computer



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performance at minimal cost. Presently, no other system is available to assist SME competitiveness in this way.

Thanks to GPSME, European SMEs will have the resources they need to develop new products. This will mean opportunity and improved competitiveness for European businesses.

GPSME

- ★ Coordinated by the University of Bedfordshire in the United Kingdom.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/100608_en.html
- ★ Project website: <http://www.gp-sme.eu>
- ★ <http://bit.ly/1ukkbDm>

CLOUD COMPUTING: FACILITATING CUTTING EDGE COLLABORATIVE RESEARCH

Cloud computing — where storage facilities are provided on demand over the internet from shared data centres — enables effective research collaboration to blossom. Rather than having to purchase a cluster of computers or struggle to find space at the lab, researchers can outsource their computing storage needs to remote facilities in the cloud and make this data accessible to colleagues.

In order to facilitate closer research collaboration, an EU-funded project entitled HELIX NEBULA (Helix Nebula — The Science Cloud) has created an online platform where customers can choose between various cloud service suppliers. The ultimate objective of the project, which was completed in May 2014, is to enable researchers and scientists to buy, use and manage cloud services as seamlessly as possible.

The team behind the project believes that cloud-based services could become a billion-euro business in the near future, helping researchers make savings of up to 40% in infrastructure costs. Indeed, the project, which began in June 2012 with EUR 1.8 million in EU funding, anticipated that data capture, processing and storage — crucial to scientific endeavour — were being overtaken by the demand for greater efficiency, speedier results and the increasing need for greater international collaboration.

Cloud-based services were identified as a viable solution, as they offer greater efficiency and agility in delivering services through economies of scale. A key advantage of cloud computing is its elasticity; storage space for example can

be scaled up quickly depending on a research team's needs.

One example of how cloud computing can benefit collaborative research projects is the work currently being carried

out at the Large Hadron Collider at CERN in Geneva. Detectors there are searching for new discoveries in the collisions of protons of extraordinarily high energy, which could tell us more about how our universe was created and shaped. These experiments are currently running a large-scale distributed computing system to process the massive amounts of data collected.

'CERN's computing capacity needs to keep up with the enormous amount of data coming from the Large Hadron Collider and we see Helix Nebula as a great way of working with industry to meet this challenge,' said Frédéric Hemmer, head of CERN's IT department.

HNX is now open to cloud providers capable of participating competitively in line with European regulations and with a suitable quality of service. Commercial cloud providers from a number of EU Member States have already joined the Helix Nebula initiative, and stated their interest in offering services via HNX. Cloud services will be offered to the global research community, for both publicly-funded and commercial organisations across a diverse range of sectors



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including health care, oil and gas, high-tech and manufacturing.

The HELIX NEBULA project is seen as a preliminary step towards establishing a pan-European cloud-based scientific e-infrastructure. Indeed, the project consortium now intends to build on the successful development of this platform to provide users with easy access to a wide range of services, including digital infrastructure, tools, information and applications.

In effect, the HNX is set to become a digital hub for researchers and scientists across Europe and beyond, encouraging the sharing of knowledge and the establishment of new virtual partnerships.

HELIX NEBULA

- ★ Coordinated by the European Organisation for Nuclear Research in Switzerland.
- ★ Funded under FP7-INFRASTRUCTURES.
- ★ http://cordis.europa.eu/news/rcn/36622_en.html
- ★ Project website: <http://www.helix-nebula.eu/>
- ★  <http://bit.ly/UNsgHg>

GUARANTEED SECURITY OF WIRELESS SIGNALS

Security of wireless data transmission is an increasingly important concern. Novel masking technologies developed with EU funding promise perfect secrecy.

Conventional encryption algorithms employed at upper layers of most 'fourth-generation' (4G) wireless systems used to be considered nearly unbreakable due to the computational complexity involved. However, a new generation of super-hackers has shown this assumption to be false.

Recent developments based on information theory have demonstrated that physical layer encryption (at the signal level) can provide perfect secrecy of data transmission. EU-funded scientists working on the project APLOE (Applied physical layer orthogonal frequency division multi-

signal of approximately the same overall bandwidth. In fact, the results take seminal early work on PLS even further by showing that the SC using the structured interferer was even higher than that using a noise-like masker. Scientists investigated several other areas of wireless security, providing new insight into additional applications of PLS, effects on transmission rates and achievable SC.

The team succeeded in all its objectives, pointing the way to realising perfect secrecy in wireless communications covering a huge global market and numerous sectors of the economy. Proposed PLS technologies will enhance confidence in secure data transmission, providing a boost to

e-commerce, e-banking, e-healthcare and a whole host of other services that will enhance the quality of life of EU citizens while ensuring a leading position for the EU in information and communications technology.

APLOE

- ★ Coordinated by the Foundation for Research and Technology — Hellas in Greece.
- ★ Funded under FP7-PEOPLE.
- ★ http://cordis.europa.eu/project/rcn/98979_en.html

“Proposed PLS technologies will enhance confidence in secure data transmission.”

plexing encryption) investigated this and other friendly jamming technologies that can be used for proven secrecy in data exchange.

‘Physical layer security’ (PLS) concepts exploit the inherent characteristics of the wireless medium, including fading or noise. In order to evaluate performance, scientists defined the ‘secrecy capacity’ (SC) as the highest communication rate for which ‘encoding schemes exist that simultaneously guarantee reliability in the exchange of information with a legitimate user and perfect secrecy with respect to an eavesdropper.’

Initial work focused on systems that use ‘Orthogonal frequency division multiplexing’ (OFDM) in which a signal is broken up, encoded and sent out on multiple carrier frequencies. Most 4G wireless systems including long-term evolution products use it.

APLOE proposed the masked-OFDM scheme in which OFDM signals become practically undetectable through masking with a non-orthogonal FDM



INDUSTRIAL TECHNOLOGIES

ELECTRONICS-TO-WEAR LIGHT UP HEALTH CARE

For most electronic circuit boards, if you try to bend them, they snap and are rendered useless. But this is set to change. A European research programme called PLACE-IT has come up with a new type of flexible electronics that won't break when you twist them.

