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Can we control cancer?

The World Health Organization (WHO) informs us that cancer is a leading cause of death worldwide. It accounted for 7.9 million deaths in 2007, around 13 % of all deaths. Deaths from cancer worldwide are projected to continue rising, to an estimated 12 million in 2030.

In an endeavour to get cancer under control, European scientists are pulling together to research the behaviour of cancer cells, thus helping to save lives. In this issue's biology and medicine section, there is reassuring news: the anti-cancer strategy of the 'Targets for cancer T' project, the research on promising anti-cancer therapies within the Telosens project, and the CPP project partners' ideas for new cancer treatments.

Also high on the research agenda is the EU's future energy supply. How can new energy sources be tapped? We need new energy if we are to sustain our current way of life. Wave power is a renewable source of energy that has yet to be fully tapped. EU and Russian researchers of the Marineco project, heading this issue's energy section, show us how and where this can best be done.

Changes to habits and certain procedures we adopt in everyday life are not brought about easily. This was confirmed by the Tigress project which used time geography, a human science, to explain how spatio-temporal constraints on people's behaviour can block innovation. How, in turn, does this affect sustainable socio-natural development, such as fisheries management or land planning? You can find the answer right at the beginning of the environment section.

In IT and telecommunications, the latest multimedia devices and gadgets tend to spring to mind. But we should not forget the services that IT innovation renders to the most basic problems of human existence. Look at the bionic hand, for example, designed by the Cyberhand project. It can be linked to a wearer's nervous system, the idea being that the person can operate it like a real hand. Read more about this in the dedicated chapter.

Winding up this issue, the industrial technologies section presents the lessons learnt from studying bonding methods used in ship structures. Aiming to make European shipyards more competitive, the Bondship research project investigated how the cost of manufacturing and outfitting ships can be reduced while increasing productivity. This is something we can all profit from, not only during a summer holiday cruise!

As usual, the events section presents a choice of forthcoming events in the field of research and development, for you to participate in.

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The editorial team



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Fluorescent proteins light up the way to cancer therapy

The potential for molecular intervention in the cascades leading to cancer cell development are immense. Scientists in an EU-funded project have screened for peptide candidates that prevent the inactivation of a tumour suppressor protein.

The complex pathways leading to tumourigenesis include the process of transformation which can involve deregulation of tumour suppressor genes or their protein products. To prevent this, the research scientist can block pathways using knockout techniques aimed at preventing the transcription of specific genes.

The project 'Targets for cancer T' formulated its objectives around this anti-cancer strategy and aimed to deactivate existing molecular targets as well as identify new ones. One of the consortium's main aims was to inhibit protein-protein interactions that give rise to the cell's acquisition of the tumourigenic phenotype.

Project partners at the University of Tartu in Estonia made use of two proteins that interact to deregulate a tumour suppressor mechanism. Protein or tumour protein 53 (p53) regulates the cell cycle and is a tumour suppressor. One of its main negative regulators is mdm2, which binds with p53 to produce two molecular scenarios. First, the so-called 'guardian of the genome' p53 protein is inhibited and unable to perform its protective activity. The protein molecule is also marked for degradation.

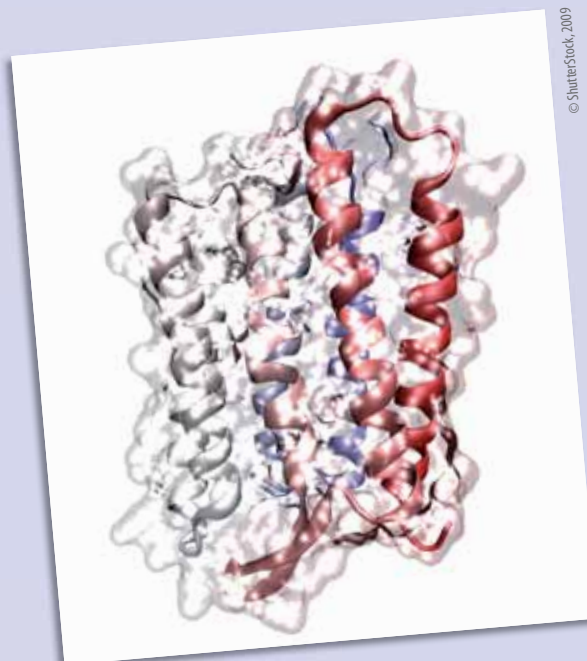
Fluorescence resonance energy transfer (FRET) was used to investigate candidate molecules that interfere with this deregulation. Vectors were constructed using green and yellow fluorescent markers for mdm2 and p53, respectively. Detectable energy changes between the two molecules were employed as a screen for small molecules or peptide-based agents that were able to interfere with the p53/mdm2 interaction.

One drawback of the FRET procedure is that high throughput screening was not possible. However, pharmaceutical companies

are still able to select suitable candidates on a secondary run to optimise the choice of promising molecules. The commercial potential of the screening process is potentially substantial as molecular intervention at p53 is frequently the start of development of cancer cells.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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The special case of adolescence for vascular parameters

For children with chronic renal failure (CRF) there are cardiovascular consequences both as a result of the disease and application of therapies. Accordingly, specific data handling techniques for cardiovascular assessment of adolescents were developed by partners in the Escape_trial project.

Childhood onset CRF manifests itself in abnormalities in arterial wall texture. An increase in the intima-media thickness (IMT) can occur early in the progression of the disease and is particularly marked in dialysed patients.



Partners in this EU-funded project aimed to assess the cardiovascular effects of CRF and any renoprotective therapy. In children, studies have shown that IMT thickness and arterial elasticity indices can reflect vasculopathic alterations. However, the situation as regards adolescents was largely unknown due to the impact of growth and consequent lack of normative values for data evaluation.

At the University Hospital for Paediatric and Adolescent Medicine in Heidelberg, Germany, almost 250 healthy adolescents aged 10 to 20 years were studied by researchers. The IMT and elasticity of the common carotid and femoral arteries together with interacting factors as a result of adolescence were measured. The aim was then to make recommendations for analysis of the data

to take into account the changes associated with adolescence.

The correlations between vascular properties and age, height, body mass index, systolic blood pressure and brachial pulse pressure were measured. All parameters measured did not adhere to the normal distribution pattern and were skewed.

On the basis of the results, it was recommended that morphological and functional measurements should be normalised to take into account the changes of adolescence and lack of adherence to Gaussian distribution.

Extended trials were planned with pharmaceutical companies for possible drug-based therapies. The research conducted by Escape_trial has provided significant input into trial design and data analysis.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training.

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Blood pressure rhythms in renal failure children

Ultradian but not circadian blood pressure rhythms were found to be linked to renal dysfunction in children with chronic renal failure (CRF).

The diurnal fall in blood pressure, known as dipping, is an important prognostic marker for patients suffering from CRF. However, full details of physiologic ultradian cardiovascular rhythms in patients with CRF, stage

2 to 4 chronic kidney disease, are not known. Furthermore, the relationship between conventional dipping analysis and Fourier spectral rhythm analysis had not been studied in renal hypertension.



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Researchers from the Escape_trial project used ambulatory blood pressure monitoring to study a sample of 214 children aged between 3 and 18 with CRF and no antihypertensive treatment. Data relating to prevalence and dimensions of circadian and three ultradian cardiovascular rhythms at 12, 8 and 6 hours were recorded.

Researchers compared the children in the sample with 938 healthy control subjects and assessed factors which characterised dipping, renal function, proteinuria and serum electrolytes. The CRF group showed significantly reduced amplitude of the circadian and of the ultradian rhythms examined. Furthermore, all blood pressure and most heart rate rhythms demonstrated a sig-

nificant delay in the time at which the peak occurs.

Conventional dipping factors and the 24-hour blood pressure amplitude were found to be independent of renal function. However, the 8-hour blood pressure amplitude was positively correlated with glomerular filtration rate (GFR), which describes the flow rate of filtered fluid through the kidney. It was also inversely correlated with the urinary protein/creatinine ratio. The 6-hour blood pressure amplitude was inversely correlated with proteinuria. Researchers also found that those children who demonstrated 24- or 12-hour cardiovascular rhythms had much lower levels of serum calcium than children without these rhythms.

It was concluded that children with CRF show both blunted circadian and ultradian cardiovascular rhythms. Ultradian, but not circadian rhythms nor conventional dipping parameters, were linked with renal function and proteinuria.

Funded under the FPS programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training.

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The importance of long telomeres

The EU-funded project Telosens focused on research to further ascertain the role of the telomere in predisposition to radiation damage and sensitivity to genotoxic agents.

The telomere is a region of repetitive DNA at the end of a chromosome. With each successive division, part of the telomere is used up but can be maintained by the enzyme telomerase reverse transcriptase. Shortened telomeres are associated with replication problems and most probably ageing.

The implications of the length of telomeres and the continued production of telomerase cannot therefore be understated. Project partners at the Spanish National Cancer Research Centre (CNIO) in Madrid have a long-distinguished record of research into these structures. As part of Telosens, they have continued their research into the role of the telomere, cell development and radiation sensitivity.

The Spanish-based team showed that more diminutive telomeres rejoin to double-strand breaks (DSBs). This impairs the repair of the breaks which can be caused by radiation damage. Not only this, but cutting the length also led to an increased sensitivity to genotoxic agents such as N-nitroso-N-methylurea (MNU) and oxidative stress.

Of particular relevance in today's research arena is the impact of telomere length on stem cell integrity. The Spanish scientists discovered that proliferation of adult stem cells *in vitro* is profoundly affected by telomere shortening, but this is not the case in embryonic stem cells.

For epidermal stem cells and tumour development, shortening of the telomere affected mobilisation. Mice with defective short telomeres showed premature ageing of the skin but a decreased tendency towards tumourigenesis. However, when telomerase was overexpressed, the stem cells were mobilised and the mice were more prone to tumour development.

The study of Fanconi anaemia (FA) may also be able to shed more light on the importance of telomeres. Patients with FA show accelerated telomere shortening and unusual sensitivity to ionising radiation. The CNIO team found that attrition at the telomere region was a result of

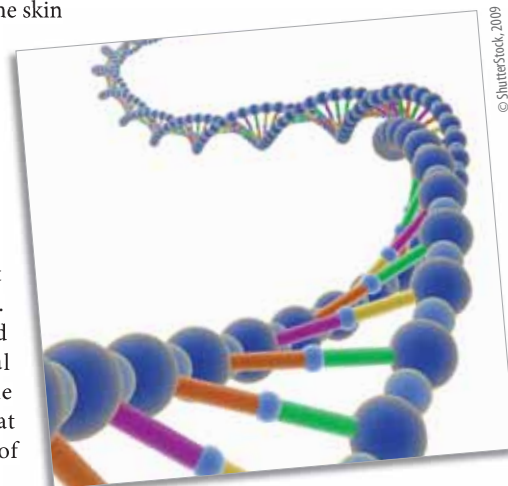
the disease, and not action of the FANCG gene.

Research on the regions at the ends of chromosomes could yield promising anti-cancer therapies. Results have already pointed to the use of telomerase inhibitors based on porphyrin and radiotherapy to promote cell death. Telomerase-based therapies could also be used in FA to preserve the telomere length threatened by the disease.

Funded under the FPS programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: information exchange/training.

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Smart fabrics, the new black

Smart fabrics and intelligent textiles (SFIT) — material that incorporates cunning molecules or clever electronics — is thriving. European research efforts are tackling some of the sector's toughest challenges.

Clothes that monitor your heart, measure the chemical composition of your body fluids or keep track of you and your local environment promise to revolutionise healthcare and emergency response — but they present tough research challenges, too. Smart textiles must be comfortable, their technology must be unobtrusive, they must withstand a difficult and variable environment and, particularly for medical and emergency applications, they must be absolutely reliable.

These are all tough challenges, but they must be overcome to realise the considerable benefits and lucrative market potential of SFIT. The market is thought to be worth over EUR 300 million, and current growth rates are about 20 % a year.

Europe has not been slow to spot the potential of Fashion 2.0, with many projects funded by the EU to develop new applications and innovative solutions to old problems. The EU has even set up a research cluster for the sector.

'We formed the SFIT cluster because there are many European projects researching new types of smart fabric,' explains Jean Luprano, coordinator of the SFIT cluster. 'We wanted to share expertise and find a way to avoid reinventing the wheel. Often the work of one project could help another, even if they were not working on the same area.'

'Many of the underlying objectives are the same, like connectivity, wearability and ensuring the fabric is accepted by users.'

The cluster achieved some remarkable cross-pollination between projects. 'The textile electrode used in Wealthy, for example, extended to three other projects, MyHeart, Proetex and Biotex. In Biotex for instance, it was not our intention to develop a dry textile electrode again, so the help was a bonus.'

The SFIT cluster currently regroups the projects Context, Proetex, Sweet, Stella, Ofseth, Biotex and Clevertex. Lessons were taken from Wealthy, which had finished

its work developing intelligent systems for health monitoring before the cluster started, and from MyHeart, which developed a textile sensor for continuous heart monitoring.

SFIT's Context project sought to develop contactless sensors for the prevention of lower back pain and repetitive strain syndrome. Proetex aimed its sights at rescue workers such as fire fighters, and is developing a system to monitor the wearer and the outside environment. The Sweet project is developing stretchable and washable electronics for embedding in textiles so smart clothes can cope with daily wash, wear and tear.

The Stella project is developing stretchable electronics for large area applications. Currently, there are no stretchable electronics on the market but they could have wide application, particularly for health monitoring. The team hopes to develop conducting substrates within the very weave of fabric, which will allow sensors to move with the body.

Optical fibres also offer a promising avenue for new smart clothing because of their potential flexibility and their capacity to use light both as an information carrier and a sensor in itself. The team behind the Ofseth project is aiming at applications in oximetry — a clever non-invasive way to measure the oxygen content of blood.

In a hospital setting, a clip is attached to a patient's finger measuring a ratio in the absorption of red and infrared light passed through a patient's finger, which varies depending on the state of oxygen-rich, bright red blood and oxygen-poor, dark red blood. Ofseth researchers hope to replicate the measure in clothing (without the need for the finger clip typically used in hospitals) by placing optical fibres around the neck of a smart garment.

In a related healthcare activity, the Mermoth project worked on

integrating smart sensors, advanced signal processing techniques and new telecommunication systems on a textile platform.

The Biotex project is looking at the chemical monitoring of textiles, a new frontier in the emerging field of smart textiles. Most smart fabric applications want to stay dry, but Biotex is hoping to develop sensors that can measure body fluids like sweat, too. If they are successful, it will open up whole new areas for smart applications.

'Right now we're looking at sporting applications, because the medical applications are very difficult to bring to market and require enormous validation efforts to ensure reliability in a medical setting,' explains Mr Luprano.

The Biotex system aims to measure the conductivity, electrolyte level, temperature and pH of the user's sweat, all enormously useful indicators for sporting applications. The project also aims at monitoring wound healing by placing biosensors in contact with exudates present in wounds.

Clevertex is taking a big picture view of the field in its efforts to develop a strategic 'master plan' for transforming, by 2015, the traditional textile and clothing sector into a knowledge-driven industrial sector.

The projects in the SFIT cluster mean a double benefit for Europe's smart-clothing sector. The applications are useful in themselves, and the technical solutions developed in each project will benefit the range of smart clothing systems.

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Frequent acronyms

ERA	European research area	ICT	information and communication technologies
FP5/6/7	Fifth/Sixth/Seventh Framework Programme of the European Community for research, technological development and demonstration activities	IST	information society technologies
		R & D	research and development
		SMEs	small and medium-sized enterprises

Stereo copolymer scaffolds in tissue engineering

Scientists have investigated new materials and techniques for the production of bioscaffolds for use in tissue engineering and regenerative medicine.

Europe's ageing population wish to remain active, resulting in a growing demand for materials which can replace, repair and even regenerate damaged tissues. Conventional techniques have only been partly successful in restoring all functions of the damaged tissue. The aim of the Intelliscaf project was to produce innovative scaffold materials for facilitating the regeneration of bone, cartilage and skin tissue. In this context, the scaffold is an artificial structure used to support three-dimensional (3-D) tissue formation.

The team produced intelligent bioscaffolds which could initially fill the tissue defect, while providing the equivalent function to the original tissue. The scaffolds supported the regeneration process of natural tissue through the promotion of cell-adhesion factors, molecular triggers and progenitor cells. The scaffold was then degraded following tissue differentiation and growth.

The material PLA 98 stereo copolymer was manufactured and used at Phusis S.A.S. in

France for the injection moulding of orthopaedic fixture devices which could be broken down and assimilated back in the body. However, the Intelliscaf team sought a scaffold implant that could be resorbed much faster. This was in order to adapt the breakdown of the polymer to the kinetic of tissue integration. Therefore, the researchers chose to use PLA 50 stereo copolymer for scaffold production. The Intelliscaf team developed a manufacturing process to produce larger quantities of PLA 50 with a controlled molecular weight.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: manufacturing agreement.

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Intelligent materials to regenerate bone tissue

Advances in the field of tissue engineering have encouraged physicians to introduce innovative techniques into clinical practice. Biochemical and biophysical stimuli of cell growth have been proposed as potent tools to improve reparative bone formation in vivo.

With the development of new materials that allow control of the way in which they combine with living tissue, repair of injured bone tissue within the human body is now possible. These include calcium phosphate compounds and new polymeric materials with physical and chemical properties that

can be altered through surface modifications to allow selective adherence of different cell types.