The new components are flexible, stretchable, strong and light — so much so that they can easily adapt to the contours and movement of the human body. And that opens the door to a vast new array of applications, from smart bandages and internal organ monitors in the health care industry and e-clothing for the fashion and road safety sectors, to smart lighting inside cars, trains and planes. The work of the PLACE-IT (Platform for Large Area Conformable

Electronics by InTegration) partners heralds the dawn of a new industry to accommodate this revolutionary flexible technology. You've heard of e-books, e-billing and e-health: now come e-textiles!

The world of cyber skins

A consortium of 12 partners, led by the Dutch multinational Royal Philips, PLACE-IT has already demonstrated potentially successful products in the

e-textiles sector and now progress in this area will be taken up by a new three-year Seventh Framework Programme (FP7) project, TERASEL, which will work on making flat circuits more elastic.

PLACE-IT mainly focused on forming electronics to cover human or automotive bodies, a kind of 'cyber skin' that can adapt its shape to the function required without breaking any of the infinitesimal connections that make up the tiny micro-electronic circuits powering all manner of applications these days.

'Uncontrolled movement and body shape are demanding on technologies, and a certain percentage of stretch ability is required if electronics are to fulfil this demand,' explains PLACE-IT coordinator Koen van Os, specialist senior scientist at Philips in Eindhoven, the Netherlands. 'Without this stretch ability, large area electronics create air-gaps and pressure points between device and skin, or sharp folding lines and cracks in the device itself,' he added.

Health care, fashion and automotive applications

One of the most innovative products developed by the team in its demonstrators is BlueTouch phototherapy, a

pain relief patch already commercialised by Philips to provide effective pain relief, particularly for back ache. Blue light bandages developed by Philips are bendable and comfortable enough to be worn on the back all day every day if need be. BlueTouch devel-

“One of the most innovative products developed by the team in its demonstrators is BlueTouch phototherapy, a pain relief patch already commercialised by Philips to provide effective pain relief.”

oped as a product during the project, was clinically proven and is now a CE-certified medical device on sale to patients in the UK and Germany since spring 2012.

One of the German partners, ZMF medical research centre, has also shown that blue light affects biochemical processes. In this way, it can be used to measure the working of kidneys using a flexible patch to pick up on a fluorescent indicator, FITC-Sinistrin, and measure the function of the organs. The team hopes this product will help detect terminal renal disease at an early stage. Seventeen universities and five major drugs companies are using the device for research and safety assessment of new drugs. Jobs have also been created through a start-up, Mannheim Pharma & Diagnostics, which aims to sell the renal monitor and FITC-Sinistrin.

The use of small LEDs in clothing has also been developed. Concert performers like the Black Eyed Peas have already trialled e-textile costumes containing OLED lighting technology in the shape of ultra-thin light-emitting foils.

Automotive lighting is another area where PLACE-IT partners, including

Germany's Freudenberg technology group, its textile research institute TITV-Greiz and Spain's Grupo Antolin, have been working. They have designed novel, 'beyond-the-bulb' lighting technologies in vehicle 'skins', such as ceilings (for interior illumination) and sun visors (for vanity lights) in a functional, energy-efficient and cost-effective way.

PLACE-IT is a EUR 16 million project, with EUR 10.8 million funded by the European Union's FP7. The project started in February 2010 and ended in November 2013.

PLACE-IT

- ★ Coordinated by Philips Electronics in the Netherlands.
- ★ Funded under FP7-ICT.
- ★ http://cordis.europa.eu/project/rcn/93792_en.html
- ★ Project website: <http://www.place-it-project.eu>

GLASS MICRO-COMPONENT MANUFACTURE FOR THE MASSES

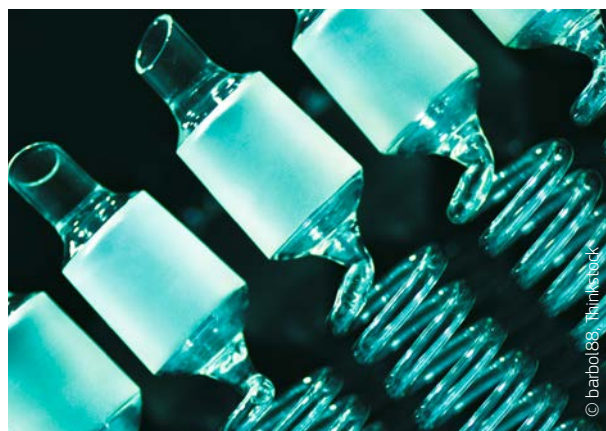
A new laser printer for patterning glass substrates on the nano scale fits in a shoebox. It opens the door to the manufacture of glass-based microsystems using a table-top device without expensive infrastructure and expertise.

Recent advances in femtosecond lasers have enabled their use in patterning glass using compact devices at a fraction of the cost of conventional clean-room equipment. EU-funded scientists working on the project FEMTOPRINT (Femtosecond laser printer for glass microsystems with nanoscale features) pushed the state-of-the-art with a low-cost, compact laser printer system.

The Femtoprinter fits in a shoebox and can pattern glass substrates with features on the scale of atoms and molecules (the nano scale). The system provides the ability to produce glass-based microsystems sporting optical, mechanical and fluid-handling capability without expensive infrastructure and expertise. The prototype enabled the first demonstration of algae biochips, the first transparent actuators and a 'five-dimensional' optical memory. Nicknamed Superman by the press, the latter is capable of storing information in excess of a thousand years.

Needless to say, FEMTOPRINT has received global attention. Newspapers such as The Telegraph and The Huffington Post have featured the technology and scientists have published the results in numerous technical papers in renowned peer-reviewed journals. FEMTOPRINT received the Best Project Finalist Award at the EuroNanoForum in Ireland, and the technology development has resulted in the creation of the spin-off company FEMTOprint, which has commercialised the printer.

Although the printer was the ultimate technological goal, technology development has led to other commercial



products as well. The innovative laser source is now available in the product line of one of the project's partners. A patented optical component has been licensed to a European company that now features it in its product catalogue.

FEMTOPRINT technologies are already having a major impact on the glass-based optical and micro-optics sectors. Uptake of the economical and powerful Femtoprinter by universities, research institutes and industry will speed up groundbreaking research in glass-based microsystems with major benefits for the EU economy.

FEMTOPRINT

- ★ Coordinated by the Technical University of Eindhoven in the Netherlands.
- ★ Funded under FP7-NMP.
- ★ http://cordis.europa.eu/project/rcn/94310_en.html
- ★ Project website: <http://www.femtoprint.eu>
- ★ <http://bit.ly/1qPHmex>

CURING PLASTICS WITH MICROWAVES

A revolutionary closed-mould system using 'Microwave-assisted curing' (MAC) and 'Resin transfer moulding' (RTM) will enable eco-friendly and cost-effective production of high added-value plastic products.

MAC is a curing method that can be used on thermosetting materials such as polyester, vinylester and epoxy resins. Thermosetting materials become strong and high-temperature resistant after curing, resulting in applications that include components for the automotive and aerospace industries.

MAC-RTM and MAC-RTM Light technologies were developed by scientists from the EU-funded project MAC-RTM (Microwave assisted curing for resin transfer moulding).

The end users specified requirements and selected two complex 3D parts for production: a small engine bonnet and the active component of an electrical engine part. To make these parts, scientists worked on selecting suitable microwave radiation transparent mould materials as well as microwave-absorbent additives and resins.



calibrated and validated to monitor the curing process, temperature and more.

For visualising the MAC process during production of very complex parts, researchers used an infrared camera system. This led to the development of an industrial production-scale unit using the MAC-RTM process. In parallel, researchers simulated and validated the MAC process by comparing simulated data with experimental material data.

The industrial-scale trials demonstrated that the MAC-RTM process fulfils important environmental and safety standards. Notable in this closed-mould system is the reduction in emissions of volatile organic carbons such as styrene by about 85 %.

In comparison to conventional curing using oven heating, MAC provides considerably more cost-effective, uniform and faster curing. Moreover, the curing

of RTM epoxy parts is far more thorough, resulting in an improvement in epoxy parts production by around 3.5 times. MAC-RTM also showed 40% lower energy consumption than a conventional heating process.

MAC-RTM technology will reduce time-to-market and increase end-user acceptance and consumer confidence. Ultimately, MAC-RTM technology will enhance the competitiveness of European businesses in the global composites market and open up more market opportunities.

“MAC-RTM also showed 40% lower energy consumption than a conventional heating process.”

Scientists initially built a lab-scale unit with the selected electrical antenna structure and current sensor to evaluate process parameters online. Based on lab-scale study outcomes, the mould design and filling system (for resin injection into the mould) were finalised. Sensor systems were

MAC-RTM

- ★ Coordinated by AIMPLAS in Spain.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/100417_en.html
- ★ Project website: <http://www.macrtm.eu>
- ★  <http://bit.ly/LogKfgA>

EXPLORING BIODIVERSITY TO PRODUCE SUSTAINABLE COSMETICS AND AGROCHEMICALS

AGROCOS is a pioneering European project which is using modern scientific techniques to explore the ancient — and still largely untapped — richness of nature to develop new products for the agrochemical and cosmetics industries.

By searching through nature's molecules to discover the essential building blocks for a new generation of ingredients, the project is expected to pave the way for products which are not only innovative and effective, but also, being naturally derived, friendlier for both humans and the environment than existing synthetic products.

At the heart of the AGROCOS (From Biodiversity to Chemodiversity: Novel Plant Produced Compounds with Agrochemical and Cosmetic interest) project are molecules extracted from 1 800 plant species harvested in 'biodiversity hotspots' in Africa, Europe, Latin America and the Asia-Pacific region. The compounds extracted are being tested for qualities which would benefit the agrochemical sector, such as anti-fungal, herbicidal or insecticidal effects, while for the cosmetics industry the key characteristics of interest include UV protection and anti-ageing properties, or efficacy against age spots (known as 'hyper-pigmentation'). From the thousands of compounds



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extracted, the project aims to identify the five most promising ones.

In addition to these final five ingredients, the project will create an extensive 'library' of compounds, to be made available for future use by researchers or commercial enterprises.

As the AGROCOS Project Coordinator, Professor Leandros Skaltsounis of the National and Kapodistrian University of Athens, explains, 'this is an important breakthrough for the technique of "bio-prospecting" — deriving materials from nature. Plants have been used since antiquity to meet people's needs,' he says. 'Henna dye has long been used as a cosmetic, for example, or the Indian Neem tree for crop protection,' he adds. This 'primitive' bio-prospecting was revived in recent decades as the discovery of novel bioactive products enabled the production of important anti-cancer and anti-microbial drugs. What is new and exciting today is that modern technologies have finally made bio-prospecting a viable technique, in terms of both cost and time, not just for pharmaceuticals but also for more general industrial applications like cosmetics and agrochemicals.

This breakthrough for bio-prospecting is especially important as it comes at a time when concerns are growing about the impact of synthetic cosmetics and agrochemicals on both humans and the environment. Synthetic cosmetic ingredients such as UV screens are under scrutiny for their endocrine-disrupting and other detrimental effects on humans and water-living organisms, while the leakage of agrochemicals into the environment is a problem that needs to be addressed. The long-term effects of low-dose exposure to the ever-growing number of such synthetic chemicals are still not understood well.

'In this context, the benefits of AGROCOS will be specific and tangible,' says Professor Skaltsounis. 'By the end of the project, novel compounds drawn from the resources offered by global biodiversity are expected to be available for use as new ingredients in cosmetic products,' he comments. 'In the field of agrochemicals, where the development procedure is lengthier — up to 10 years — we expect that the promising compounds will be the starting point for more specialised development of agrochemical agents.'