Three-dimensional (3-D) constructs of biodegradable materials offer an initial and adequate mechanical support for seeded cells to integrate with the surrounding tissue. Moreover, they help the bone tissue to regain its original shape in the region of the treated defect. Within the framework of the Intelliscaf project, two different surface modification methods were used to further enhance their biological performance.

In order to improve the potential of porous scaffolds to trigger bone induction, a biomimetic calcium phosphate (CaP) coating was

applied on their surface through a two-step aqueous procedure. The promotion of octacalcium phosphate (OCP) crystals grown epitaxially on the scaffold surface stirred the interest of researchers in this technology. OCP was known to be one of the precursors during the bone mineralisation process and could be used as a carrier for osteoinductive agents.

Through mixing hydroxyapatite with tricalcium phosphate which resulted in biphasic CaP ceramics, or selecting different CaP phases, the degradation rate of scaffolds could be tailored. Moreover, gas plasma treatment allowed desirable surface features that enhance adhesion of the coating materials as well as mediate cell responses of the host tissue. While these surface modifications require further improvement, they hold the promise for revolutionary advances in orthopaedic surgery.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support; marketing agreement; manufacturing agreement.

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Tele-rehabilitation for spinal cord injured patients

A protocol was designed as part of the EU-funded Thrive project to provide tele-rehabilitation to patients as part of the aftercare they receive once they have returned home. Following testing and consultations with medical specialists, patients and their carers, this protocol is ready to be integrated into health systems throughout Europe.

Life for patients who have suffered spinal cord injuries can be very difficult. The individual needs to relearn how to be autonomous, and in many cases this depends on the treatment and support they receive. Medical treatment for these types of injuries

requires collaboration from many specialists including neurologists, orthopaedic experts and urologists. Specialised spinal units do exist in many places in Europe and they do deliver a high standard of care. However, this type of extensive care is only limited to

the first months after injury. For aftercare to be effective, it needs to be extensive, which is costly and out of the reach of many care systems' budgets.

The Thrive project used information and communication technology (ICT) to improve the level of care provided to spinal cord injured patients. The use of this technology allows them to return to their family settings without compromising the quality of treatment they receive. This

continued on page 9

DNA extraction from extreme environment microbes

The DNA from micro-organisms living under extreme conditions of heat, acidity and alkalinity was extracted and used to build a metagenomic library.

Biodiversity of micro-organisms has traditionally been explored by isolating and culturing microbes in the laboratory. However, only a small fraction can be successfully cultured under such conditions. Therefore, the vast genetic potential offered by microbes in the environment has been massively under-utilised. The diversity of micro-organism communities means that an inexhaustible supply of valuable compounds including enzymes with industrial and pharmaceutical applications would be available. This fact has led to a radically different approach through the use of metagenomics, in which genes in non-cultured bacteria are identified by their functions and sequences.

Researchers from the Gemini project collected samples of micro-organisms from extreme habitats. These included hot springs, geysers and volcanic areas where temperatures ranged from 58 to 78 °C, and the pH from 2.5 to 3.5 and from 9 to 9.3.

The isolation of DNA suitable for cloning, and which represented the microbial diversity of the sample, was a technological challenge to the Gemini team. This was due to difficulty in lysis of microbial cells retrieved from extreme environments. Most protocols for DNA extraction have been developed for mesophiles that grow best under moderate

conditions and release highly stable nucleases after cell lysis.

The Gemini consortium successfully developed methods for isolating high-quality DNA from the samples. For the heat loving micro-organisms, total DNA extraction was facilitated by suspending samples in DNA extraction buffer and treating in a bead beater. The solution was incubated at 60 °C for 2 hours, and the supernatant centrifuged before being extracted with chloroform/isoamyl alcohol. The DNA was then precipitated with isopropanol and dissolved in water. The amount of DNA isolated was enough to build several libraries of environmental DNA from these extreme habitats.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4778

Genetic marker for diabetic nephropathy

Development of complications in diabetes can cause early mortality. The EU-funded project Euragedic used data from a large sample group of diabetic patients throughout Europe to identify the genes involved.

Diabetes affects 5 to 10 % of the population in Europe to varying degrees. Out of these patients, around 30 to 40 % will go on to develop diabetic nephropathy (DN) with the need for dialysis and transplant a distinct possibility. As one of the leading complications of this disorder in glucose metabolism, partners of the EU-funded project Euragedic aimed to investigate the molecular basis behind DN.

As large numbers of the population are affected, EU resources could be mustered to study the large sample size required for this complex trait. Out of three European populations, the French National Institute for Health and Medical Research (Inserm) undertook a large case/control study comprising 1 176 patients with diabetes type 1 and 1 323 control subjects for comparison.

The team identified polymorphisms and then tested more than 400 haplotype-tagging single nucleotide polymorphisms (SNPs) for association with DN. Finally, only one SNP, located in the UNC13B gene, showed significant linkage with DN after applying the multiple testing correction.

The location of the potential marker in gene UNC13B would appear to be linked to the gene's function. UNC13B modulates apoptosis in glomerular cells and is upregulated by hyperglycaemia. This further contributes to the renal complications of diabetic hyperglycaemia and starts to occur early on in the development of DN. The team suggested that the polymorphism could be used as a marker for the initiation of nephropathy, but further research is needed on the exact role of the gene in DN.

The discovery of a marker for onset of this diabetic complication would confer huge benefits to patient and healthcare facilities generally. Early diagnosis and intervention would improve risk assessment regarding development of diabetic complications.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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continued from page 8 'Tele-rehabilitation for spinal cord injured patients'

approach to rehabilitation, described as tele-rehabilitation, was evaluated in experiments done in public care systems in three EU Member States: Belgium, Italy and the United Kingdom.

The project designers created a tele-rehabilitation protocol in which all aspects of medical care were integrated. Effective detection of medical complications was therefore enabled over time to ensure therapeutic action when needed.

The effectiveness of the protocol was tested by comparing a selection of predefined medical outcomes in patients who received tele-rehabilitation and those who received only standard home care. The protocol was validated and adapted following feedback from medical specialists, patients and carers.

The Thrive project demonstrated the importance and success of tele-rehabilitation when applied to spinal cord injured patients,

and that it is suitable for use by interested health institutions.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training; other.

<http://cordis.europa.eu/marketplace> > search > offers > 4891

Immunisation improves innate immunity

Researchers have investigated immunisation of pigs as a means of upregulating the production potential of interferon-alpha (IFN-alpha). Incorporating this fact in the formulation of control strategies could contribute to the control of outbreaks of classical swine fever (CSF).

The devastation caused by outbreaks of CSF has promoted research to move towards improving the immune defences of pig herds in order to limit outbreaks. The development of effective marker vaccines for the production of a fast immune response was taken up by the IMPCSF project as its priority objective.

At the Institute of Virology and Immunoprophylaxis in Switzerland, project partners demonstrated an additional benefit of immunisation. Vaccination primes natural interferon producing cells (NIPCs) to

increase production of IFN-alpha after a viral infection. IFN-alpha is one of the key players in the innate immune system and stimulates both macrophages and natural killer cells to illicit an antiviral response.

The project scientists compared immunologically naïve pigs with those immunised against swine fever. The vaccinated animals were more receptive to virus infection and produced higher levels of IFN-alpha.

Moreover, this sensitisation was maintained for a minimum of eight months after immu-

nisation. This means that NIPCs are not only highly important in innate immune responses but are linked to the adaptive immune system in terms of immunological memory.

Many cells in the immune system produce IFN-alpha, but NIPCs are one of the most potent. As such, there is great potential for the combination of increased sensitivity of NIPCs and induction of more specific immune responses. These principles could be used in the design of swine fever vaccines.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; joint venture agreement; information exchange/training; private-public partnership; available for consultancy; other.

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T-helper response aids swine fever vaccine development

Severity of outbreaks of classical swine fever (CSF) has emphasised the need for a complete understanding of the immune mechanisms underlying protection against this disease. To this end, researchers in the EU-funded project IMPCSF have classified the frequency and type of a range of peptide-induced immune responses.

CSF is an economically important infectious viral disease affecting domestic pigs and wild boars. Infected animals develop severe leukopaenia and immunosuppression, accompanied by haemorrhagic lesions. As many as 9 out of 10 young pigs can die as a result of infection. The social and financial consequences of mass slaughter following a CSF outbreak have directed research centres

and authorities to reconsider the application of emergency vaccines.

Consequently, there is great interest in developing and using marker vaccines for the control of CSF in domestic pigs and wild boars. Project partners at the Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health in Germany, re-stimulated peripheral blood mononuclear cells (PBMCs) isolated from virus-infected miniature pigs. These trials gave valuable data on the T-cell immune response.

The scientists used two types of peptide — synthetic peptides previously identified as potential T-cell epitopes and peptides from the non-structural virus protein region. It was found that different peptides stimulated

varying proportions of CD4+ and CD8+ T lymphocytes. For example, one peptide induced a response of almost exclusively CD8+ T cells.

Enzyme-linked immunosorbent spot (Elispot) assays were used for a further subdivision of the peptide induced T-cell response into Th1 or Th2 cytokine-producing cells. The team found there was no relationship between the type of peptide-stimulated cell and the final fraction of interferon-gamma (IFN-gamma) or interleukin-4 (IL-4) producing cells. Nearly all possible combinations were found, ranging from almost exclusively IFN-gamma yielding cells to various mixtures of IFN-gamma and IL-4 producing T cells.

Differences in cytokine response as a result of antigen stimulation can be applied to aid the development of novel effective vaccines. Moreover, data on different peptides can be used as a basis for multi-peptide vaccines, as a strategy for increasing the breadth of the vaccine-induced response.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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Genomic solutions for fish egg cryopreservation

For efficient, disease-free broodstock management in the aquaculture industry, gamete preservation is essential. Integral to the success of cryopreservation, researchers have devised a genomic test to determine oocyte viability.

Cryopreservation is a demanding process for cell structure, integrity and function. Freezing of living tissue, particularly when there is a high water composition, leaves the cells open to rup-

ture of vital membranes on thawing. Moreover, the cryoprotectant used is potentially toxic and can affect viability of the oocyte on maturation, fertilisation and embryo development.

Under the auspices of the EU-funded Cryocyte project, procedures were developed to evaluate viability of oocytes. Tests included the use of stains, measurement of membrane permeability as well as enzyme activity. In order to develop a more refined, less invasive technique, the project team at the University of Bordeaux in France investigated the use of genomic-based protocols.

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Breeding for milk yield and scrapie resistance

Breeding programmes to increase the genetic resistance to scrapie appear to be one answer to its control. Researchers have designed models to select optimal programmes, not only for scrapie resistance, but to maximise mild yields.

The ARR allele is associated with resistance to scrapie — the disease is rare with individuals with only one copy of the allele (heterozygotes). Furthermore, homozygous sheep have been shown to be resistant to experimental oral challenge with scrapie and bovine spongiform encephalopathy (BSE).

In a bid to eradicate the incidence of scrapie and BSE, selective breeding programmes in favour of the presence of ARR gene are being pursued. Unfortunately, selection pressure imposed for ARR may be accompanied by a loss of production traits as a result of linkage. Also, pleiotropic effects may arise where the ARR gene may control other unrelated characteristics.

The EU-funded project Scrapiefreesheep investigated the projected effects of scrapie gene selection on characteristics such as fertility and mortality rates, production traits and disease susceptibility.

Project partners at INRA in France concentrated on the maintenance of the production trait, milk yield. To study the effects of positive selection for the ARR allele, the scientists applied a deterministic and dynamic model to sheep breeding programmes. The relative frequencies of the ARR allele in conjunction with milk yield, under polygenic control, could then be predicted.

The model applied to 15 years of a selection programme strategy presently used for sheep breeding in France. Three initial frequencies for the ARR allele were used. The predictions also incorporated a level of constraint on genetic progress for milk yield.

The results of the models showed that the optimal strategy to fix the ARR allele in the population depended on the level of constraint applied to conserve milk yield. The higher the constraint set, the

longer it took to establish the gene in the breeding pool. However, the higher the initial allelic frequency of the ARR gene, the lower the influence on milk production.

Using these models will no doubt be a strong basis for sheep breeding programmes designed to eliminate the threat of scrapie by genetic means. The overall aim is to achieve this without severely compromising the health and productivity of the European sheep population.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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Breeding scrapie out of European flocks

The prion disease scrapie is the equivalent in sheep of bovine spongiform encephalopathy (BSE) and Creutzfeldt-Jakob disease. An EU-funded research team conducted experiments to evaluate the most effective breeding strategies for reducing prevalence of the disease.

Scrapie is a degenerative disease that affects sheep and goats. The disease is highly transmissible and so its containment is of utmost

importance. Outbreaks of the disease considerably reduce the welfare of animals and although so far it seems unlikely, it is possible that this may show signs of impact on humans as the infected animal passes along the food chain.

The aim of the Scrapiefreesheep project, as the title suggests, is to reduce the incidence of the disease in the sheep population. This research was conducted in order to determine an optimal breeding strategy for scrapie control.

This particular part of the project developed a simulation model. The

demographic parameters were set to represent the extensive Norwegian sheep population in Rogaland county. Examined were 2 705 flocks, with a total of 174 000 ewes. The model was run to compare each breeding strategy, which was in turn compared to a scenario where no intervention to control scrapie was performed. Three breeding scenarios were compared. These differed in the genotype of the rams that were used.

The results showed that in all three breeding strategies, there was a reduction in infected flocks. However, complete eradication was only achieved by using the most resistant allele to scrapie, not merely by excluding the most susceptible allele.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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The result, a molecular profile assay, was developed to monitor the impact of cryopreservation and other oocyte manipulations. The oocyte viability molecular signature (OVMS) utilises the polarisation of maternal transcripts within zebrafish oocytes for the required signature. It is hoped that the novel protocol will be able to replace the more chemically and physically rigorous

tests involved in staining and functional evaluation.

The development of a successful cryopreservation technique will mean that maternal banks of genetic material can be created. This has so far remained elusive in yolk-laden eggs, as opposed to spermatozoa that pose few problems on freezing. Spread of disease within fish

populations also stands to be reduced and our dwindling fish supplies replenished.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

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Unified format for the exploitation of proteomic data

With the recent achievements in sequencing the human genome and the genome of other organisms vital to medical research, scientists are faced with an enormous overload of data. A bioinformatics tool developed by the Temblor project promises to allow them to search seamlessly across different databases of information.

The wealth of information available in completely sequenced genomes has become an essential tool for modern biomedical research. In practice, it is the extraction of associations between proteins encoded by the genome of an organism that poses an interesting biological problem. Proteins interact with each other to build fully functional cells, and disruptions of the networks of protein-protein interactions can be the cause of disease.

Different types of experiments have provided data from one to tens of thousands of interactions with varying levels of reliability. Large sets of protein-protein interaction data, fragmented across local databases therefore needed to be brought together before they could be cross-validated. Besides defining the essential standards for the collection of protein-protein interaction data, in 2002 the international scientific Human

Proteome Organisation (HUPO) proposed the development of the PSI-MI format.

The Proteomics standards initiative — molecular interaction (PSI-MI) format is a standard data model for representing and exchanging protein interaction data. Protein interactions are first described at a basic level that covers all currently available data and assists subsequent additions of new information. Based on the extensible markup language (XML) standard, this format was developed through the concerted efforts of major producers and providers of protein interaction data in both academia and industry.

Its rapid and widespread acceptance quickly revealed that the first version was limited in scope. Within the Temblor project, the PSI-MI format

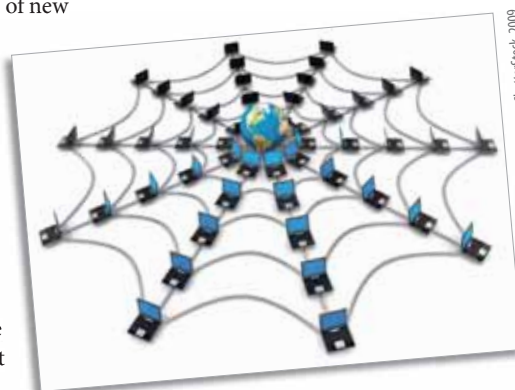
has evolved to enable the description of interactions between a wide range of molecule types, such as nucleic acids and molecular complexes. A highly detailed description of the biological role of each molecule within an interaction is also supported, as well as storage of quantitative parameters and, in particular, kinetic parameters.

The PSI-MI format version 2.5 schema along with extensive documentation and tools are freely available at: <http://www.psidev.info>

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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Proteomic strategies strike at the pathways to disease

A proteomics approach was adopted by researchers to analyse the modifications of proteins involved in the molecular cascades leading to inflammatory bowel disease (IBD).

The 'Genetics of IBD' project aimed to adopt a genetic and proteomic approach to identify the molecular components of implicated pathways in the development of inflammatory bowel disease. Project partners in the Protein Research Group at the University of

Southern Denmark specifically developed proteomic screening strategies. Throughout their research, the scientists modified established protocols to allow for the high level of accuracy required.

Modifications in proteins in patients with IBD were identified and characterised using mass spectrometry-based methods. Analysis of complex mixtures of proteins requires the sensitivity and specificity of this analytical technique. Furthermore, project partners were aware that protocols for preparation of the sample to be analysed are critical.

Mass spectrometry was combined with affinity-based methods of sample preparation, and high-performance liquid chromatography for maximum accuracy. Modifications in sites in post-translational proteins can then be determined. The NOD2 protein was a particular target in the study.

Phosphorylated proteins were characterised using the hybrid ion trap combined with Fourier transform ion cyclotron resonance

mass spectrometer. This allowed identification of phosphopeptides with high analytical power and efficiency. The NOD2 protein was shown to be phosphorylated at the serine-116 amino acid.