"We expect that the promising compounds will be the starting point for more specialised development of agrochemical agents."

For one of the project partners, KORRES, a Greek company which develops a wide range of natural cosmetic products, there is no doubt about the significance of the project. 'This is the biggest piece of research in natural ingredients in recent years,' says Lena Korres, the company's Brand Development Director, who is in charge of new product development.

'This goes right back to our heritage here at KORRES,' she explains. 'We are passionate about natural ingredients, and research is at the core of what we do. For us, this will be fantastic because it will provide us not only with the five specific ingredients, but also with an extensive library of ingredients detailing the benefits of each and how they can help us in cosmetics.'

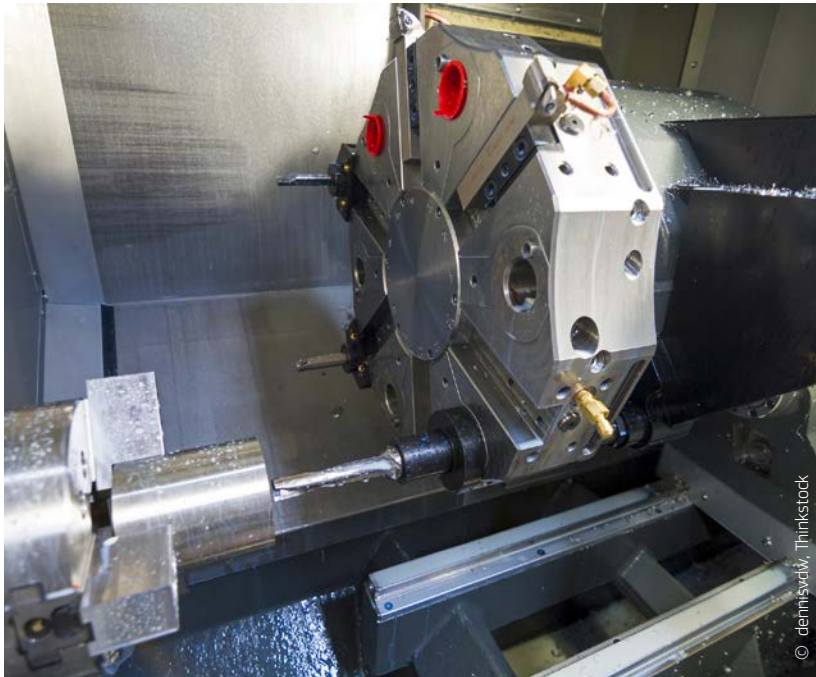
Even more exciting will be the fact that this could be just the tip of the iceberg for bio-prospecting. According to Professor Skaltsounis, 'only 10 % of the existing 400 000 higher plant species, and an even lower percentage of fungi and invertebrates, have so far been analysed.'

AGROCOS

- ★ Coordinated by the University of Athens in Greece.
- ★ Funded under FP7-KBBE.
- ★ http://ec.europa.eu/research/infocentre/article_en.cfm?artid=32282
- ★ Project website: <http://www.agrococos.eu/>
- ★  <http://bit.ly/1AHrpsX>

MANUFACTURING MACHINERY ADAPTS INTELLIGENTLY

The use of smart technologies in plug-and-produce components for machining tools and systems has enhanced damping and thermal control in five demonstrators. Improved efficiency and product quality are among the benefits.



integrated control logic linked to a computer numerical control system. The intelligent ASCs can thus adapt behaviour according to changes in the operation environment.

“Commercialisation will help a huge market sector involved in the manufacture of machine tools and production equipment as well as the end users who purchase them.”

ASC technology for vibration control, adaptive fixturing and thermal compensation was demonstrated in milling machine tools and robots to highlight the benefits of the holistic approach. Commercialisation will help a huge market sector involved in the manufacture of machine tools and production equipment as well as the end users who purchase them. Substantial increases in product quality and productivity are expected along with enhanced energy efficiency.

EU-funded scientists working on the project HARCO (Hierarchical and adaptive smart components for precision production systems application) are revolutionising machine tool and manufacturing machinery design rules. The current challenge in manufacturing is to develop stiff, lightweight and well-damped structures to increase product quality and throughput with minimal waste and machine downtime. In order to achieve these goals, engineers seek to integrate adaptronic devices for multiple functions,

including active vibration control, adaptive fixturing and advanced thermal stability control. All of these capabilities must be achieved in a cost-effective and commercially viable design.

HARCO has made this possible with a hierarchical approach. Smart actuators and sensors are integrated into modular adaptronic devices that can then be connected (plugged in) to form ‘Adaptive smart components’ (ASCs). The ASCs are elements of a distributed control architecture, with

HARCO

- ★ Coordinated by Centro Studi Industriali in Italy.
- ★ Funded under FP7-NMP.
- ★ http://cordis.europa.eu/project/rcn/94813_en.html
- ★ Project website: <http://www.harcoproject.eu.com>
- ★  <http://bit.ly/1rWuB1i>

QUIETER AND SAFER DOORS

European door makers are faced with increasingly stricter building regulations and lower construction costs. New designs for superior doors will meet European rules and help smaller businesses compete.

European manufacturers of wooden construction products, specifically wooden doors, are presently struggling to compete in the market. The various reasons include EU legislation specifying noise thresholds, and cheaper options from abroad.

Levelling the playing field was the SILENTWOOD (Multilayered Wood-based Exterior Doors with Enhanced Acoustic Insulating Properties for Dwellings, Sanitation and Educative Centres) project. The 11-member consortium ran

for three years to April 2013, during which time it received nearly EUR 2 million. The project aimed to help European manufacturers comply with new EU building regulations while also helping with their market situation.

The project set two broad objectives: to develop a new door structure for noise reduction, and to design and validate a complete door system. The project's resulting doors would be certified in terms of noise and fire resistance, and also be compliant with mechanical and thermal requirements.

In addition, the products would be environmentally friendly, lightweight and inexpensive.