Linked to the first objective was the characterisation of the signalling pathways regulated by phosphorylation. For optimum efficiency in the mass spectrometry analysis stage, the phosphopeptides were previously enriched with strong cation exchange by immobilised metal affinity chromatography (IMAC). Identified were 700 unique phosphopeptides, many of them key kinases of the pheromone response pathway in yeast.

This research showed for the first time that a mitogen-activated protein (MAP) kinase signalling pathway can be investigated using phosphoproteomic methodologies. Overall, proteomic strategies have been developed for large-scale protein analysis and protein phosphorylation. The protocols developed in this research can be transferred to human cells, and molecular profiles of cascades can then be used to model novel therapies.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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When virtual reality feels real

Despite advances in computer graphics, few people would think that virtual characters or objects are real. Yet placed in a virtual reality (VR) environment, most people interact with them as if they were really there. European researchers are finding out why.

In trying to understand presence — the propensity of humans to respond to fake stimuli as if they were real — the researchers are not just gaining insights into how the human brain functions. They are also learning how to create more intense and realistic virtual experiences, opening the door to myriad applications for healthcare, training, social research and entertainment.

'Virtual environments could be used by psychiatrists to help people overcome anxiety disorders and phobias [...] by researchers to study social behaviour not practically or ethically reproduced in the real world, or to create more immersive virtual reality for entertainment,' explains Mel Slater, a computer scientist at ICREA in Barcelona, Spain, and at University College, London, United Kingdom. He led the team behind the research.

Working in the EU-funded Presenccia project, Mr Slater and his team, drawn from fields as diverse as neuroscience, psychology, psychophysics, mechanical engineering and philosophy, conducted a variety of experiments to understand why humans interpret and respond to virtual stimuli the way they do, and how those experiences can be made more intense.

For one experiment they developed a virtual bar, which test subjects enter by donning a VR headset or immersing themselves in a VR CAVE (cave automatic virtual environment) in which stereo images are projected onto the walls. As the virtual patrons

socialise, drink and dance, a fire breaks out. Sometimes the virtual characters ignore it, sometimes they flee in panic. That in turn dictates how the real test subjects, immersed in the virtual environment, respond.

'We have had people literally run out of the VR room, even though they know that what they are witnessing is not real,' says Mr Slater. 'They take their cues from the other characters.'

In another instance, the researchers re-enacted controversial experiments conducted by American social psychologist Stanley Milgram in the 1960s, that showed people's propensity to follow orders even if they know what they are doing is wrong. Instead of using a real actor, as Mr Milgram did, the Presenccia team used a virtual character to which the test subject was instructed to give progressively more intense electric shocks whenever it answered questions incorrectly. The howls of pain and protest from the character, a virtual woman, increased as the experiment went on.

'Some of the test subjects felt so uncomfortable that they actually stopped participating and left the VR environment. Around half said they wanted to leave, but said they did not because they kept telling themselves it wasn't real,' Mr Slater says.

All had physical reactions, measured by their skin conductivity, perspiration and heart rate, showing that, at a subconscious level, people's responses are similar regardless of whether what they are experiencing is real or virtual. The plausibility of the events enhances the sense that what is happening is real. Plausibility, Mr Slater says, is therefore more important to presence than the quality of the graphics in a VR environment.

For example, when a test subject was made to stand on the edge of a virtual pit, staring down at an 18-m drop, their level of anxiety increased if they could see dynamically changing shadows and reflections of

their virtual body even if the graphics were poor. In other experiments, the researchers made people believe that a virtual hand was their own — replicating in VR the so-called 'rubber hand illusion' — or that they were looking at themselves from another angle, creating a kind of out-of-body experience. In one trial, they even gave male test subjects a woman's body.

By understanding what makes people perceive virtual objects and experiences to be real, the researchers hope to create applications that could revolutionise certain psychiatric treatments. Patients with a fear of spiders or heights, for example, could be exposed to and helped to overcome their fears in VR. Similarly people who are shy or paranoid about public speaking could be helped by having to face virtual people and crowds.

'One application we are working on is designed to help shy men overcome their fear of meeting women by making them interact with a virtual woman,' Mr Slater says.

The technology is also being used for social research which, much like the Milgram experiments, would not be practical or ethical to conduct in the real world. One experiment due to be run at University College, London, will use a virtual environment to study how people respond to violence in public places, such as a bar fight between football hooligans.

Besides healthcare and research, more immersive VR would also help in training, potentially greatly improving the results of flight or driving simulators. Mr Slater also envisions VR environments being used to train people to use prosthetic limbs and wheelchairs through mind control before trying them out in the real world. A brain-computer interface (BCI) developed for just such a purpose was tested in the Presenccia project and in a similarly named predecessor called Presencia, which received funding under the EU's Sixth and Fifth Framework Programmes (FP6 and FP5), respectively.

Though immersive VR is likely to have many applications in healthcare, research and training, the biggest market is probably entertainment. With the cost of VR technology coming down, people could eventually be exploring virtual worlds and interacting with virtual characters and other people through VR rooms in their homes akin to the 'holodecks' seen in *Star Trek*, Mr Slater says.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90561>



Glucose syrup and beer safer for coeliac disease patients

A novel test with high sensitivity has been developed to detect coeliac disease (CD) toxic prolamins. The assay is for use on beers and glucose syrups and so promises to make food 'treats' safer for patients with CD.

CD is a condition restricted to humans characterised by damage to the small intestinal mucosa. Inflamed and flattened villi in the jejunum reduce absorption of important nutrients including iron, calcium and vitamins to a serious extent.

As a gluten-free diet forms the complete treatment for patients, the development of accurate assay methods for CD-toxic gluten in foodstuffs was taken up by the EU-funded CD-CHEF project. Protocols involving a range of assays based on enzymes, antibodies and aptamers were investigated for their reproducibility and sensitivity.

Project partners at the Universitat Rovira i Virgili in Tarragona, Spain, focused on the development of a method to determine the presence of hydrolysate forms of CD toxic prolamins. Prolamins are the alcohol-soluble storage proteins high in proline and glutamine typically found in cereals.

The novel enzyme-based ELISA (enzyme-linked immunosorbent assay) detects prolamins in beers and glucose syrups (dextrose and maltodextrose). For the immobilised antigen, peptic-tryptic digests compared very favourably against the standard gliadin. Sensitivity is as low as parts per billion

and artificially fortified samples proved highly reproducible.

The same project partners also worked on an optical biosensor that can detect gliadin. Its biocomponent is an aptamer developed within the consortium. Sensitivity proved to be down to the low parts per million (ppm) but needs to be effective at a minimum of 10 ppm. Further research was planned to refine the surface plasmon resonance-based assay and improve its levels of detection.

Accurate assay techniques for the detection of prolamins will not only improve the quality of life for CD sufferers. It will also facilitate the enforcement of legislation regarding the labelling of gluten-free foods.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: licence agreement; marketing agreement; available for consultancy.

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Microsystem modules for identifying gluten

Coeliac disease (CD) is an autoimmune disorder which causes inflammation in the small intestine of sufferers as a reaction to gliadin and glutenin, gluten proteins found in wheat. Researchers developed an integrated microsystem capable of extracting and detecting coeliac disease gluten from both raw and cooked foodstuffs.

The CD-CHEF project developed a microsystem laboratory prototype, which integrated different micromodules for the extraction, metering, dilution, reagent delivery and detection of CD-toxic gluten. Each micromodule was contained

in an individual polymer chip. The complete system was made up of all the chips assembled together on a specially designed platform. A metal plate with metal frames was capable of housing the chips in any combination necessary; different combinations were then successfully tested.

The various components for active flow comprised a syringe pump connected to several inlet ports. External valves were used in order to prevent a major drop in pressure, which could occur if all the chips were served by a single port. A light barrier monitored the arrival of fluids at dedicated sites on the chip, indicating the correct moment to switch valves.

Internal valves were based on a single principle; the only difference being variation in the design of the slits in the rubber disk. All the valves were activated by electric stepper motors and their positions checked by common forked light barriers. All components were controlled by an electronic compartment that was also based on a modular design.

When the complete system was assembled, it boasted automatic switching of valves plus automatic monitoring of the plug position and operation of the extraction motor and centrifuge. The system also used an electronic system to control progress. The first results showed that the microsystem works well in principle, but further work is needed so that the device is robust enough to handle real samples.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: licence agreement; marketing agreement; manufacturing agreement; available for consultancy.

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Identification of RNA-binding proteins

Experts in the cellular transport of bioactive molecules created a consortium under the auspices of the CPP project. The group developed a novel technology for the identification of RNA-binding proteins (RBPs), based on peptide nucleic acid (PNA) and cell-penetrating peptide (CPP) conjugates.

The CPP project partners designed, synthesised and tested novel non-viral gene delivery vectors for DNA single- and double-strand cargos based on cell-penetrating peptides. They investigated the biological effects of successful nucleic acid delivery

systems which were detected both *in vitro* and *in vivo*, using high-throughput assays.

The research team first studied the cell penetration mechanisms of CPPs before developing techniques for identifying *in vivo* the inter-

actions of RNA proteins. These techniques resulted in a better understanding of the role of RBPs in regulating gene expression.

The CPP project developed the PNA-assisted technology for the identification of RBPs, which allowed scientists to determine those proteins which complex a target RNA *in vivo*. The research team isolated proteins which were close to, or in complex with, regions of ankylosis messenger RNA (mRNA). This

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ProViz — interactive visualisation of protein interactions

Many biological concepts can be abstracted as networks, yet their analysis and visualisation is still an open problem. ProViz was developed by the Temblor project, to help discover interesting biological relations hidden in large and dense networks of interacting proteins through direct visualisation.

The understanding of a cell's machinery that regulates its development and function as well as the discovery of new drug targets can be greatly enhanced by studying protein-protein interactions. In the past few years, high-throughput methods such as affinity purification have been used to characterise protein-protein interactions and have produced a wealth of data in the form of networks.

Aiming to address the needs of biologists exploring local and distant databases of protein-protein interactions, researchers at the Université Bordeaux 1, France, have

integrated analysis and visualisation tools within ProViz. This software platform can be used to identify protein interactions of interest, either through keyword search or through analysis of network structure. It has been designed for drawing graphs, but more importantly for the interactive exploration of large graphs.

Based on the Tulip platform and the molecular interaction extensible markup language (XML) format, ProViz provides a rich set of basic and advanced operations on graphs. Subgraphs produced either by selec-

tion or clustering related protein interactions are automatically organised into views that can be manipulated independently as well as used to produce further views. When building views, users can employ external controlled vocabularies, such as the gene ontology vocabularies that describe gene products in terms of their associated biological processes and cellular components.

ProViz is freely available from <http://cbi.labri.fr/eng/proviz.htm> as a stand-alone application. At the software download site, links to interactive tutorials have also been added for biologists who wish to explore the possibilities offered to handle large datasets of interacting proteins networks.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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Healthy nutrition from the foetus to old age

A research study was undertaken on the reversal of effects of protein restriction in the maternal diet during the neonatal and foetal periods. One team of scientists focused on the effects of taurine supplementation on restoration of function in affected organs.

A preventive approach to medicine saves not only valuable resources in terms of treatment costs, but can help to reduce the incidence of chronic diseases in later life. For example, there is a proposed association between inadequate nutrition during the foetal and neonatal periods and the later development of obesity, type II diabetes and cardiovascular diseases.



On this basis, the EU-funded Nutrix project aimed to determine the effects of alteration of early foetal programming on later physiological development. The main affected structures are the pancreas and liver as well as adipocyte cells and the vascularisation process. Four European laboratory centres of excellence then contributed to the research on identification of the nutrients responsible and designed trials to test for means of prevention.

The project team at UCL in Brabant Wallon, Belgium, focused on the organic acid taurine, famous for its incorporation in some energy drinks. As a nutrient in the foetal period, adequate levels in the plasma are important to ensure normal development of the pancreas. Overall, the aims were to test if taurine supplementation would restore beta-cell mass as well as pancreatic and brain vascularisation.

The results showed that most developmental alterations as a result of maternal protein

restriction could be reversed by taurine supplementation of the mother's diet. Specifically, the remedial effects extended to vascularisation in both adult brain and neonatal pancreas.

The team also investigated the effects of taurine at the genomic level. Microarray DNA analysis showed that when the maternal diet is supplemented, 12 % of the 15 000 genes expressed in the developing islets of Langerhans can be up or down-regulated. Moreover, supplementation with taurine can restore 9 out of 10 of the genes where output is changed.

The implications of the data are potentially good news for the prevention of two of the major causes of degenerative disease in the ageing European population, type II diabetes and cardiovascular disease. At the other end of the lifespan spectrum, recommendations to avoid malnutrition during pregnancy can be implemented with scientific backing.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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was achieved by inducing cross-linking of the PNA-RNA-RBP complex through the use of ultraviolet (UV) light.

Scientists from the consortium closely studied the first signs of pharmacological changes in these specific protein-RNA associations. Their findings indicated that PNA-assisted

identification of the RPB was a reliable technique. Therefore, this method was able to be used to quickly determine which proteins interacted *in vivo* with the target RNA.

The project's long-term goal was to produce new cancer treatments based on selective tissue and cell delivery. This will help to avoid the side

effects associated with conventional treatments, thereby contributing to an improved quality of life for European citizens and the world.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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Telomere association with DNA repair proteins

The role of the telomere and DNA repair proteins in telomere-related radiosensitivity has been further elucidated by European researchers.

The function of the telomere in ageing, DNA repair and sensitivity to ionising radiation has attracted many research projects. One of these, the EU-funded Telosens project, has investigated the role of telomere integrity in relation to radiation carcinogenesis. Specifically, partners at the Spanish National Cancer Research Centre, CNIO, focused on the role of DNA repair proteins in telomere maintenance.

Four proteins, in particular, were shown in previous research by scientists at CNIO to play a role in telomere length and capping. The relationship between the enzyme telomerase and these proteins was further determined by breeding mice doubly deficient for the gene responsible for the protein in question and telomerase.

One protein, PARP poly (ADP-ribose) polymerase, was investigated in conjunction with another project partner, ENSL in Lyon, France. A functional relationship at mammalian level was found between PARP and a telomere-binding protein, telomeric repeat binding factor 2 (TRF2).

The TRF2 protein, in particular, yielded an interesting insight into the relationship of the telomere with DNA repair mechanisms. To investigate the theory that TRF2 repressed DNA repair, specifically at the telomeres, the scientists generated mice with increased expression of the protein under the keratin-5 (K5) promoter.

These K5-TRF2 mice exhibited age-related skin disorders, including skin hyperpigmentation and neoplastic lesions. When studied at molecular level, the keratinocytes showed drastic changes to the telomere, including shortening together with chromosome instability.

Furthermore, K5-TRF2 mice showed increased sensitivity to ultraviolet (UV) radiation and DNA agents giving rise to cross-linking of the DNA structure. Cross-linking results in the DNA double helix strands being prevented from separating for synthesis or transcription.

The skin phenotype of the K5-TRF2 mice is reminiscent of the skin condition xeroderma pigmentosum. Defective DNA

repair and shortened telomeres aggravated by the absence of telomerase is thought to give rise to these UV-sensitive individuals.

The work of the Telosens partners has defined TRF2 as playing a major role in DNA repair and telomere integrity. As such, further research may help elucidate cellular responses to ionising radiation.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: further research or development support; information exchange/training; private-public partnership.

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Elucidating the cooperative behaviour of sensory nerves

Patterns of cooperative behaviour between peripheral sensory nerves, elicited by real-world stimuli, can be more accurately recognised by a combination of signal analysis techniques proposed within the EU-funded Rosana project.

It is a little known fact that the haptic sensory organ is the first to be developed in the human embryo. On the other hand, artificial systems supporting human haptic perception have been the last ones to be designed

and, until today, have not reached any level of maturity. Researchers are probably just beginning to understand how the responses of neurons in the somatosensory system are used to create internal representations of the real-world stimuli that triggered them.

In the study of information flow in the human nervous systems, Rosana project partners combined electrophysiology experiments with computational modelling. Extra-cellular recordings of neurons producing short electrical pulses (spikes) nearby to an electrode tip provided the essential electrophysiological experimental data. To distinguish between discrete events, namely spike trains, and to assign the detected neural activity to the neuron responsible for generating it, an innovative approach was adopted.

To overcome some of the limitations of existing techniques, researchers at the Universidad Complutense de Madrid, Spain,

proposed to combine different methods for efficiently extracting spike features. First, spike trains were identified with the use of principal component analysis (PCA). Typically, this involves clustering around certain features of the time series of spike trains, such as spike height and width, or template matching the entire waveform. Discrete events that are simultaneously observed on multiple electrodes were assigned to a single spike train.

Either independent component analysis (ICA) or continuous wavelet transforms were subsequently applied to derive the spatial distribution of spike trains recorded from several different neurons on separate electrodes. Containing more information than the simple time coincidence, it corrected several types of separation errors and proved to be valuable as a preparatory step for neural signal processing. This was essential for the development of mathematical models capable of reproducing the neural activity elicited by specific stimulations of the skin surface.

Funded under the FP5 programme IST (User-friendly information society).

Collaboration sought: further research or development support.

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Improving the fixation of dental implants

Scientists investigated new improved ways of fixing and supporting dental implants in patients.

The Imload project has increased scientists' understanding about the way bone material responds and adapts to mechanical stimuli when applied to dental implants. The research team developed and evaluated a new non-invasive device for supporting oral prostheses. It was based on magnetism and a magnetic core within the implant. The team found that additional work was needed to further the concept and technology if a prototype is to be developed.