First, the project evaluated and selected options for an innovative multilayered structure. The best of these was developed to manufacturing conditions. Various prototypes were evaluated and tested. Secondly, materials were compared, the best combinations of which were compounded into an engineered wood and processed into doors.

Next, a customised computer-aided engineering software module was developed to simulate noise transmission through panels of the chosen material. The software also simulated mechanical and other properties. Together the simulations reduced the need for laboratory testing.

Lastly, all the developments were combined into innovative multilayered door prototypes made of composite wood and other materials, which were also tested. The resulting



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products meet the target requirements and are ready for commercialisation.

The project devoted considerable effort to preparations for introducing the new products to market, including a funding and investment plan. Other work involved dissemination activities including participation at conferences and trade fairs, a project website, journal articles and popular publications, including newsletters and posters.

As a result of SILENTWOOD, European manufacturers will regain their market share while also supplying Europe with the superior doors required by legislation.

"The resulting products meet the target requirements and are ready for commercialisation."

SILENTWOOD

- ★ Coordinated by Inspiralia in Spain.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/95151_en.html
- ★ Project website: <http://www.silentwood.eu>

WINEPEN TESTS GRAPE RIPENESS ON THE VINE

Testing whether grapes are ripe usually involves destructive and time-consuming chemical tests. Now, researchers have developed the WinePen, a handheld device that can test ripeness on the vine.

Recent EU quality legislation in the viticulture industry is putting a lot of pressure on small vineyards. To survive, they will need to increase the quality of their grapes and reduce the production of low-quality wine.

Thanks to the EU-funded PREMIVM (Low-cost, hand-held, and non-invasive optical sensor for multi-parametric field analysis of grapes and leaves in vineyards) project, winemakers now have a device that can quickly and easily monitor grape ripeness without any damage to the fruit. The device uses fluorescence to measure the concentrations of various chemicals related to ripeness, and comes with built-in software.

Vineyards in the Czech Republic, Spain, Italy and Portugal participated in the research and testing process. Researchers used a wide range of grape varieties to build a reference library that was used to calibrate the prototype device.

The device software provides useful statistical analyses based on the data collected, telling farmers about grape ripeness and sugar content. It can also coordinate Global Positioning System data, has an online interface and can be accessed from a computer, tablet or smartphone.

PREMIVM's demonstration prototype was successful — results are internally consistent and they correlate well with conventional methods of measurement. PREMIVM has thus

developed a device that could help small EU vineyards remain competitive in the face of challenging legislation.

PREMIVM

- ★ Coordinated by Agri-Ciência in Portugal.
- ★ Funded under FP7-SME.
- ★ http://cordis.europa.eu/project/rcn/96391_en.html
- ★ Project website: <http://www.premivm.eu/>
- ★ <http://bit.ly/VfzFiO>



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EU'S REVOLUTIONARY ASSEMBLY PLATFORM

An EU-funded project has turned a vision into reality. Flexible assembly units coordinated by adaptive control will now permit European manufacturers to quickly produce a variety of products with minimal new investment.



Organising, monitoring and controlling factory assembly operations at both the shop-floor and systems level is a daunting task. Including the ability for self-organisation and adaptation to changing conditions at both these levels seems like science fiction. Work conducted within the scope of the EU-funded project IDEAS (Instantly deployable evolvable assembly systems) is making it all a reality.

The significance of IDEAS' accomplishments has already been widely recognised. A publication on the project in Assembly Automation won the Outstanding Paper Award at the Literati Network Awards for Excellence 2013. The European Commission selected IDEAS as one of its 11 official Success Stories since the beginning of the Sixth Framework Programme (FP6).

In essence, the elegance of the solution lies in a successful principle at work in complex systems from biological organisms to universities to businesses. In each case, individuals or units are responsible for specific functions in which they have expertise. They are coordinated to work

together and intelligently adapt to a changing environment to achieve a higher goal.

The IDEAS consortium further developed the established paradigm of 'Evolvable assembly systems' (EASs), in which simple, dedicated machine modules (agents) are created for each individual assembly process. Scientists combined EASs with a highly distributed adaptive control system based on control boards developed within the project for seamless interaction in multi-agent applications.

The success of the 'Multi-agent system' (MAS) approach was proven in a simplified pre-demonstrator. The MAS automatically reacted to changing production conditions and flexibly managed resources. Production processes were run without programming using a simple graphical interface and drag-and-drop functionality. The miniaturised production platform served as the test bed for further development.

Researchers demonstrated the full re-configurability (plug-and-produce capability) and adaptability in the

assembly of two industrial systems. Small and medium-sized enterprises will soon be able to automate assembly without investing in expensive automation equipment. Re-usability

"The significance of IDEAS' accomplishments has already been widely recognised."

also decreases ecological impact. This is poised to revolutionise European assembly. IDEAS will enable manufacturers to recapture outsourced jobs and open the door to new global markets, overcoming the hurdle imposed by the current economic crisis.

IDEAS

- ★ Coordinated by the Royal Institute of Technology in Sweden.
- ★ Funded under FP7-NMP.
- ★ http://cordis.europa.eu/project/rcn/95351_en.html
- ★ Project website: <http://www.ideas-project.eu>

"The small size and light weight of MEMS' components make them ideal for creating propulsion systems for microsatellites."

SPACE

MICROSATELLITES PROPELLED INTO NEW ERA

An emerging trend in the space industry today is the shift from large satellites to smaller microsatellites with stringent power and weight requirements. EU-funded scientists are forging ahead with a new generation of micro-propulsion systems that could help these microsatellites reach the correct orbit.

Each satellite has to position itself in space and maintain its orientation. Inability to do this would cause it to tumble along its orbit, and its antennas will drift out of alignment with Earth.

To achieve movement, a satellite ejects matter in one direction to move in the opposite one. Chemical propulsion powers conventional rockets and down-scaled versions of this technology. A solid propellant is burned to produce a flow of fast-moving gas, thereby providing a strong push forward.

As would be expected, this large and spectacular form of propulsion is not suited to tiny microsatellites. Although it is tempting to miniaturise the tried-and-trusted propulsion technique, the PRECISE (Chemical-propulsion for an efficient and accurate control of satellites for space exploration) project is making progress in a more experimental form of propulsion.

The experimental system being developed is inspired by 'Micro-electromechanical systems' (MEMS). This technology involves creating very small components, with features measured on the scale of micrometres. The small size and light weight of MEMS' components make them ideal for creating propulsion systems for microsatellites.

These components were fabricated in the form of silicon chips, much like the chips found in computers and

other electronics. They were bonded together, allowing filters, heaters, thermal flow controllers, flow control and pressure relief valves to be sandwiched into compact units no larger than a one cent coin.

The micro-chemical propulsion system microworks by heating paraffin in closed cavities to increase its volume before expelling it through nozzles. The cavities were formed at the interface between chips, while the whole setup consists of chips mounted on top of one another. Equipped with sensors to control the flow by adjusting the power of the heaters in the bottom chip, the microCPS provides thrust larger than 1 Newton.

The first prototype is expected to be assembled in the early part of 2014. It will then require a great deal of testing and experimentation, but the flexibility and compact size of MEMS' technology make it a promising platform for future propulsion designs.

PRECISE

- ★ Coordinated by the DLR in Germany.
- ★ Funded under FP7-SPACE.
- ★ http://cordis.europa.eu/project/rcn/100845_en.html
- ★ Project website:
<http://www.mcps-precise.com>

MODELLING SUITE TO PROBE STELLAR EXPLOSIONS

The study of massive star explosions can provide important insight into the evolution of the Universe and the distances between its objects. EU-funded scientists have developed and applied advanced models with exciting results.



Scientists working on the EU-funded project STELLAR EXPLOSIONS (A comprehensive and multi-faceted study of stellar explosions using radiation-hydrodynamics and time-dependent radiative transfer techniques) developed improved models of explosion mechanisms and radiation dynamics. They applied them to probe the spectra, light curves and polarisation signatures of all types of ‘supernovas’ (SNe), the largest explosions occurring in space, as well as to other explosive stellar events for exciting new descriptions of dynamics.

The key to success in modelling the mechanisms of explosions was in starting with physically consistent models of the progenitor star produced from the public stellar evolution code MESA-Star. Scientists then developed radiation hydrodynamics code, called V1D, to treat core collapse and stellar eruptions.

The pinnacle of project modelling was the development of CMFGEN, including all relevant processes for ‘Non-local thermodynamic equilibrium’ (non-LTE) and the time-dependence of radiative transfer in homologously expanding SNe ejecta. Ejecta are the remnants of the stars ejected when they explode. After billions of years of explosions, they provide important information about how the Universe came to be the way it is. CMFGEN was expanded to include treatment of non-thermal processes as well, and has been tested against a variety of data.

STELLAR EXPLOSIONS uniquely combines three modelling codes (MESA, V1D and CMFGEN) for comprehensive dynamic descriptions of massive star explosions with unprecedented detail and interrelationships. In addition,

CMFGEN enables the detailed study of the non-LTE aspect of radiative transfer not possible with other available codes.

Applications of the algorithms have provided groundbreaking information about all types of SNe explosions. Models of the ejecta have generated light curves and full polarised spectra for any SN type. Code development and application to observations have far exceeded original expectations, resulting in many publications in peer-reviewed scientific journals.

Overall, STELLAR EXPLOSIONS has delivered a suite of software tools for modelling the causes, mechanisms and effects of SNe explosions that will foster a powerful burst of experimental and theoretical investigations into some of the most important questions about our Universe.

“STELLAR EXPLOSIONS has delivered a suite of software tools for modelling the causes, mechanisms and effects of SNe explosions.”

STELLAR EXPLOSIONS

★ Coordinated by the CNRS in France.

★ Funded under FP7-PEOPLE.

★ http://cordis.europa.eu/project/rcn/90629_en.html

COMBATING DEFORESTATION FROM SPACE

Tropical forests are among the most biologically diverse habitats on the planet but are under threat from illegal logging and mining activities. An EU-funded initiative is developing an early warning system that can rapidly identify the first signs of deforestation, thereby acting as a tool for ensuring sustainable development within these fragile ecosystems.

The REDD-FLAME (REDD fast logging assessment & monitoring environment) project will design and test a system for monitoring logging activities in tropical and sub-tropical forests with the aid of very-high-resolution Earth Observation satellites. The system will complement

existing low- to middle-resolution systems that cover entire countries or regions, monitoring areas at high risk of deforestation.

REDD-FLAME is designed to mainly use 'Synthetic aperture radar' (SAR)

"High-resolution SAR data will be used to create highly detailed maps of forest change to identify hotspots and detect indicators of illegal activity."

data, but a parallel approach employing optical remote sensing data is also being implemented. The project has identified a wide range of users, including indigenous peoples, forest managers, enforcement agencies, policymakers, and logging and mining enterprises.

High-resolution SAR data will be used to create highly detailed maps of forest change to identify hotspots and detect indicators of illegal activity, such as camps and new roads. This information can then be matched with intelligence or circumstantial evidence acquired in cooperation with local partners on the ground.

Project partners will determine what information is required for mapping and monitoring deforestation as well as identifying the forest type and land cover. They will also assess the most suitable methods for implementing a near-real-time forest monitoring system using data from multiple satellite SAR sensors.

Researchers are testing REDD-FLAME in three countries — Brazil, Indonesia and Mozambique — to determine its potential as part of a forestry monitoring centre. The results are used for informing policymakers, providing information for monitoring programmes, providing evidence for law enforcement efforts and helping local communities to protect their lands from illegal encroachment.

REDD-FLAME will therefore help build capacity in the host countries for managing forest resources and help combat deforestation, thereby conserving biodiversity and the natural environment.