The Imload consortium also developed a device which allowed loads to be applied

directly to a dental implant. The device used either pneumatic or electromagnetically driven actuators. Actuators can be used either as mechanisms to facilitate motion, or as clamps to prevent an object from moving. The pneumatically driven actuators were used for low-frequency loading, while electromagnetic ones were used for both high- and low-frequency loading applications.

The pneumatic actuators were unable to induce the same bone-forming frequencies of 20 to 30 Hz that were stated

in the literature. The Imload team, therefore, designed and developed an electromagnetic-based system that employed a variable range of frequency and load. The system used a linear motor actuator to directly load dental implants at frequencies of 3 and 30 Hz. The device was developed, assessed and improved for use in further oral implant trials.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; marketing agreement; manufacturing agreement; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4752

Effect of combining endocrine disrupting chemicals

An investigation was carried out into the combination effects of similarly acting endocrine disruptor chemicals (EDCs), using cell-based assays as well as fish and rat models. The results were used to enhance risk assessments.

Research has shown that when they are in a mixture, similarly acting EDCs can produce combined effects. This can even occur at levels where no discernable effect would be produced if the chemical was on its own. Scientists from the EDEN project investigated how better knowledge of EDC mixture effects can be used to deliver improved chemical risk assessments.

The team studied mixtures of EDCs with similar properties through the use of the

E-screen cell-based assay. The team also used an extended developmental toxicity model for rats. Vitellogenin induction in sticklebacks and zebra fish was also used; vitellogenin is an egg yolk precursor protein. Additional tests using sticklebacks involved the suppression of testosterone-induced spiggin, a proteinaceous glue-like substance created in the fish's kidneys.

Dose response curves were documented for each separate component of the mixture. This information was then used to calcu-

late the expected combined effect for mixtures whose composition was known. The researchers discovered that the combined effects of oestrogenic and antiandrogenic EDCs from the same class were affected by the accumulative dose or concentration.

These findings by the EDEN project were of importance as they helped in risk assessment of mixtures of EDCs. They revealed how information regarding the strength of chemicals can be used to draw valid conclusions for assessing the risk of certain mixtures. The results from the project were used as a basis for a default concept for better chemicals' risk assessment of EDC mixtures.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

<http://cordis.europa.eu/marketplace> > search > offers > 4856

Maternal smoking affects male reproductive health

A comprehensive Europe-wide study of the effects of maternal smoking on the reproductive health of their male offspring supported the case for pregnant women to steer clear of smoking.

EDEN, the name given to a research project funded by the EU, assessed factors which interfere with the release of hormones into the body (endocrine disruptors) and the effect this has on humans, wildlife and laboratory animals. This broad research theme focused on the question of whether human or wildlife exposure to endocrine disrupting chemicals from the environment plays any causal role in developmental disorders.

One approach to deal with this question was a report concerning differences in male reproductive health in association with maternal exposure to smoking. Nearly 2 000 adult men from northern and eastern Europe took part. The research involved a questionnaire, in which the participant and his mother

answered questions relative to smoking habits and reproductive health. Those who participated underwent a compulsory physical examination. The physician examined a semen sample provided by participants.

The results showed that men who had been exposed to smoking in utero had a 20 % reduction in sperm concentration and 24 % reduction in total sperm count, in comparison with unexposed men. Furthermore, it was found that exposed men had smaller testes.

This study strongly supported the hypothesis that foetal development is particularly vulnerable and important for adult reproductive health and fur-

thermore, that maternal smoking may have long-term implications for the reproductive health of their offspring.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

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Experimental design in herring population genetics

A detailed knowledge of the population structure of Atlantic herring is required for the proper management of stocks. This meant that a comprehensive method was needed for differentiating between members of different populations, both in surveys and in samples from fisheries.

An incorrect understanding of the population structure of fish stocks can result in overexploitation of sexually mature fish. This can affect genetic diversity within the species. This is made worse as different populations of Atlantic herring come together seasonally.

The goal of the Hergen project was to provide guidelines for the conservation and management of the biodiversity of Atlantic herring in the North Sea. Scientists concentrated on evaluating statistical power when

applying test procedures, sets of genetic markers and sample sizes.

Analysis by researchers focused on three major lines of enquiry. The first evaluated the level of statistical power in a number of empirical and hypothetical scenarios. The second compared the efficiency of statistical techniques for testing heterogeneity. Finally, an assessment was carried out on the phenomenon of reduced power when combining multiple exact tests using Fisher's

method. This was done with particular regard to the chi-square distribution.

Observations showed that, as predicted, power increases according to the level of population differentiation (FST, the fixation index), sample size, the number of samples as well as the number of loci and alleles. Uniform allele frequency distributions were found to be superior to skewed ones. The power for detecting divergence in the North Sea herring population can be considerable for frequently used sample sizes and sets of genetic markers at low FST values. This was regardless of the statistical method used.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4590

Locating and tracing the origins of cod

Establishing the origin of cod has been the goal of the EU-funded project Codtrace. As such, one of its objectives was to develop and test a methodology suitable for that purpose.

One such criterion for doing so was to develop a microsatellite classification of harvest location. During the three-year project, specialised techniques were used as well as double-blinds on both farm bred and wild cod. However, results proved to be less encouraging than hoped. The techniques included an analysis of both body and otolith morphometry, surface chemistry, genetic analysis and molecular markers for fish bacteria.

Determining the population of origin on an individual basis produced varied results. For example, the percentage of assignment was 43 % for the North Sea, whilst the proportion was 83 % in the Baltic Sea. Reasons for such variation is unclear, but it was deter-

mined that the lower the temporal genetic differentiation, the harder it would be to determine individual population of origin. Also, it remained unclear whether such difficulties for determining origin were exclusively related to migration.

Genetically determining individuals to their place of origin kept a stable pattern over the seasons. The first season of sampling for spawning location, 14.61 % of the fish were not correctly assigned whilst in the second season 25 % were not correctly assigned. The degree of difference may be somewhat influenced by the number of individuals assessed. However,

microsatellite loci remain important and useful markers for traceability, and this, along with the other techniques, will eventually become constituent techniques that will help develop fishing policy, law and an academic knowledge base.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

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Stats for cod migration modelling

The preservation of cod (Gadus morhua) has been the focus of a number of management methods and policies. Cod is one of the world's most commercially important fish, and assessing the effectiveness of such policies is a key element behind the EU-funded project Codssey.

The project developed an expert query system based on the environmental data of cod in four regions: the North Sea, the Barents Sea, the Icelandic plateau and the Baltic Sea. This data will be used to reconstruct migratory pathways and perhaps provide some insight as to the environmental factors influencing migratory patterns. Other factors assessed were salinity and water temperature.

However, to assess the effectiveness of management policies in preserving cod numbers, the project identified several critical features. One was tracing the horizontal and vertical movement of cod schools within the four different ecosystems chosen. Another element was to identify the environmental factors that might affect such movements.

To do so, the researchers had to develop an innovative solution. Since each ecosystem is

different as regards the dynamic data ranges, no standardised query tool could be developed. Hence, the project formulated a series of statistical techniques that could pinpoint the whereabouts of cod with greater accuracy than before. Moreover, it is also capable of providing estimated cod positions within acceptable degrees of certainty.

The innovative statistical techniques proved highly reliable, and can be also be used for other fish species than cod.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4677

Linking individual growth and puberty in salmon

Experiments were conducted in order to examine the correlation between individual growth and puberty in sibling groups of farmed salmon.



Early maturation of farm-based fish is problematic in terms of profit losses for the aquaculture industry due to production inefficiencies. In answer to this, the Pubertiming project examined genetic, environmental, hormonal and nutritional factors which could activate precocious maturity.

Large groups of salmon were individually tagged at different sites and their growth performance was monitored. Results showed that the larger fish with an elevated condition

factor near the time of the winter solstice were much more likely to mature earlier as compared to smaller, leaner fish. This finding illustrates a correlation with body size, growth and adiposity playing a role in the movement towards puberty.

Contrary to this, effects were not as expected as regards the restricted feeding of three individually tagged salmon sibling groups before winter solstice. It is quite probable that there are other factors besides growth and adiposity that may affect the results of a given treatment.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; available for consultancy; other.

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Listeria in dairies producing traditional cheeses

Listeria monocytogenes (L. monocytogenes) is a highly virulent and potentially fatal food-borne pathogen, which can be found in some dairy products. Therefore, researchers have studied ways of controlling its presence in cheese-making dairies.

Scientists from the LMtooche project found that contamination of dairies by *Listeria* species can happen during any time of the year, or at any point during the production process. The time of the year did not affect the likelihood of infection.

The team observed that every part of the dairy was at risk from contamination, although some surfaces had a higher incidence of *L. monocytogenes* than others. The persistence of the pathogen may be a result of its ability to adapt to acid and salt and

its capacity to create biofilms and resist disinfection.

The LMtooche team found that mixtures of *L. monocytogenes* and other species could occur at anytime, indicating that contamination can come from a number of sources. They also found that the presence of *Listeria* species, other than *L. monocytogenes*, did not predict the presence or absence of *L. monocytogenes*.

The cheeses studied are traditionally produced products linked to a geographical

region and based on local skills. This has resulted in the preservation of regional cheese varieties and the variety of flavours they contain. This diversity has led to a certain amount of heterogeneity and variability in the project's results.

Members of the consortium were unable to draw any firm conclusions regarding the presence of *L. monocytogenes* in cheeses, due to the limited number of positive samples discovered. Therefore, the team were unable to establish a correlation between the presence of *L. monocytogenes* and the chemical composition of cheeses.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

<http://cordis.europa.eu/marketplace> > search > offers > 4843

Turbulent flow and the adherence of Listeria

Researchers from the EU have investigated ways of controlling the presence of the food pathogen Listeria monocytogenes (L. monocytogenes) in cheese-making dairies. The work has included studies into the effect of turbulent flow on Listeria attached to surfaces.

The LMtooche project developed unique apparatus for conducting their experiments, including radial flow chambers. The chambers were used to investigate the shear forces necessary for detaching adherent cells of *L. monocytogenes* isolated from dairies. The information was used to improve cleaning and decontamination procedures for dairies.

The project also provided a better understanding of the effects of those cleaning and decontamination processes which used liquid shears to bring about cell detachment. The extent to which the procedure removes organisms depends on the sever-

ity of the process. However, the technique introduces a selection pressure by tending to favour those cells of the phenotype that the team have isolated from dynamic environments. The genetic basis for this in *L. monocytogenes* was not known at the time of the experiments.

Sodium hydroxide, NaOH, is frequently used in surface sanitisation studies for *L. monocytogenes* biofilms. These studies were carried out both under static and flow conditions. Results from experiments conducted by the research team indicated that there was no significant difference between

decontamination carried out under static and flow conditions. It was also demonstrated that surface roughness was not an important factor in the removal of biofilm.

Results did not reveal a correlation between the number of *L. monocytogenes* attached to stainless steel and the amount of force needed to dislodge them. Furthermore, the absence of the biofilm-associated protein (Bap) gene reduced the cells' ability to adhere to a surface. It also decreased the force required to displace those cells already attached. However, researchers also found that bap-negative strains like T8 and C897 needed higher shear stresses to bring about their removal than for the bap-positive 10403S.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

<http://cordis.europa.eu/marketplace> > search > offers > 4889

Screening the faba bean for broomrape resistance

The development of enhanced faba bean genotypes, which can be used as a sustainable alternative to non-EU produced plant protein, was the subject of this project. In order for this to be achieved, part of the study focused on recommending suitable methods for screening the bean for parasitic resistance.

Eufaba was a project which was designed to provide a viable solution to the lack of home-produced plant protein in the EU. The research team focused their attention on faba bean breeding. The aim was to combine the application of marker-assisted selection and conventional breeding methods to develop improved faba bean genotypes. The enhanced bean genotypes were unique in that they had

been developed with characteristics identified as important to sustainable agriculture. These characteristics included resistance to major biotic and abiotic stresses.

One of the studies in the project focused on developing suitable methods for screening broomrape resistance. Broomrape, or *Orobancha crenata*, is a parasitic plant of the host faba bean and can inflict devastating yield losses, thereby undermining its use as a plant protein crop.

The research findings allowed for the provision of recommended methods of screening which were found to be most effective. Short descriptions of each method were provided by the scientists.

Field testing was one such method. This involves ensuring that the parasite seeds are distributed uniformly in the soil to prevent the selection of bean genotypes that could remain uninfected by parasite attack.



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Another recommended method was pot testing. It was suggested that field screens are probably the most efficient for discarding susceptible accessions, but that carefully conducted pot testing is needed to confirm that plants uninfected in the field are actually resistant.

Finally it was recommended that *in vitro* testing be conducted. This method carried out in a growth chamber involves growing host and parasite in sand or vermiculite held in the gap between two glass sheets. This alternative method for screening of broomrape resistance was developed with the faba bean in mind by another project partner.

Various techniques were therefore used for the close observation of germination attachment and early development of parasitic weeds. None of these methods were however properly suited to the testing of the faba bean. Therefore, this latter *in vitro* technique was presented as a viable alternative.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4893

Effects of anti-nutrients on hen membrane ghosts

Vicine and convicine are anti-nutritional factors that can be present in the faba bean (Vicia faba). As part of the drive to improve the crop's nutritional value, scientists have determined the effects of a faba bean vicine/convicine (v/c)-enriched diet on red blood cell (RBC) membrane proteins.

The faba bean has great potential for the production of plant protein. Furthermore, as a legume, its nitrogen-fixing properties can help to combat the excesses of artificial nitrogen application. *Vicia faba* has therefore been incorporated in European breeding programmes under the umbrella of the Eufaba project to increase its overall performance for sustainable agricultural purposes.

Selection pressure was applied against the presence of anti-nutritional factors v/c. High levels of these glycosides in vertebrate diets cause a range of undesirable effects. Humans deficient in glucose-6-phosphate dehydrogenase (G6PD) can develop haemolytic anaemia. As regards animals, their overall performance is reduced and hens suffer reduction in egg production.

At a cellular level, high v/c content induces increased redox sensitivity. Project partners therefore speculated that high v/c levels would cause modifications in the structure of RBC membranes. A novel protocol was therefore

developed to isolate chicken RBCs and prepare ghosts for analysis to detect protein changes.

Unlike human RBCs, those of laying hens are nucleated. The aim then was to achieve the separation of DNA from haemoglobin-free ghosts for analysis by electrophoresis. Initially, the presence of contaminating DNA when RBC protein bands were separated meant that electrophoresis results were unsatisfactory. However, addition of extra DNAase allowed good separation of bands in mono- and bidimensional polyacrylamide gel (PAGE).

Project partners from the University of Torino in Italy and the INRA Institute in Tours, France, worked together to compare three groups of chickens on different diets. Two experimental groups of hens were fed with 25 % faba bean, one with low and the other with high v/c. The feed of the control group consisted of soybean meal without v/c.

The proteins were analysed again using the same PAGE method. Relevant spots that had

changed were excised and subjected to 'Matrix-assisted laser desorption ionisation — time of flight' (MALDI-TOF) analysis.

This research work represented the first proteomic analysis of laying hen RBC membrane proteins. Elucidation of the molecular basis behind the action of nutritional factors can be a valuable factor in breeding programmes to produce sustainable animal feed crops.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

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Integration of natural predators in crop management

In protecting crops, it has long been known that an integrated approach often works best. Exploring the manner in which integration can best be applied in oilseed rape crops was the aim of the Master project.

Reducing the use of pesticides is of primary importance in modern agricultural practices and has been the focus of many EU directives. Research has revealed that a multifaceted, integrated approach can produce a more sustainable system. Integrated

pest management involves the use of natural enemies, biological approaches enhancing self-defence mechanisms inherent in crop types and mechanical controls such as physical weed removal and tillage.



To this effect, Master sought to establish a set of guidelines focusing on a financially viable and more environmentally friendly approach. Since rape seed is an economically important EU product, the project also investigated the financial impact that adaptation of new technology and processes would have on farmers. The technical guidelines therefore needed to consider a whole range of agricultural stand-

ards and practices, as well as investigate the economic realities involved in crop management across Europe. Therefore, collaborative field test experiments were performed and replicated in five European countries.

One of the primary objectives of the project was to determine the greatest threats to oilseed rape crops and to characterise their ecology. This would include investigating pest behaviour, habitat requirements, phenology and biology. The experiments therefore compared two systems: a standard crop system and the integrated approach. The results of the trials showed that the integrated approach preserving natural predators (therefore using less insecticide) could be put forward to farmers as a viable approach. The technical details of this approach in the form of guidelines have been made available to both the scientific and agricultural communities.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4614

Collection of expressed sequence tags for ryegrass

Forage grasses comprise an important part of the diet of livestock reared on Europe's farms. The GRASP project aimed to enhance the quality of these grasses through genetic research.

Surprisingly, forage grasses have not received the attention that other crops have attracted with respect to genetic improvement through selective breeding. The EU-funded GRASP project sought to rectify this situation through a targeted research programme.

During the project, Plant Research International (PRI) in the Netherlands performed extensive gene sequencing of *Lolium perenne*, better known as perennial ryegrass.

In total, 4 500 short sequences of complementary DNA (cDNA) called expressed sequence tags (ESTs) were produced.

The range of base material PRI used for sequencing has ensured that a wealth of advantageous plant traits was represented. The ESTs, the first of their kind for ryegrass, will subsequently be analysed to identify which gene segments are related to increased quality, yield and reproduction. In fact, initial profiling has already high-

lighted several ESTs with excellent potential in this regard.