REDD-FLAME

- ★ Coordinated by Remote Sensing Applications Consultants Limited in the United Kingdom.
- ★ Funded under FP7-SPACE.
- ★ http://cordis.europa.eu/project/rcn/97918_en.html
- ★ Project website: <http://redd-flame.info>



THE SPACE-TIME CONNECTION

European scientists are developing what may be the most precise clocks ever built. Based on laser excitation of atoms, these optical clocks will have a ticket to ride aboard the International Space Station (ISS) for a test-run.



Clocks are conceptually rather simple devices. They are based on a repeated event that occurs at a highly regular interval and a mechanism for keeping track of the events. Grandfather clocks get their reference interval from a swinging pendulum. Quartz watches get theirs from an oscillating crystal.

Atomic clocks measure the frequency of electron transitions from one orbital to another in atoms of certain elements. Transitions are so reproducible that the definition of a second is

currently tied to atomic transition. The standard is cesium-133 (Cs-133).

Cs-based clocks 'tick' at about 1 trillion times per second, operating in the microwave range of the 'electromagnetic' (EM) spectrum of frequencies. Optical clocks, operating in the visible light range of the EM spectrum (frequencies of 1 million trillion times per second), would obviously be capable of even greater accuracy.

A European consortium is developing ultra-precise portable neutral-atom lattice optical clock demonstrators for use in space. Their goal is to provide a 10-fold

increase in performance compared to microwave atomic clocks employed in a previous European Space Agency (ESA)-backed ISS mission.

With EU funding of the SOC2 project (Towards Neutral-atom Space Optical Clocks: Development of high-performance transportable and breadboard optical clocks and advanced subsystems), scientists developed laser technology and integrated it with atomic setups for 'strontium' (Sr) and 'ytterbium' (Yb). They are investigating two novel approaches for loading the atoms into the optical lattice clock.

SOC2 technology is expected to impact space- and ground-based investigations of time and gravity and commercial development of technology relying on lasers and high-precision timing devices. It might even provide the basis for the new standard of measurement of the second.

SOC2

- ★ Coordinated by Heinrich Heine University Düsseldorf in Germany.
- ★ Funded under FP7-SPACE.
- ★ http://cordis.europa.eu/result/rcn/89837_en.html
- ★ Project website: http://www.exphy.uni-duesseldorf.de/optical_clock/soc2/index.php

MAKING MORE SENSE OF SPACE

A novel data processing system for space research will help scientists exploit the huge amount of data it receives from beyond Earth and prepare for future space missions.

Space research requires sophisticated tools to simulate conditions in outer space and make use of the data it receives from ongoing missions. One breakthrough in this direction has been the development of sophisticated modelling tools that help researchers advance space missions and reduce costs. The EU-funded project 'Integrated medium for planetary exploration' (IMPEX) set out to build a system that enables high-tech simulation outputs and measurements obtained from space.

The project worked on specifying the requirements of the system and conducted web conferences to outline the different inputs from stakeholders. This paved the way to design the software involved and define a common data model, along with interfaces and protocols of the envisioned infrastructure.

IMPEX created an online document management system, communication networking mechanisms and a project website to further its goals. One of the website's smartest features is a series of audio podcasts that explore the project's goals and introduce stakeholders to specific modules of the project.

The simulation data model was finally designed to be compatible with the 'Space physics archive search and extract' (SPASE)

effort, which facilitates information retrieval across the space and solar physics data environment. In addition, the website has been designed to promote information exchange, initiate remote procedures and exploit services within the infrastructure.

Once the system goes online, it will boost collaboration between modelling experts and space mission data experts, making great strides in interpreting space mission data. IMPEX will also encourage joint analysis of space mission data that will further our understanding of space significantly and lay the groundwork for future missions. Last but not least, the influx of data and resulting analyses will represent a powerful boost to the European knowledge economy and European Research Area (ERA).

IMPEX

- ★ Coordinated by the Austrian Academy of Sciences in Austria.
- ★ Funded under FP7-SPACE.
- ★ http://cordis.europa.eu/result/rcn/90312_en.html
- ★ Project website: <http://impex-fp7.oew.ac.at/>

EVENTS

SEPTEMBER
22 ▶ 25

Amsterdam, THE NETHERLANDS

CONFERENCE

SPIE REMOTE SENSING

A conference entitled 'SPIE Remote Sensing' will be held from 22 to 25 September 2014 in Amsterdam, the Netherlands.

The conference aims to provide international researchers and scientists access to the most recent satellite-based imaging systems and the data generated by satellites.

It will bring together the scientific community, government officials and industry representatives to discuss current concepts and define future challenges in satellite research and technology.

For further information, please visit:
<http://spie.org/remote-sensing-europe.xml>

SEPTEMBER
26 ▶ 27

Rome, ITALY

CONFERENCE

SECOND INTERNATIONAL CONFERENCE ON SUSTAINABLE DEVELOPMENT

The Second International Conference on Sustainable Development (ICSd 2014) will be held from 26 to 27 September 2014 in Rome, Italy.

The conference aims to provide a forum for sharing ideas and research on the issues related to the three pillars of sustainability science: economic, environmental and socio-cultural.

By presenting cross-field research, the event sets out to develop better informed practices and policies. It will attract an interdisciplinary audience who share an interest in — and concern for — sustainability from a holistic perspective.

For further information, please visit:
<http://www.ecsdev.org/index.php/conference>

OCTOBER
06 ▶ 10

Sithonia, GREECE

CONFERENCE

NINTH INTERNATIONAL CONFERENCE ON ANTICANCER RESEARCH

The Ninth International Conference on Anticancer Research will be held from 6 to 10 October 2014 in Sithonia, Greece.

The conference will bring together 19 scientific societies working in the area, including the Union for International Cancer Control (UICC), and will include six parallel sessions each day, including symposia on specific topics organised by the Auspicious Societies and Scientific Committees. Special sessions will be devoted to discussions and arrangements of international cooperation projects and activities, encompassing the aims of the International Institute of Anticancer Research.

For further information, please visit:
<http://www.iar-anticancer.org/conference/>

OCT.