Eventually, it is hoped that molecular markers can be developed to facilitate targeted grass breeding in order to improve the quality of forage grass across Europe. Plant researchers, breeders and others will benefit from the GRASP ESTs, which have been made available on the project website in the form of a database.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; private-public partnership.

<http://cordis.europa.eu/marketplace> > search > offers > 4729

Advanced grape and berry processing

Processing technologies for grape and berry applications were examined for their bioavailability and bioactivity effects as well as possible health benefits in consumer products and ingredients.

The Maxfun project has developed enzyme-aided processing technologies for grape and berry applications. Particular emphasis was placed on boosting yields and enhancing final product (specifically juice and wine) quality. Enzymatic treatments were combined with physical/physiochemical and mechanical ones. Furthermore, these technologies were applied to extract valuable food ingredients from the by-products of current processes.

Bioactivity assays and *in vitro* models illuminated the possible health benefits found in consumer products or ingredients. For example, dietary polyphenols (chemical substances found in plants) are very responsive to the mild alkaline state in the small intestine. Additionally, many of these compounds can be changed into unknown as well as undetected structural forms with varying chemical properties. This means that they also have varying

bioaccessibility, bioavailability and biological activity.

Treatments containing pectinase showed significant increase in antimicrobial and antioxidant activity of the berry juices. Whereas high-pressure and high-power ultrasound treatment appeared to show great promise as far as berry processing technologies are concerned, their effects on antimicrobial and antioxidant activity remain to be seen.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4702

Reducing the number of dormant viruses in sheep blood

Sheep immunised systemically with the gag gene and gag interferon (gagIFN) showed a marked reduction in maedi visna virus (MVV) provirus load in their blood.

The development of a suitable vaccine for combating small ruminant lentiviruses (SRLVs), which affects sheep and goats, has proven to be a major challenge for scientists. This has been as a result of limited information regarding target antigens, protective immune responses and vaccine strategies.

The MVAC project studied the most suitable antigens for achieving protection and the best vaccination strategies were investigated. Researchers evaluated DNA vaccine strategies in sheep challenged with MVV, which causes encephalitis and chronic pneumonitis.

Sheep were immunised systemically with the gag gene and gagIFN. The gag gene codes for precursors of internal virus proteins

found in the retrovirus genome. These trial sheep demonstrated a significant reduction in provirus load in their blood. The provirus is a virus genome that has integrated itself into the host cell's DNA and is passively replicated along with the host's genome.

However, the research team found that the provirus load in the lung tissue of the animals was not significantly different from the controls. It was also discovered that provirus loads in blood and tissues of sheep immunised with gp150env, which codes for intermediates for proteins in the virus envelope, did not differ from the controls.

The results indicated that the propagation of the virus from the lung tissue was limited by

gag immunisation. Therefore, systemic DNA immunisation did not halt infection but induced a reduction in the provirus load in the blood of sheep immunised with the gag gene. Large scale trials were recommended to further test the significance of this data.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4475



Making continence management easier

A novel slimline urinal device now has an improved filter design. The device aids in continence management and is particularly helpful for women with limited mobility.

Continence management can be very problematic for individuals with severe urinary continence difficulties, particularly in the case of limited mobility. This is especially true for women. Female urinals are highly underused because they are only effective if the user is standing or sitting at the end of a chair. Furthermore, conventional female urinals require a large capacity, meaning in turn that they are large and that insertion and removal is difficult.

In an effort to resolve this problem, the NICMS project developed a slimline urinal. This device does not require a large capacity, since urine is immediately whisked away and stored in the liquid handling system until it can be emptied. Since it is very small, the user does not need to undress in order to put the small urinal interface in place. This feature makes it far more usable by women than traditional urinals.

The device uses a high bubble-point filter to get rid of air from the flow of liquid into the storage container. It was necessary to add more particulate filters so that the life of the high bubble-point material could be preserved. In addition to ensuring that the filter stays clean, an odour- and moisture-reducing material has been added to the centre of the filter unit. The unit is disposable and the filter is changed once every 24 hours.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: joint venture agreement; licence agreement; manufacturing agreement; financial support; venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 5023

Allergic diseases bite the dust

Scientists have moved one step further in the treatment of allergic diseases using plasmid constructs to deliver allergen-encoding vaccines.

Genetic or DNA viruses have gained acceptance as a potent means of providing protective immunity against infective agents in all species — from fish to primates. In response to the escalation of allergic diseases, research on plasmid DNA encoding proteins from allergens promises relief to the sufferers of allergic diseases such as asthma.

Scientists working with the European project Allnnavac focused their research on how the allergen-encoding vaccines modulated immunological mechanisms. Probably the two most common causes of allergy were targeted: the house dust mite and the pollen of *Parietaria*, a widely distributed flowering plant.

Human allergic disorders are characterised by the proliferation of T helper Type 2 (Th2) cells and B cells, both of which are important in immune reactions. However, these cells can form an important part of the allergic inflammatory response. Project partners worked on the design and evaluation of novel DNA vaccines in terms of their ability to inhibit allergic Th2-mediated responses.

At Novartis Vaccines & Diagnostics S.r.l. in Italy, the team worked specifically on a plasmid DNA construct developed within the company. The pCMV plasmid was named after the cytomegalovirus (CMV) component, which was used as the vector. The resulting

construct was pCMVDerp1 cyt which contains the house dust mite gene Derp1.

The researchers found that the Derp1 gene was encoded within *in vitro* transiently transfected cells. One practical modification was that the Derp1 gene was cloned directly downstream from the CMV promoter. This prevented secretion of the Derp1 protein and kept it within the cytoplasm of the cell.

Further research on this plasmid construct will enable a thorough study of the plasmid's ability to invoke an immune response and DNA vaccines.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4607

Computer models help prevent lameness in cattle

A computer model was developed which allowed researchers to visualise the deformation of a cow's foot on hard and soft surfaces. This has enabled risk factors for lameness in cattle to be identified, and improved flooring designs to be tested.

Lameness in dairy cattle is not only distressing for the animals involved, it also has a serious financial impact on the farmer. In the majority of cases the injury originates in the claw region of the foot. Therefore, a better understanding of the biomechanics and functions of this structure are crucial to addressing the problem. However, the bio-mechanical forces at work within the bovine claw cannot be measured directly.

The problem of lameness was addressed by the Lamecow project, which created a computer-based finite element model of the bovine claw. The model simulated the stress and deformation which can occur in a normal claw, and in three diseased forms. The simulation was used to study the ways in which the healthy and diseased feet of cattle are loaded when standing on different types of flooring. The three diseased forms included a flat claw, a contracted claw and laminitis.

The models were created using measurements of important mechanical character-

istics, including the tendency for the claw to become elastically deformed when force was applied to it. The highest stress levels were found in the proximal inner wall, the outer edge of the weight-bearing surface and under the heels. The maximum stresses were found to be three times higher for a cow standing on a hard surface than for one standing on a soft surface.

Previous simulations had only calculated the forces in the horn capsule, however, the new model developed by the Lamecow project included bone and connective tissue. The model showed that most deformation was found in the softer tissue and that areas of high-strain levels corresponded to the location of sole ulcers in diseased claws. The project has also opened up new avenues of research into claw biomechanics, such as validating new claw trimming techniques, as well as the

testing carefully designed flooring. This included slatted or grooved flooring, with or without the addition of rubber mats.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5005



Molecular markers improve meat safety measures

Meat traceability lies at the heart of ensuring that livestock and meat are disease-free. In line with tougher EU regulations for tracking meat and animals, researchers have developed methods to sample and profile DNA from livestock.

Concern from both consumers and industry regarding diseases such as swine fever, foot

and mouth and transmissible spongiform encephalopathies (TSEs) is understandably high. The EU's 'Farm to fork' initiative aims to trace food, feed and ingredients through all stages of production, processing and distribution.

In response to this, the appropriately named, EU-funded 'EID + DNA tracing' project developed a double system of electronic identification and DNA analysis. Electronic tagging could therefore be utilised up until slaughter, and then DNA profiling be used to trace back from 'fork to farm' in order to identify the origin of suspect or infected meat.

For the most effective means of analysing DNA samples, there are three main research stages to be accomplished. Firstly, collection of the biopsy followed by selection of appropriate markers, and lastly, verification of the effectiveness of

the analysis including a statistical significance rating.

After laboratory and field comparisons of hair, blood and saliva, the best form of sample collection proved to be a specially designed ear-tag biopsy. Samples were then preserved and analysed as appropriate. For genetic identification of sheep, cattle and pigs, sets of short tandem repeat (STR) and single nucleotide polymorphisms (SNPs) were selected from International Society of Animal Genetics' lists. On implementation of the methods, sets of both STR and SNPs were selected for auditing purposes.

Analysing the methodologies, statistical significance was calculated as a function of exclusion probability. This was more than 99.9 % for both types of marker. Implementation of an effective dual system of movement monitoring will help to protect the European livestock industry against disease outbreaks. Moreover, consumer reservations about meat safety can be eliminated.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4828



Finding the reasons for histamine in wine

Wine production is of major economic importance in Europe. Scientists from the European project Decarboxylate have investigated wine spoilage by biogenic amines.

Histamine, a biogenic amine is produced by fermentation from the amino acid histidine. When ingested, it can cause allergy-like symptoms such as flushing, headache, palpitation, itching, wheezing, difficulty in breathing and diarrhoea. Unfortunately in wine, the presence of alcohol and other biogenic amines can exacerbate these effects.



Not surprisingly, the wine industry has set a strict limit on histamine content for wine producers of 2 to 10 mg/l. The histamine-producing pathway is not present in all lactic acid bacteria (LAB) strains. Accordingly, scientists at Bordeaux University in France surveyed more than 250 wines in their famous wine-producing region. They tested for the presence of histamine-producing LAB.

A specially developed real-time quantitative polymerase chain reaction (PCR) method was used to analyse the vintage wine. The stark reality was that only 2 % of the wines were free of histamine-producing bacteria, although not all these would be unacceptable.

To elucidate this, the team then investigated the actual concentration of bacterial cells in some

of the spoiled wine. They found that when there were over 1 000 cells per litre, concentrations of the amine were significant (over 2 mg/l). This was the case in around 7 of the 10 wines.

To see if there was a geographical link, they mapped the distribution of histamine concentration in the different wines from different vineyards. They concluded that some localities produced wine that was more prone to spoilage. This however could be attributable to practices and wine composition, not geographical distribution.

Identifying the causes of histamine production in wine could be the key to keeping concentrations at an acceptable level. This means that less wine will be categorised as unsuitable for consumption and good news for the wine industry as a whole.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4200

Key issues for human biomonitoring in Europe

The identification of several critical issues by VITO, a research institute in Belgium, will help guide the development of the human biomonitoring (HBM) movement in Europe in the coming years.

The European Commission has recognised the importance of HBM as it attempts to develop an integrated approach to human health and the environment. More than 20 leading research organisations came together to participate in an FP6 project entitled ESBIO, the aim of which was to prepare a relevant HBM pilot project.

During ESBIO, researchers with VITO highlighted a number of critical elements that need to be taken into consideration.

For example, the creation of the registration, evaluation, authorisation and restriction of chemical substances (REACH) system will provide valuable insight into toxic substances, some of which could possibly serve as HBM biomarkers.

VITO also believes it essential to establish fruitful communication and exchange of information with authorities performing health examination surveys in EU Member States. To this effect, collaboration with the

'Feasibility of a European health examination survey' (FEHES) project should be realised.

Finally, in order to facilitate the presentation of HBM as well as environmental and health data, VITO proposed cooperation with the 'Infrastructure for spatial information in Europe' (Inspire) initiative. This will require the definition of a geographically representative sampling scheme in order to be successful.

Funded under the FP6 cross-cutting activity 'Research for policy support'.

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4655

Orthopaedic surgery aided by new material

New natural materials have been developed by researchers working with polymers from marine sources. Scientific tests applied to these structures showed that they could be used by surgeons in reconstructive surgery.

Physically stressed regions of the human skeleton, such as the hands, skull, ribs and arms, make up about 30 % of the bone implant market. Reconstructive surgery on the facial area also relies heavily on the utilisation of bone implants. This important area of orthopaedic surgery, which concentrates on reconstructing bone defects, depends heavily on the standard of medical treatment available at the time.

The Algisorb project set out to make a marked difference in the quality of treat-

ment available by developing a bone-forming material which enhances bone growth, can be completely reabsorbed and leads to a complete restitution of the injured bone. The material for this purpose was derived from marine algae, which contains substances that stimulate bone growth.

As part of the project, one of the partners worked with polymers which are of marine origin, namely chitin and chitosan. The scientific team developed several types of ma-

terials and shapes, and in so doing were able to control the systems and their properties. The formulations which were developed offered profiles which could be used in biomedical applications.

Following the execution of this project, the results were communicated to bone replacement manufacturers, seaweed harvesting or processing companies and the scientific community.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support; joint venture agreement; financial support; venture capital/spin-off funding.

<http://cordis.europa.eu/marketplace> > search > offers > 4833

Methodology for estimating wave power potential

Wave power is a renewable source of energy that has yet to be fully tapped, but finding the best place to site a wave power installation just became a whole lot easier.

The 'INCO 2' programme funded an international research effort entitled Marineco, bringing together wave energy experts from the EU and the Russian Federation. The aim was to design, build and test an offshore float wave electric power station (FWEPS).



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The current techniques used to identify locations suitable for FWEPS installations are limited. During Marineco, Applied Technologies Company Ltd, one of the Russian participants, was assigned the task of developing advanced methods to evaluate wave power potential.

The challenge was to accurately address physical phenomena covering a wide range of spatial and temporal scales. The solution was to employ multiple models. For instance, a hydrodynamic model was applied at the synoptic level, while a probabilistic model provided feedback regarding wave climatology.

In addition, the power associated with three-dimensional waves was estimated by approximations based on regular sinusoidal waves. Finally, Applied Technologies Company Ltd came up with a way to calculate wave power potential, using several wave parameters derived at different time scales.

The new approach was tested during Marineco. A highly preferable site was detected off the southern coast of the Greek island of Euboea, where low seasonal and synoptic variability ensures stable power generation year-round. Furthermore, site access is ideal for easy maintenance. The site was subsequently selected for trials of the Marineco FWEPS.

Funded under the FP5 programme 'INCO 2' (Confirming the international role of Community research).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4996

Relaying offshore industry sustainability credentials

A stakeholder dialogue was facilitated by this EU-funded research initiative, with the objective of bringing together key players in the offshore energy sector.

Trends-2 is the name of this initiative, which brings together industry players and other stakeholders in order to facilitate the development of a sustainable, clean, safe and secure energy supply in the EU. Through the development of this network, key players are able to bring to the fore industry standards and objectives, with the goal of making European energy supply more environmentally sound in the present and future.

The Trends-2 teams set up a meeting for the European offshore industry in order to facilitate stakeholder dialogue. Apart from allowing for networking opportunities, this meeting had, as its key message, the enhancement of sustainability and competitiveness in supplying energy from European waters. There was also discussion of the scope for applying new developments in offshore oil and gas supply to renewable sources of energy.

Top priorities for the industry were identified. These included maximising production from existing oil and gas fields, and decommissioning existing platforms and pipelines at the end of their productive lives. Other key themes for the offshore business were the exploitation of Arctic and deep-water fields, the development of wave energy, enhancing supplies of offshore wind energy and the utilisation of depleted reservoirs for the storage of carbon dioxide trapped from the combustion of fossil fuels.

The main result of the meeting seemed to be the need for improved communication. Recommendations ensued. These were that new ways of establishing formal processes for sharing good practice be identified, also that further case studies of the business benefits of effective stakeholder dialogue be conducted. The possibility for the development of a model outlining an approach to successful joint working arrangements that

would help to improve and broaden stakeholder input was also discussed.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; information exchange/training; private-public partnership; available for consultancy.

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Promoting use of new energy technology by reducing risk

Oil and gas companies have been reluctant to utilise new technologies available to them due to the introduction of uncertainty. Researchers taking part in the Trends-2 project sought to reduce this risk by outlining a comprehensive qualification for these new technologies.

The aim of this EU-funded project was to bring together stakeholders in the energy sector with the objective of finding strategies to meet Europe's need for sustainable energy supplies. In order to do this, a pan-European network was set up. This was made up of executives of large oil and gas companies, representatives of small and medium-sized enterprises (SMEs), universities and non-governmental organisations (NGOs). On an equal footing, participants in the project were able to present the future challenges which they expect will arise in the

production of hydrocarbon energy. Specifically, attention was paid to issues concerning quality, health and the environment.

Within the project framework, research was undertaken in the field on new technologies and what these could bring to the industry. The findings showed that new technology seemed to perpetuate uncertainty for the industry. Oil and gas companies do not generally take risks, since failures imply large costs in terms of loss of production. However, this approach means that the industry

is wasting opportunities that the use of new technologies could bring. It was suggested in the research report, that the reluctance to use new technologies in this field results in slow development towards safer and more environmentally friendly production.

For the risk that the industry relates to new technologies to be mitigated, the research team laid out new methods which could be adopted for qualifying new technologies, thereby reducing the related risks. They suggested that the current generic work process be revised and qualifications be provided to do these revisions.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: further research or development support; joint venture agreement; information exchange/training; private-public partnership; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4888

New sensors and data network for offshore wind farms

New sensors and a data communication network from the Energy Research Centre of the Netherlands (ECN) will enable offshore wind farm operators to better monitor wind turbine performance.

Offshore wind farms, collections of wind turbines installed at sea, present a number of advantages over their land-based counterparts. However, significant challenges remain with respect to remote monitoring of the turbines.

FP5 funding was used to investigate new techniques for condition monitoring (CM) of wind turbines. The research within the project entitled Connow culminated in the development of several new sensors by wind energy specialists with the ECN.

More specifically, vibration monitors were created that can be implemented in a variety of configurations to collect different types of data. The ECN also produced a number of oil monitoring sensors and integration with existing CM systems was planned. The new equipment was designed to be able to

interface with supervisory control and data acquisition (SCADA) systems that are common to today's wind turbines. Algorithms were also developed to convert feedback from the sensors into useful information related to power generation.

An important component of ECN's work was the creation of a data communication network to allow online configuration of the sensors as well as automated data transfer. The system allows its users to create ad-hoc reports, integrating both CM and SCADA data that can be viewed with a web browser. Automated reporting is also possible.

During the project, a selection of the new sensors as well as the data communication network were successfully tested in the field at a small wind farm. It should be noted that the technology is also equally applicable to onshore wind farms.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: information exchange/training; other.

<http://cordis.europa.eu/marketplace> > search > offers > 4847



Reconstructing sea surface temperature from cores

Danish geologists reconstructed a record of sea surface temperature (SST) stretching several thousand of years into the past, in the hope of shedding light on the future state of the climate.

The oceans play a central role in moderating the Earth's climate system. For this reason, knowledge of the natural variability of SST in the past is critical.

The EU-funded research project Pacliva was dedicated to investigating SST on the north Icelandic shelf. This region is home to the polar front and it is also where colder

Arctic and Polar waters meet with relatively warmer Atlantic water.

Scientists with the University of Aarhus in Denmark, a Pacliva participant, used accelerator mass spectrometry radiocarbon dating to date two north Icelandic sediment cores (MD99-2275 and MD99-2271). The incorporation of tephrochronology techniques helped eliminate sources of error normally associated with radio-

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The behaviour of clay in excavated disturbed zones

A Euratom-funded, multinational research effort evaluated the suitability of clay deposits for housing nuclear waste underground.

Deep geological repositories remain the most viable option for the safe, long-term storage of high-level radioactive waste. Research institutes and universities from three EU Member States that produce electricity from nuclear power, and thus generate nuclear waste, came together during the EU-funded Selfrac project.

The objective of the project was to improve understanding of the behaviour of clay deposits in the excavation disturbed zone (EDZ). The experiments were performed at Mont Terri in Switzerland and coordinated by the European Underground Research Infrastructure for Disposal of Nuclear Waste in Clay Environment (Euridice).



As expected, the permeability of the EDZ is significantly higher than that of the surrounding undisturbed rock. When resaturated with water, the clay's self-healing processes help recover part of the loss, but the

EDZ remains comparably permeable. This finding contradicts earlier laboratory-based research, in which self-healing appeared to be more effective. Euridice believes the discrepancy is due to stress fields that develop in the laboratory environment, but not inside the underground tunnel.

Euridice and its Selfrac partners also examined the possible impact of water intrusion and the subsequent swelling of the bentonite buffer surrounding the waste canisters. The increase in pressure in the EDZ, in the order of several megapascals (mPa), was achieved artificially with the aid of a load plate. They discovered that the rising pressure accelerated self-healing in the Opalinus clay present at Mont Terri, which in turn led to a rapid reduction in hydraulic conductivity.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4980

New enzymes boost ethanol production

Genetically improved enzymes created during the EU-funded TIME project could significantly enhance Europe's ability to produce ethanol, a promising biofuel.

Ethanol is a by-product of the fermentation of simple sugars derived from lignocellulosic biomass. As carbon is absorbed from the atmosphere during the cultivation of the biomass, ethanol is considered a carbon neutral fuel.

Aiming to promote the production and adoption of ethanol as an alternative fuel, the EESD programme supported the TIME project. One of the targets of the ambitious work programme was to improve hydrolysis with special enzymes. The research was headed by scientists based in Finland with Roal Oy.

Attention was focused on a fungus called *Trichoderma reesei* (*T. reesei*) which produces enzymes, specifically cellulases, that break down cellulose into simple sugars. Genetic engineering, namely the cloning,

sequencing and transfer of 13 different genes to *T. reesei*, was employed in an effort to impart increased thermostability. This enables hydrolysis to take place at higher temperatures, where it is more efficient. Cellulose binding domains (CBDs) were also incorporated where necessary.

Laboratory tests with synthetic substrates and Avicel cellulose were carried out to determine specific activities. In comparison with the current high performance benchmark, *T. reesei* cellobiohydrolase I (CBHI), the new enzymes, proved not only more effective but also less susceptible to cellobiose inhibition.

Another important milestone reached during the TIME project was the successful production of the novel thermophilic cellulases

at pilot scale. Roal Oy managed to evaluate a range of raw materials as well as the influence of various production conditions.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

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These important findings were shared with the Pacliva research consortium as well as with the greater academic community.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4915

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carbon dating. Three different transfer functions were then developed and applied, in order to produce highly resolved time series of SST dating back 8 000 years in the past.

Analysis of the time series revealed good agreement for periods where observations were available. Other well-known phenomena, such as the Roman Warm Period and the Little Ice Age, were correctly repro-

duced, providing additional confidence in the methodology.

In general, an overall decreasing trend in SST was discovered, interrupted only by relatively brief, isolated periods of warming. The diatom-based and planktonic oxygen isotope transfer functions produced slightly higher temperature values than the planktonic foraminiferal assemblage approach based on maximum likelihood.

Overcoming constraints to sustainable development

Innovation is a widely used term. Often, however, it is a concept that cannot surpass the point of epiphany. The role of innovation on sustainable societies and the hurdles it must overcome have been analysed.

Time geography (TG) is the branch of human science involving the relation of temporal factors on spatial human activities taking into consideration constraints or limitations. The concept was developed in the late 1960s by Torsten Hägerstrand, Professor in the Department of Social and Economic Geography at Sweden's Lund University. It consists of analytical methods paired with a generalising mechanism, in order to conclude how people use spatially patterned resources. The concept emphasises that time is as important as spatial proximity when it comes to human activity. It also stresses that people's spatial activity can often be governed by limitations rather than by independent decisions.

With this concept in mind, the EU-funded Tigress project analysed the way in which TG methods can provide insight for integrating sustainability with social, economic and environmental policies. The notion was that TG concepts might help clarify spatio-temporal constraints on people's behaviour and illustrate how innovation (qualitatively new system behaviours arising through changed beliefs) is blocked. The project's analysis comprised case studies in a wide range of areas associated with sustainable socio-natural development. These include fisheries management, urban sprawl and water demand, transnational demographic change, sustainable agriculture and land planning.



Several key findings resulted from this analysis. Overall, it was evident that the more regulated, stratified and competitive a given environment is, the less likely it is that innovation is possible. Such environments have a higher degree of what is known as systemic inertia, which needs to be overcome in order for pioneering ideas and creativity to flourish.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

<http://cordis.europa.eu/marketplace> > search > offers > 5018

Use of solar collectors to treat water pollution

The inability of conventional biological wastewater treatment to remove some industrial pollutants has shown the need for a new approach. Scientists from the EU-funded CADOX project took on the challenge, developing hybrid technology that both minimises pollution and recycled water.

The CADOX consortium focused on treating non-biodegradable chlorinated solvents and pesticides, which pose a threat to human health. The researchers used a combination of solar photocatalysis, ozone and bioprocesses to treat wastewater containing these priority hazardous substances (PHSs).

New technology using solar collectors, which can significantly reduce the treatment costs of water containing PHSs, was developed and demonstrated. Solar collectors are devices that take energy directly from the sun and turn it into a form which is easier to use or store. The CADOX team selected compound parabolic concentrators (CPCs) as the best option for carrying out photocatalytic processes.

The static behaviour of CPC solar collectors made them suitable for use with large-volume water treatment systems, contributing to their ability to capture both direct and diffuse ultraviolet (UV) sunlight. This was significant, because water cannot absorb

UV radiation under cloudy conditions and a major portion of solar UV radiation reaches the surface of the earth as diffuse light. Therefore, the solar detoxification process was also able to work on cloudy days.

The CPC reflector was constructed from highly reflective anodised aluminium. The collector frame was made from a galvanised sheet and featured 16 parallel tubes of 1.5 m length. The reactor tubes comprised borosilicate glass with a low iron content to enhance transmissivity. A modular system was designed with the collectors connected in series, with high-density polyethylene (HDPE) quick connections between reactor glass absorbers. The complete module consisted

of a series of collectors connected together in rows orientated from east to west and slightly tilted to prevent the accumulation of rainwater.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4937



Exploiting the sun to clean wastewater

Engineers have come up with a novel way to decontaminate hazardous industrial wastewater by harnessing the power of the sun.

European legislation requires the treatment of industrial wastewater to remove dangerous pollutants. The EESD programme supported a number of initiatives aimed at developing innovative solutions to meet this challenge. For instance, the partners involved in the EU-funded CADOX project investigated the potential of combining chemical, biological and other methods.

Ecosystem Environmental Services S.A., a small Spanish firm participating in CADOX, contributed to the creation of SolarCadox. The new technology combines the Fenton

process, discovered more than a century ago, with modern photochemistry. Specifically, ultraviolet and visible light are used to reduce Fe(III) to Fe(II), iron's initial state in the Fenton process. The reaction also produces hydroxyl radicals, which help break down organic pollutants in the wastewater.

A major advantage of SolarCadox is that the light is derived from solar radiation. This ensures that no additional energy is required, and consequently no further pollution is generated. A turn-key solution was produced in collaboration with the CADOX

project coordinator, the Plataforma Solar de Almería of the Research Centre for Energy, Environment and Technology in Spain.

It should be noted that a relevant study must be performed prior to implementation of SolarCadox. Guidance addressing the suitability of the technology for different pollutants and the proper sizing of the installation has been made available in a relevant handbook. Ecosystem Environmental Services S.A. can provide consulting services to tailor SolarCadox to specific sites, climates and types of wastewater.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4946

Wetlands reveal climate secrets

Scientists with the University of Gloucestershire in the United Kingdom got their hands dirty searching in mires for evidence of abrupt climate change over the past several millennia.

In addition to accommodating unique biodiversity, wetlands such as mires also contain features that provide insight into the past climate. The EESD programme funded an extensive research effort, entitled Accrotelm, targeting mires across Europe.

The project was led by the Centre for Environmental Change and Quaternary Research (CECQR) of the University of Gloucestershire. Several Accrotelm participants were involved in the collection of peat cores from directional transects along eight ombrotrophic mires. The mires were located as far south as Spain and as far north as the Faroe Islands, an autonomous province of Denmark.

CECQR examined the cores using a revised version of 'Quadrat and leaf count macro-

fossil analysis' (QLCMA). The updated QLCMA protocol revealed the abundance of unidentified organic matter as well as sphagnum and other identifiable plants in contiguous 1 cm sections of the cores. In addition, the peat was also analysed with colorimetry, in order to determine the level of humification at various depths in the core.

Experts at CECQR studied the results of the QLCMA and colorimetry, and were able to draw conclusions about the state of Europe's climate dating several thousand years into the past. They focused their attention on rapid changes in the proxy climate variables.

The Accrotelm consortium intends to publish the research results in scientific journals and also to upload the core data to the Pangaea database.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5011



Fish behaviour caught on camera

The detailed observation of marine fish response to environmental variations was made possible in the EU-funded Ethofish project, thanks to the development of computer software capable of recording and quantifying fish activity.

The purpose of the Ethofish research project was to examine the behavioural mechanisms of coastal marine fish, occurring in response to altered levels in turbidity or oxygenation in the water. These are two important environmental factors which are greatly affected by human activities along coastlines. In turn, this study would contribute to the understanding of the effects of environmental disturbances on ecosystems and the development of specific environmental regulations.

Quantitative reporting of the fish activity was done with the assistance of computer software named MotionGrab, which was developed for this purpose. A motion detector capable of scoring movements in a number of user-defined areas was designed. The software program could log activity in four fish tanks simultaneously or could record the time spent by fish in up to four regions or habitats.

In addition to recording a video stream of the movement, a text file could be pro-

duced by the software. This file contained the date and time of the activity. If used in addition to another program, MotionRead, the audio video interleaved (AVI) files could be replayed at variable speed, forward or reverse as well as frame by frame. Whilst MotionGrab generates the data, MotionRead has various functions which made the scoring and logging of the behavioural data easier.

Funded under the FP5 programme 'Life quality'
(Quality of life and management of living resources).

Collaboration sought: further research or development support.

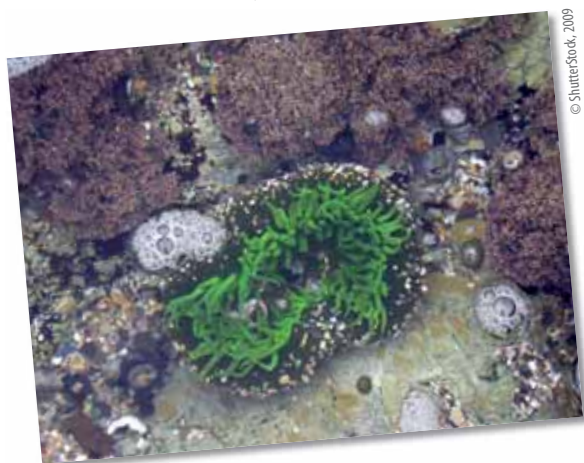
<http://cordis.europa.eu/marketplace> > search > offers > 5007

Trawling disturbance in the north-west Mediterranean

Some organisms which dwell on the seabed are more vulnerable than others to the physical impact of commercial fishing. Marine scientists have therefore studied changes in benthic communities, to determine the level of disturbance resulting from these activities.

Fishing by commercial trawlers can disrupt communities of organisms living on the seabed, including the elimination of certain species through changes to their habitat. Scientists from the EU-funded Response project conducted a multidisciplinary investigation to gain a clearer understanding into how the benthic ecosystem responds to

such perturbations. Their work involved the analysis of an area representative of a heavily exploited European fishery. The investigation centred on a chronically disturbed community from a fishing ground in the north-west Mediterranean, and included an area that had not been fished for 20 years.



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Although the long-term effects of trawling are not well understood, previous studies indicated that similar ecosystems disrupted in this way are dominated by opportunistic organisms. Comparison of the fished and undisturbed study areas overall showed the benthic community mainly comprised deposit feeders amongst the substrate or burrowed deeply into it, and predators. The part of the study area which was heavily

fished had significantly greater levels of large burrowing scavengers and mobile deep burrowing organisms.

The undisturbed area, in contrast, featured significantly greater numbers of the more vulnerable organisms. These included sedentary suspension feeders, which live on the surface of the seabed. The Response consortium therefore recommended that fisheries' managers must consider the effect of trawling on the structure and function of the benthic ecosystem to minimise ecosystem disturbance.

A greater understanding of the environmental impact of commercial trawling has made a significant contribution to the scientific basis of the EU's common fisheries policy. This has helped in the implementation of regulations to mitigate the impacts of fishing on marine ecosystems within European waters. The project's findings have also contributed to the conservation of biodiversity and the development of sustainable fisheries, since fish require a healthy marine ecosystem in order to flourish.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4986

Past ocean chemistry tells the story of climate change

The analysis of multiple trace elements has enabled researchers to identify past ocean chemistry. One team of researchers has developed an innovative method enabling the design of a faster and more accurate analysis procedure.

The 6C consortium took up the challenge of reviewing climate change from a multi-disciplinary perspective, with a focus on carbonate chemistry and the carbon cycle. Research was based on the hypothesis that pore water-driven calcite dissolution during glacial periods can account for most observed changes in partial pressure of atmospheric carbon dioxide. This hypothesis resulted from boron isotope studies and modelling carried out prior to the project's design.

The scientists used all available trace element proxies using biogenic carbonates in foraminifera to determine chemical and physical conditions in oceans in the past. It was therefore established that proxies based on trace element ratios can be used to reconstruct past environmental parameters. Certain conditions needed to be met however. Firstly, an established connection was required between the elements and the feature under study. Moreover, the trace

element ratios must have been preserved after burial, so that the biogenic carbonate could be measured.

The chemical properties of ocean waters successfully determined included anions such as carbonate, phosphate and alkalinity. For example, the ratio of cadmium to calcium in foraminifera can be used to derive and determine phosphate levels in deep water. These ratios were found to extend to other physical environmental parameters. An indicator of past ocean temperature is the relationship between magnesium and calcium in foraminiferal calcite. Moreover, the ratio of magnesium to calcium has also been established as a successful palaeotracer.

The study was able to take advantage of the fast scan methodology, which used a quadrupole inductively coupled plasma mass spectrometer (ICP-MS). Many universities worked in collaboration to validate the technique as well as to improve the consistency

of results. This method was of particular value to researchers within the fields of geochemistry and palaeo-oceanography.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; financial support; information exchange/training; available for consultancy.

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History of earthquakes in the Dead Sea fault zone

A combined historical, archaeological and earthquake hazard study helped to determine the level of seismic risk in the region of the Dead Sea fault zone (DSFZ). This has helped to improve the seismic catalogue, giving scientists a better understanding of each event.

The Dead Sea fault zone presents geologists with an opportunity to study seismic processes along an active fault. The Dead Sea straddles the border between Israel and Jordan and is the lowest point on the surface of the Earth on dry land. The fault extends

south to the Red Sea and north up through Lebanon and Syria, ending in southern Turkey. The region also has a rich cultural heritage and possesses many ancient archaeological sites.