24 ▶ 26

Rome, Italy

CONGRESS

SECOND INTERNATIONAL CONGRESS ON SPORT SCIENCES RESEARCH AND TECHNOLOGY SUPPORT

The Second International Congress on Sport Sciences Research and Technology Support (icSPORTS 2014) will take place from 24 to 26 October 2014 in Rome, Italy.

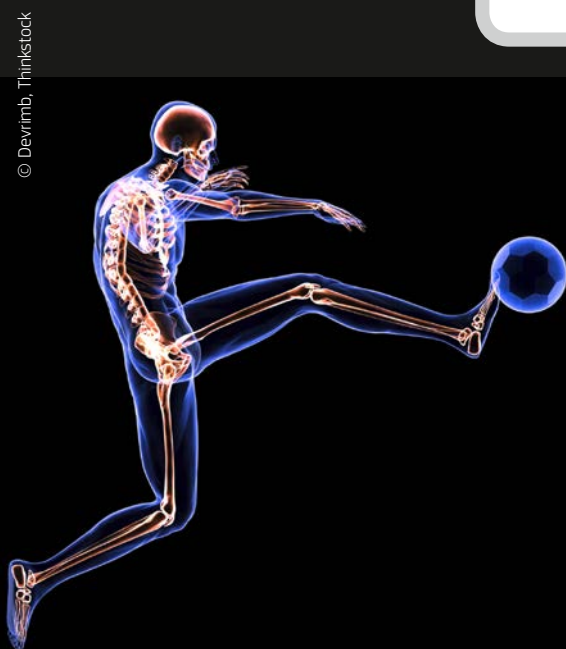
As sport is becoming more and more technological, and engineering in general and Information Technology in particular play an increasingly important role, this event aims to bring together academics and practitioners in the field to exchange ideas and develop synergies. Four areas in particular will be discussed, namely: signal processing and motor behaviour; sports medicine and support technology; health, sports performance and support technology; and computer systems in sports.

Held over three days, interested participants may also submit a paper to the conference and can also apply to speak at the event.

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

EVENTS

For more forthcoming events:
<http://cordis.europa.eu/events>



OCTOBER
15►17

Nice, FRANCE

CONFERENCE

**SECOND INTERNATIONAL
CONFERENCE
ON BIOINSPIRED AND
BIOBASED CHEMISTRY
& MATERIALS**

The Second International Conference on Bioinspired and Biobased Chemistry & Materials will be held from 15 to 17 October 2014 in Nice, France.

Bioinspired and biobased chemistry and materials is an emerging field covering materials science, chemistry, physics and biology. It arises from the knowledge of synthesis, directed self-assembly and hierarchical organisation of natural materials, and uses this understanding to engineer new artificial materials and devices for diverse applications.

The purpose of the conference is to bring together and create a cohesive community of scientists, engineers and managers from different backgrounds in order to promote new ideas and disseminate technical information in the field of bioinspired and biobased chemistry and materials.

For further information, please visit:
<http://sites.unice.fr/nice2014-conference/>

OCTOBER
30

Brussels, BELGIUM

CONFERENCE

**STANDARDS — YOUR
INNOVATION BRIDGE**

A conference entitled 'Standards — Your Innovation Bridge' will be held on 30 October in Brussels, Belgium.

The event will offer participants the opportunity to engage with leading experts on innovation and standardisation issues and to discuss how standardisation can enhance the impact of innovation in Europe. The conference will focus on the link between standards, innovation and competitiveness and on the role of standards in disseminating knowledge and bringing research results to the market.

Speakers will include representatives of standards bodies and researchers at national and European levels. The DemoZone will provide an exhibition space for European research projects.

For further information, please visit:
<http://www.cencenelec.eu/News/Events/Pages/EV-2014-02.aspx>

NOVEMBER
03►04

London, UNITED KINGDOM

CONFERENCE

**INTERNATIONAL
TRADE AND ACADEMIC
RESEARCH CONFERENCE**

A conference entitled 'International Trade and Academic Research' (ITARC) will be held from 3 to 4 November 2014 in London, United Kingdom.

The conference aims to focus on a wealth of issues in all aspects of business management, health and social care sciences, management education, teaching and learning methodologies and other fields. In the wake of the recent global financial crisis, the dynamics of international trade have taken on added significance. Therefore, getting an insight into the theories and processes that have helped certain economies weather this storm is key.

The conference will be a platform for academics, research experts, business leaders and practitioners to share their knowledge and experiences.

For further information, please visit:
http://www.abrmr.com/conference_detail.php?id=95

NOV.

7►8

Manchester, United Kingdom

CONFERENCE

**FOURTH INTERDISCIPLINARY
CONFERENCE ON AGING AND SOCIETY**

The Fourth Interdisciplinary Conference on Aging and Society will be held from 7 to 8 November 2014 in Manchester, United Kingdom.

This conference seeks to bring together a range of professionals from both the public and private sectors with a common concern for dramatic changes in the world's population and the increase of the average lifespan.

It will feature critical discussions on health and well-being, protecting the human rights of older people and global perspectives on care models.

For further information, please visit:
<http://agingandsociety.com/the-conference>



A comprehensive overview of European energy research at your fingertips!

<http://setis.ec.europa.eu/energy-research/>

Aiming to support cutting-edge projects, the Energy Research Knowledge Centre (ERKC) is a community portal that allows energy researchers and policymakers across Europe to share ideas and findings and identify potential partners and resources.

The ERKC web portal collects and organises validated, referenced information on energy research programmes and projects being currently undertaken in Europe and beyond. It is also a source of news on innovative work being carried out in the EU.

ERKC publications analyse the policy implications of energy research results and provide an overview of innovative research across the spectrum of energy technologies. One such overview – a Thematic Research Summary on Bioenergy – will be available on the portal in the near future.

The ERKC was set up under the umbrella of the European Commission's Strategic Energy Technologies Information System (SETIS). A recent publication of SETIS also deals with bioenergy and is available here: <http://setis.ec.europa.eu/setis-magazine/bioenergy>



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