Scientists from the EU-funded APAME project have studied seismic activity along the active fault and applied it to case studies. Researchers can point to significant evidence for ancient earthquakes which resulted in significant damage. They produced a set of data concerning the occurrence of moderate-sized and large earthquakes, with

damage distribution and location for the northern segment of the fault zone.

Researchers carried out a critical evaluation of the seismic activity of the DSFZ before the present era, based on archaeological and palaeoseismological information. The work involved the assessment of the magnitude of historical events and the earthquake hazard in the study region in the DSFZ. Researchers also carried out an assessment of the slip rate of the DSFZ.

The APAME project involved cooperation between European scientists and partners in the Middle East. The high population density and wealth of historical and cultural monuments existing within the region forms an exceptional source of information. The aim of the project was to implement seismic hazard models that can be applied to Europe. The results provide a greater understanding and insight into seismic processes along active faults and were applied to European case studies.

Funded under the FP5 programme 'INCO 2'
(Confirming the international role of Community research).

Collaboration sought: further research or development support;
information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4919

Emissions tests given green light by Winchester's drivers

Following a round of emissions tests, designed and implemented by researchers taking part in the EU-funded Miracles project, vehicle owners were found to be positive about receiving regular information on how much pollution their vehicles emitted. These tests took place in Winchester city, United Kingdom, using specially designed equipment.

The quality of air in cities, in particular in the city centre, is impacted by the level of traffic congestion and the number of high-polluting vehicles in circulation. In order to address this, a consortium consisting of city councils, transport authorities, universities and research institutions were brought together within the framework of Miracles.

The city of Winchester, a cathedral city in the south-east of England, was the case in point for one part of the study. Prior to the project's implementation, the city council made a statutory declaration of an air quality management area for the city centre. This set the groundwork for the project and highlighted the high levels of air pollution which needed to be dealt with.

Implementation of the objectives of the Miracles project involved carrying out specific monitoring trials which tested polluting

traffic. Innovative equipment tools, developed as part of an earlier EU-led project, played a key role in the tests. This equipment was modified so that it could monitor vehicle speed and acceleration. Also, it was interfaced with an automatic number plate recognition system which made it possible to identify and inform individual polluters of their emissions.

Following implementation of the tests, various enforcement strategies were applied. Firstly, drivers were informed if their levels of emissions were good, fair or poor. The emission levels of individual vehicles were made available on a website-based database. Another measure involved the provision of subsidised emission checks and repair services to high-polluting vehicles. This

encouraged voluntary maintenance of high-emission vehicles.

The results of the monitoring tests carried out indicated that the percentage of vehicles that could be identified as high polluters were in fact less than had been expected. Following dissemination of questionnaires used to assess vehicle owners' reactions to the implementation plan, it was established that regular feedback to vehicle owners on their emissions would be welcomed.

Funded under the FP5 programme Growth
(Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5012



Rural community perceptions of tourism

Tourism in Europe's rural regions is in need of better integration. In order for tourism to be more sustainable and effective in these areas, the link between host communities and tourism was analysed.

Rural communities generally do not get much exposure to tourism. Given this, the Sprite project conducted host community surveys comprised of 50 members representing each area. The surveys took a very thorough approach in terms of community perceptions. For example, it focused on links between tourism and place, requirements, expectations and experiences of interaction with tourists as well as their willingness to interact.

The survey was made up of questionnaire-based interviews geared toward particular local communities. The assessment was

qualitative as well as quantitative in scope. The main areas covered were the amount of control a community has when it comes to tourism resources and levels of cooperation, ranging between host communities, tourists and agencies. It also considered potential conflicts that could arise in this context.

As a result, the reports offer a broad spectrum of information on communities and the way they perceive the connections between tourism and place. They can offer ways

to help communities resolve tensions while boosting integrated tourism in rural areas.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4985



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Interpreting integrated tourism's potential

Rural regions in Europe are in need of a boost when it comes to tourism. In order to alleviate this problem, researchers adopted an integrated approach through a compiled analysis of results.

In an effort to offer suggestions for advancements towards more effective and sus-

tainable integrated tourism, the Sprite project spanned 12 study regions. The analysis examined how local resources and activities are linked with tourism in regards to economic, social and cultural aspects as well as the impacts and benefits of integrated tourism.

Following the original research, a scrupulous interpretation of the results specifically pinpointed the function of integrated tourism in respect to advancements in lag-

ging rural regions. The methods involved and the possible ways in which integrated tourism can infiltrate to local and regional economies, societies and cultures were also interpreted.

Beyond this, firm recommendations were generated covering the ways in which integrated tourism operates within regionally specific contexts, playing an important role in policy objectives. Finally, a report was drafted for each country which indicated important resources for institutions and practitioners, both nationally and regionally, whose aim is to delve further toward integrated tourism.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4978



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Relief in sight for potato blight

A new approach to managing late blight in EU organic potato production has been developed in hope of preventing economic losses by also boosting yield.

Potato crops can suffer from symptoms caused by a fungus infestation occurring late in the growing season — which is known as late blight. This condition more often than not causes significant economic loss to organic production across Europe. With copper fungicides being banned, a comparably functional alternative is called for in order to prevent further economic losses for farmers.

In quest of this alternative, the Blight-MOP project has come up with improved organic production systems for controlling potato blight. This was done through creating

regionally adapted blight management strategies, which were based on various aspects such as best current practice identification, variety resistance management and field diversification strategies.

The successful reduction of blight impact using mixtures of potato varieties was contingent upon the level of resistance of the varieties in combination, but it did not always directly affect yields. Moreover, alternating rows with susceptible and resistant varieties did not have a significant impact on the disease. Combining potatoes with grass, clover

or spring wheat at right angles to the prevailing wind direction reduced blight but did not affect yields. On the contrary, using wheat as a bordering crop was more effective in reducing blight but lessened yields due to the dominating height of wheat over potato plants.

The results indicated that a single variety of crop occupying an entire field makes more commercial sense. Diversification as a means of a combined control approach with low to moderate blight disease pressure is an option that needs to be further addressed.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4977

Safety assessment for dimethyl ether fuel system

An innovative high-pressure fuel injection system was developed for use with dimethyl ether (DME), a colourless gas which can be produced from biomass. The work was part of a European initiative which carried out research into the use of alternative fuels in heavy duty vehicles.

The use of DME has created considerable interest as a clean burning hydrocarbon fuel suitable for use in diesel and petrol engines, and fuel cells. As part of a CO₂ reduction strategy it can help to decrease emissions from heavy duty vehicles. Because no soot emissions are produced by the enhanced environmentally friendly vehicle (EEV), European urban emission standards can also be achieved.

The Afforhd project developed a new fuel system for the direct injection of DME into a heavy duty diesel engine. Since the prototype was subject to field testing, great attention was given to safety tests. Therefore, the Afforhd project carried out a 'Failure mode and effect analysis' (FMEA) safety assessment on the fuel system. The FMEA is a well-established procedure for investigating potential failure modes within the installa-

tion, as well as providing information on how it can be improved.

Researchers concluded from the tests that the main risks posed were from DME leakage and failure modes located within the tank system. According to Liquefied petroleum gas (LPG) guidelines such as R67, the leakages represented a risk comparable to that of a petrol engine. The severity of an accident was balanced by a lower likelihood of an incident.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4905

Using your mobile phone as a parking meter

In order to ease traffic congestion, the city of Berlin, Germany, was the site of a demonstration trial for a 'tele-parking system'. This new technology provides an alternative to inconvenient park-and-pay coin meters. Instead, users and enforcers rely solely on their mobile phones.

Urban areas suffer from heavy traffic congestion which considerably reduces the quality of life of citizens. It is the responsibility of city municipalities to intervene in order to provide possible solutions. One such solution is on-street parking management, aimed at reducing the number of vehicles in the city by introducing a pricing system on parking.

As part of the EU-funded Tellus project, project partners introduced a new parking management system in Berlin. The new system was based on state-of-the-art technology for parking management, which includes time-adjusted pricing whilst making parking transactions easier for users. This technology is entitled 'tele-parking system/mobile parking'. As the name suggests,

it uses cellular phone technologies. The drivers as well as the enforcement agents use a mobile phone.

During the demonstration trial, the information collected by mobile phone was registered by a service centre. Parking duration times of the users were noted and they were charged accordingly. For ease of use, the payments were virtual, collected once a month by bank transfer. Municipal officials received all the anonymous statistical data of parking transactions that occurred within their

jurisdiction. The next stage for the project is to test the suitability of a public-private partnership in this venture.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: joint venture agreement.

<http://cordis.europa.eu/marketplace> > search > offers > 4975



Tackling distressed urban areas

EU-funded researchers produced policy papers providing guidance on urban regeneration. With this advice, stakeholders at different decision-making levels were given the tools to move towards more sustainable European cities.

Urban life in the sprawling metropolis can be difficult. The social phenomenon of large distressed urban areas can be witnessed in most European cities. It is this environmental, social and economic distress apparent in cities which leads to a poor quality of life for many of its citizens. Good urban governance and an integrated civil society can alleviate some of these problems, but in order for decision-makers to make the right choices they must first have the right information.

The LUDA research project addressed the issue of urban distress by carrying out three

years' worth of research on the subject. The project facilitated exchange of experience between European cities and between stakeholders. Overall, the project provided tools for a strategic approach to planning and developing an urban rehabilitation process.

Researchers based at the Leibniz Institute of Ecological and Regional Development, Germany, prepared and disseminated policy papers which had been developed at different stages of the project. Each of the five policy papers produced contained policy recommendations. These in turn contrib-

uted to the European Commission's *White Paper on European Governance*.

The papers reported on urban regeneration activities which were founded on the belief that urban development needs to be viewed holistically and be linked to quality of life issues. The papers took into account the different levels of decision-takers, therefore targeting guidance to agencies, local authorities and central government. The LUDA project in this way represents a step ahead toward a sustainable Europe.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4989

Technically assisted rehabilitation

A group of electronics engineers in Spain worked on the development of advanced devices that will wire the bionic hand, designed by the Cyberhand project, to a wearer's nervous system. The neural stimulators allow for sensory feedback to reach the brain and instructions from the brain to control, at least in part, what the hand is doing.

The human hand is controlled by efferent neural signals carried from the central nervous system to the peripheral nervous system. At the same time, information obtained on the position of fingers or the force produced while holding an object are brought to the central nervous system by activation of afferent peripheral nerves.

Aiming to implement this structure, the hand prosthesis designed during the Cyberhand project will be controlled by the patient wearing it in a very similar way. The efferent neural signals coming from the central nervous system will be processed, and afterwards sensory feedback will be delivered by stimulation of specific afferent nerves.

The Centro Nacional de Microelectrónica de Barcelona focused on nerve regeneration electrodes that, instead of biomimetic sensors, will recreate the perception capabilities of the human hand. Neural signals recorded by nerve regeneration electrodes need to be amplified and filtered before specific nerves are stimulated.

The application-specific integrated circuit (ASIC) delivered consists of four amplifiers for multi-electrode recordings with amplitude as low as a few microvolts (μ Vs). More specifically, it was produced in complementary metal oxide semiconductor (CMOS) technology to work with cuff, sieve or longitudinal intrafascicular electrodes.

An attractive characteristic of its multiple channel stimulator (that applies electrical impulses to the afferent nerves) is the ability to be programmed to generate any complex waveform using computer software. Although it is an ideal circuit for a hand prosthesis, there is still a lot of room for advancement and optimisation.

A major issue in follow-up activities of the Cyberhand project partners was the limited number of implantable electrodes and thus the number of possible stimulation channels. New possibilities have, however, opened up for a hand prosthesis that can, through a connection to the neuromuscular tissue, be directly controlled by the patient wearing it.

Funded under the FP5 programme IST (User-friendly information society).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5008



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Database of biochemical pathways

A new-generation bioinformatics database was created to host information on biochemical pathways. It has as its basis integrated layers of genomic and proteomic data, drawn from major research centres throughout Europe.

The 'Biochemical pathways' (BioPath) database was developed through the Temblor project and contains data from the Roche Applied Science biochemical pathways wall chart. It is a database of biochemical pathways that provides access to metabolic transformations and cellular regulations. It uses search methods based on chemical structures, enzymes and reactions to enable scientists to investigate the endogenous metabolism of different chemical species.

Main features of the database include the representation of each molecule by listing all atoms and bonds in the form of connecting tables. Within reactions, the reac-

tion centres, the atoms and bonds in the rearrangement process are marked. The information in the database was enhanced by a set of 3D-structure conformations which were added using the Corina and Rotate programs. The web user interface allows researchers to carry out structure searches to retrieve information on chemical compounds and their related data.

The current system contains information regarding 1 175 molecules, 1 545 biochemical reactions, 1 000 enzymes and over 200 named pathways. The organisms covered include prokaryotes, plants, yeasts and animals, as well as general pathways. Users can find information pertaining to subcel-

lular localisation of pathways including cytosol, chloroplasts and mitochondria.

The database was designed with the aim of helping researchers explore enzyme inhibitors as transition state mimics. It can demonstrate how the classification of biochemical reactions based on physicochemical effects at the site of the reaction matches the classification of enzymes using the EC code.

The database is accessible online at: <http://www2.chemie.uni-erlangen.de/services/biopath/index.html> and <http://www.mol-net.de/software/carol/index.html>

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 4917

Beating the bullies — changing real-world behaviour through virtual experience

Social problems like bullying and stereotyping involve thoughts, feelings and reactions that resist change. New research shows that when students play active roles in virtual dramas, their attitudes and behaviour can change.

In 2006, a group of European educators, psychologists and IT specialists realised that emotionally driven problems such as bullying, stereotyping and scapegoating demanded emotionally compelling interventions. The researchers set out to create virtual worlds with characters that children could interact and empathise with powerfully enough to change their own attitudes and behaviour.

The EU-funded research project eCircus ('Education through characters with emotional-intelligence and role-playing capabilities that understand social interaction') has now produced two programs: FearNot! ('Fun with empathic agents to achieve novel outcomes in teaching') and Orient. They give students helpful roles in interactive virtual worlds, where they can learn to change their thoughts, feelings and actions.

Finding new ways to resolve such problems is important, says eCircus coordinator Ruth Aylett, because they are pervasive, hurtful, and can cause lasting psychological damage. 'Knowledge-based interventions don't necessarily succeed,' she explains. 'If we're able to reduce victimisation, we're giving people a way to get out of a very painful situation and improve the quality of their lives.'

The eCircus researchers first focused on primary school children who were the victims of bullying. They drew on recent psychological theories that highlight the importance of feelings for changing how people treat each other. 'Emotion is an essential part of human interaction,' says Ms Aylett, 'so education about human social interaction must include feelings.'

The theories led them to expect that if they could get children to empathise with and try to help victims of bullying in a virtual world, the children could try out different strategies, experience the results and develop better ways to deal with bullying in their own lives.

The researchers used the computer program FearNot! that had been developed as an initial small prototype by an earlier European research effort called Victec. The eCircus team made FearNot! much richer in content and more open-ended. For example, they provided virtual bullying victims with the ability to remember strategies that they have tried. Those memories allow the vir-

tual characters to reject approaches that have failed and ask the children who are helping them in the simulation to come up with better ideas.

'We are the first people to produce software for dealing with bullying that is not pre-scripted,' says Ms Aylett. 'We've produced something that is genuinely interactive to the individual responses of each child.'

To test the effectiveness of FearNot!, the eCircus team tried it out with close to 1 000 students in 30 primary schools across Germany and the United Kingdom. The researchers tested FearNot! by comparing a group of users and a control group of non-users, similar to the method used for testing medical treatments. Students in selected classes spent a total of 1.5 hours playing FearNot! over the course of three weeks.

The results were encouraging. 'It definitely reduces victimisation in the short term,' notes Ms Aylett. 'It has a significant positive effect even at this low exposure.'

Although further work is needed to demonstrate long-term effects, the coordinator is confident that if all the children in a school experienced FearNot! over a longer term, and as part of a social learning curriculum, bullying and victimisation would be reduced.

'FearNot! has achieved its objectives very well,' says Ms Aylett. 'You'd need a games or educational software company to take it further.'

While FearNot! has younger children interacting with cartoon-like characters in a simple world, Orient immerses older students in a much more vivid and complex virtual world, where they learn to empathise with and accept newcomers from other cultures. In Orient, three students are equipped with various handheld control devices and 'beamed down' as a team to visit the planet Orient.

Planet Orient is populated by aliens called Sprytes, who look rather like large bipedal tree frogs and who have their own language and customs. Students have to learn a lot about the Sprytes and empathise with them in order to help them.

'We wanted users to feel adrift in this alien culture,' says Ms Aylett. 'How can you empathise with new people in your own culture if you've never experienced being adrift yourself?'

The software that shapes what happens as students interact with the Sprytes acts like the director of an improvisational drama. The software starts and ends scenes, chooses which characters appear, and can impose challenges such as a storm.

Each Spryte has its own goals, feelings and memories that control what it does and that can change based on experience. The interaction between the Sprytes and the students produces an unpredictable 'emergent narrative.'

'There's no fixed plot,' explains Ms Aylett. 'Our characters are acting autonomously, making up their minds as they go.'

According to Ms Aylett, students standing in front of a large screen and interacting with these psychologically believable aliens soon respond as if they were real. 'Orient produces the feeling of really being there,' she says.

Although Orient needs further development and testing, Ms Aylett believes it has the potential to help solve a major social problem by spurring students to change their attitudes toward students from other cultures. 'It's the attitudes of the host community that can either make new students welcome or make their lives miserable,' she says.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90663>



Paperless proof, the e-government magic act

A French-developed security platform which turns e-mail into the electronic equivalent of registered mail could help deal with the bureaucratic paper mountains throughout Europe.

In all sorts of dealings and transactions between government departments, between businesses and government bodies, and between individual citizens and government, verification of identity and proof of what has transpired is needed. As a rule, this has usually meant forms to fill in, signatures dated and physically posting or delivering the completed forms.

A few years ago, a French Government initiative set out to develop a secure online platform to handle electronically the many transactions between local communities, or collectives, and the central government and particularly the interior ministry. These include the 'collectives' having to inform the ministry of all decisions they take, and also to notify the central government of all births, deaths and marriages that occur.

French public financial institution Caisse des dépôts et consignations set out to develop and test the Fournisseur d'accès sécurisés transactionnels (secure access gateway provider) platform or FAST. The system is able to provide automated and secure document exchange, legally recognised acknowledgement of receipt, electronic certificates and signatures, secure encryption of information as well as traceability, time-stamping and archiving of electronic documents.

This means collectives all over France no longer have to post off copies of life-event certificates to Paris, but simply file them

electronically via the FAST platform. Individual citizens benefit in a number of ways, such as no longer having to provide a physical copy of a birth certificate when making a benefit application.

Now the magic of the system is being brought to the rest of the EU thanks to a project funded under the EU's eTEN programme for market validation and implementation, the FASTeTEN project.

The project's technical coordinator, Jean François Navarre, says in France a whole host of new e-government functions have been made possible by the platform and a private company has been established to market these services, both in the country and around Europe. 'While this means FAST is not free, people wanting to use it will improve their performance and save themselves money,' he says.

The EU-funded project, which got underway in 2008, has two very different trials of the platform's capabilities on the go. One is in the Spanish region of Valencia, where it is being used with the local government's e-procurement platform to provide a new level of security by generating legally binding proof of both calls for proposal and of transactions. The second is in the English city of Sheffield, and the objective here is to develop from scratch a new procedure for the management of contacts within organisations. This is being done by a pilot system to manage the contacts between schools and parents.

Jonathan Gay, the project partner in charge of the Sheffield trials, said: 'We took stock of the paperwork being used in the local school system to see what could be put onto the FAST platform to reduce the need for parent-based signatures.' Then 10 schools were selected to trial a cross-selection of applications. 'We have carried out hundreds of tests on the forms and interfaces, worked with the school secretaries and now we are ready for implementation,' he says.

One of the applications being trialled is parental consent for events, such as school outings. Instead of posting or giving children consent forms for parents to fill in, a teacher can put the detail of an event onto the platform which will then contact all the parents, and send reminders to those who do not respond. Parents log onto a website to give consent via an electronic signature. Parents who do not have access to a PC at home can use a token with an electronic signature on it at a public terminal.

If a problem occurs during the event, a parent cannot claim to have not given consent because of the security built into the system, which not only recognises the electronic signature but also records the exact time it was received and then archives it. With an ordinary e-mail there is not the same legal standard of proof. Another application being looked at is paperless exam results.

One difference between the trials is that, in Valencia, the platform is installed on the regional government's servers, whereas in Sheffield everything is run through the FAST central servers in France. This might change, according to Gay, who said: 'We might bring the system here as time-stamping and archiving need input from people and we might be able to create new IT jobs.'

'We are implementing FAST with a view to the long term and the project funding is to allow us to come up with as many ways as possible to use the technology and to develop new applications and mechanisms.' He mentions the health and emergency planning sectors as potential users of the technology.

According to Navarre, the platform can be used at a municipal, regional, national and pan-national level throughout the EU to provide transparent, secure and easy-to-use e-government services for citizens and businesses.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90609>



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Providing easy online access to plant genome data

BioFloWeb is a new, highly flexible bioinformatic tool capable of providing online access to a vast quantity of plant genome data.

Europe's leading research institutes have combined their resources to sequence the genomes of a number of organisms. Progress has been impressive, but has also resulted in the dispersion of data among a variety of sources, which makes its exploitation difficult.

The Planet research consortium set about developing software-based tools to make this highly valuable data available to the

research community. The EU-funded work focused on *Arabidopsis*, one of the first plants to have its genome sequenced.

Genoplante-Info of the Centre de ressources Infobiogen (closed since July 2006), a Planet participant from France, created a stand-alone web-based application entitled BioFloWeb. It exploits BioMoby web services to collect data for *Arabidopsis* from a number of sites. A flexible search mechanism allows

users to define their own workflow or to use existing workflows from the Taverna workbench.

BioFloWeb users can also tailor the way the resulting gene report is organised and presented, in order to suit their individual needs. Genoplante-Info has copyrighted the application and made a fully operational prototype available for those interested in learning more about this exceptional tool.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4998

Power lines help to secure remote summer homes

An advanced building management system devised during the EU-funded Wirenet project will help deliver much needed security services to summer homes, particularly older ones, in remote locations.

The ability to transfer data over power lines has opened up a number of new opportunities in the information technology sector. The Wirenet project was dedicated to developing novel products and services based on this technology.

Ardoran OU Ltd, a Wirenet participant from Estonia, investigated the potential for building management systems (BMS). Installations of BMS entail both hardware and software components that control lighting, climate, security and other building functions. By enabling data transfer over exist-

ing power cables, the need to retrofit older buildings was eliminated.

Contacts established during the Wirenet dissemination activities led to the identification of a significant market in summer vacation homes. This was especially evident for Estonia's close neighbour, the Russian Federation, where the so-called *datchas* are very common in the countryside. The idea was to apply the technology developed during Wirenet to provide security services to groups of older summer homes.

Ardoran OU Ltd and its Wirenet partners are following up on this and other promising leads.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5016



Customised management of coastal lagoons

Information technology tools have enabled a novel integrated approach for managing coastal lagoon ecosystems which are influenced by river basin runoff.

Lagoons in southern Europe contain a plethora of valuable resources, yet these ecosystems are affected by surrounding

agriculture as well as urban and economic activities. In order to strike a sustainable balance, the DITTY project has designed reliable information technology tools using an integrated model approach specifically customised for river catchment-coastal lagoon ecosystems. Such specificity allows for management options through a realistic socio-economic assessment.

The results of these efforts can be seen through many pivotal outcomes in the gulf of Gera on the island of Lesbos, Greece,

which was used as a test site. For example as regards the technical aspect, tools and methodologies were applied, elaborated and adapted in accordance with the characteristics of such a coastal water body. Furthermore, the methodologies were tailored specifically for end-users' needs, with particular emphasis devoted to developing user-friendly and flexible tools as well as policy-making support.

Enhancing cooperation between developer and end-user in this way was a key highlight of the efforts overall. The results can also be applied to other similar coastal areas in Greece.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).

Collaboration sought: further research or development support; information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4920



IT tool for managing southern Europe's lagoons

A biochemical model was developed for the sustainable management of watershed-lagoon systems in southern Europe. This was coupled with a watershed-based model, which utilised information from local stakeholders.

A general biochemical model for coastal lagoons was developed, implemented and validated with field data by scientists from the DITTY project. It was then coupled with a watershed model, which was also devel-

oped by the same consortium. The aim of the project was to develop the scientific basis for the sustainable use of southern Europe's lagoons and their resources. Researchers took into account the impacts of agriculture, urban development and economic activity on the aquatic environment. This information was used to develop information technology tools that were designed specifically for these types of ecosystems.

The watershed model evaluated and predicted the quality and quantity of surface and subsurface water, as affected by human activities. This tool combined the soil and water assessment tool (SWAT) hydrological model, the modular finite difference flow (Modflow) ground-

water model and the QUAL2E in-stream water quality model. It was developed for a specific watershed where water was managed artificially through the use of pumps and channels, rather than following gravity.

The DITTY team also developed a set of thermodynamic indicators for measuring the ecological status of coastal lagoons. The model used scenarios based upon the main economic activities found within a particular watershed-lagoon system. In this case the model was applied to a scenario based on clam farming practices, which followed priorities set by local stakeholders. The object of the stakeholder analysis was to identify the winners and losers from a range of management options. A version of the model was incorporated into the decision support system (DSS) developed by the University of Siena for the Sacca di Goro, a brackish lagoon in the Po river delta of north-eastern Italy.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).

Collaboration sought: further research or development support;
information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4931

Optical sensing elements for trace gas detection

Reversible alterations in the optical properties of nanostructured media when exposed to specific pollutant gases have allowed the implementation of innovative sensing schemes to differentiate trace gas amounts.

For the detection of concentrations of reducing and oxidising gases as incredibly small as 10 parts per billion, the EU-funded Nanophos project aimed beyond the established electrochemical or spectroscopic gas sensor concepts. By exploiting emerging nanophotonics technologies, a new class of optical sensors was developed to alleviate deficiencies in terms of sensitivity and selectivity.

Based on the detection of changes in the refractive index of oxide films when exposed to hazardous gases, optical sensors promise significant improvements in the accuracy of gas concentration measurements. Thin films of zinc oxide (ZnO), tin dioxide (SnO₂) and other inorganic basic materials were used as sensing media with very fast response times.

Alterations in their optical properties could be detected by means of an optical interrogation system, which generates light beams to be directed towards the thin oxide films. Researchers at the Institute of Electron Tech-

nology in Poland were assigned the challenge of fabricating diffractive optical elements that respond to hydrocarbons and other organic compounds, including alcohols.

Optical gratings were written on specially designed photosensitive polymers using photolithographic techniques, as well as on multi-layer metal/metal oxide thin film structures. Polymeric materials are transparent over a broad wavelength region, but they suffer from several disadvantages, including a large thermal expansion coefficient and degradation after prolonged illumination.

On the other hand, metal oxide-based optical gratings provided for the increased selectivity that was desired. Variations in gratings' diffraction efficiency, not only as a result of changes to their refractive index but also to their geometry, can be used to measure extremely low gas concentrations. Add-

itional advantageous characteristics of these sensing elements include the possibility to operate at room temperature, as well as in unusual and extreme conditions.

Funded under the FP5 programme IST
(User-friendly information society).

Collaboration sought: further research or development support;
information exchange/training; available for consultancy.

<http://cordis.europa.eu/marketplace> > search > offers > 4969



Virtual music school becomes a reality

Students of popular musical instruments may soon be learning to play with the help of a new generation of intelligent, interactive computer programs thanks to European researchers.

While it is unlikely, and most people would say undesirable, that computers can ever take the place of teachers, they are becoming an indispensable support tool in many subjects and this may soon also be the case with music.

As with most computer-aided teaching, the key to developing a musical tuition system is developing superior software able to hear and react to music being played, and make judgements as to whether it is being played correctly.

This is what a consortium with partners from six EU Member States has been trying to do for the past three years in the EU-funded Vemus project — and if initial results are anything to go by they have succeeded.

The project's researchers set out to develop a teaching architecture and software platform for novice and intermediate-level students of recorders, flutes, trumpets, saxophones and clarinets. Project coordinator George Tambouratzis explains the decision to focus on these particular instruments was made for two reasons. Firstly, it is considerably easier to develop a system for monophonic wind instruments like these than it would be for a polyphonic instrument, such as a piano. Secondly, the project partners did a survey in their home countries before the project got underway and found these were the five most popular instruments for beginner students.

They then decided to address three specific learning scenarios. In each scenario, a musical score is initially input into the platform, so the system can then recognise it and check if the right notes are being played in the right sequence, using correct note durations. Any deviation from the score is noted by the system and fed back to the student.

The first e-learning scenario is self-practice, where a student practices a piece of assigned music at home. The student is able to improve his or her performance by taking into account the feedback from the Vemus platform.

The second scenario involves distance learning and is targeted at students who live a long way from a music teacher, perhaps on a remote island. A teacher can set the pupil tasks to perform via the distance learning platform and the student can then

practice the set pieces over and over, each time getting feedback from the platform to show where things are going wrong. Once the student is happy with the work, it can then be submitted to the teacher for review via the platform. The teacher can then give a detailed assessment of the work, make comments on it and grade it.

The third learning situation is in a conventional classroom where collaborative learning and group activities can take place involving a teacher and several students. An example of this is the teacher getting one student to play a piece that the others follow as the score. The details of the performance — distributed simultaneously via a wireless network established by the platform — are displayed graphically on each of their personal PCs.

All of the instruments and the different types of platform have been field tested by project partners in different EU Member States, including Estonia, Greece, Lithuania, Romania and Sweden. According to Mr Tambouratzis, the feedback to date has been good, although he stresses the final feedback will all be assimilated into an end-of-project report due in early 2009.

'Initial results show that students using Vemus learn more quickly than control groups studying the same music using conventional teaching methods,' he says. 'Motivated by interaction with their computers, the Vemus students also study longer and learn more pieces than the control group students,' he says.

Although the project is ending, the website, from where teachers and students can download trial versions of the Vemus platform for free, has been licensed for a further three years. 'Although everything still has to be finalised, it seems likely that the software will not be com-

mercialised but will be made freely available to anybody who wants to use it,' says Mr Tambouratzis.

Already several schools and conservatories which were not involved in the project have expressed their interest in using the system, and publicity is encouraging others to join. Different curricula in different countries and specific local requirements are not a barrier, Mr Tambouratzis says, as it is not complicated for teachers to load new scores into the system which has a multilingual interface available in a number of European languages, including the major ones.

Looking to the future, he says now that the basic Vemus architecture has been put together, it is quite easy to add new musical instruments to the modular system, although it would be more complicated to add polyphonic ones. Once the project is completed, the partners have some ideas for future projects to build on the work done here, he adds, though discussions are still at an early stage.

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Safer, better, faster: addressing cryptography's big challenges

Every time you use a credit card, access your bank account online or send secure e-mail, cryptography comes into play. But as computers become more powerful, network speeds increase and data storage grows, the current methods of protecting information are being challenged.

Once shrouded in secrecy, cryptography (using mathematical algorithms to secure, hide and authenticate data) has come out into the light in the current digital era. No longer restricted — in western countries at least — by tight usage and export controls, cryptographers are now collaborating more extensively than ever before to create better algorithms and faster encryption methods to protect the vast volumes of data being generated by governments, businesses and citizens.

In many ways, European researchers are leading the way in addressing the big challenges facing the future of information and data security. 'There are three big issues facing cryptographers,' says Bart Preneel, Professor at Katholieke Universiteit Leuven in Belgium and President of the International Association for Cryptologic Research. 'Cost, speed and long-term security.'

The first two problems are closely interconnected, a consequence of the trend towards storing more information in more distributed systems, from the flash drives and smart cards in your pocket, to the computer in your home or the network at your office. Cost, in this sense, refers not only to the cost of hardware capable of robust encryption, but also the energy cost of running cryptographic processes on increasingly tiny, low-power devices. Cryptographic programs

also need to be faster if they are to secure the vast amount of information now being stored.

'In a few years we will have devices in our pockets with 10 terabytes of storage capacity — current methods are far too slow to encrypt that amount of data practically,' Professor Preneel notes.

Time is also a problem in another sense. A lot of data being generated today will need to be kept secure for decades or even centuries to come, but history has shown that gains in computer processing power make it easier to crack cryptographic codes. Algorithms developed in the 1970s, for example, can now be readily broken by researchers.

'We may want to store medical information securely for a long time, not just for the duration of someone's life, but in the case of DNA data for the lifetime of their children and grandchildren as well,' Professor Preneel says.

Those challenges and others were addressed by an international network of researchers led by Professor Preneel. With funding from the EU, the Ecrypt network of excellence brought together 32 leading research institutes, universities and companies to produce some of the most valuable contemporary research on cryptography, generating

10 % of all papers and research articles in the information security field published worldwide over the last four years.

Structured into five core research areas, dubbed 'virtual laboratories', the researchers developed improved cryptographic algorithms, ciphers and hash functions, studied cryptographic protocols and implementation methods, and worked on more robust algorithms for digital watermarking.

Among their main achievements are eight new algorithms with the capacity to outperform AES, the Advanced Encryption Standard developed by two Belgian researchers in the 1990s and subsequently adopted by the United States' Government to protect classified information. They also developed a new and improved method for creating cryptographic protocols based on game theory, and created lightweight cryptographic algorithms for use in low-power, low-computing-capacity devices such as smart cards and radio frequency identification (RFID) tags.

Three competitions of the kind that sparked innovation in digital cryptography in the 1970s and 1980s were also organised to find winning applications in the fields of stream ciphers, cryptographic software benchmarking and digital watermarking.

The researchers' work will all but certainly feed into commercial cryptographic applications over the coming years. A block cipher, for example, is due to be used on commercial RFID technology, while another application has been developed by Danish project partner Aarhus University for secure auctions in the agricultural sector.

Many of the researchers are continuing their work in a second project, Ecrypt II, which began in August 2008. Whereas Ecrypt received funding under FP6, the follow-up initiative is being funded under the Seventh Framework Programme (FP7). The new project will deepen research in core areas that were addressed more broadly by the first initiative.

'We know that our studies have been read by banks, businesses and governments around the world, but because we made the information publicly available we don't know how they are using it,' Professor Preneel says. Cryptography has not, therefore, shed its veil of secrecy entirely.



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Lessons learnt from joining ship structures

Aiming to make European shipyards more competitive, the EU-funded Bondship research project has introduced a new process that can reduce the cost of manufacturing and outfitting ships, while increasing their productivity.

Modern ships consist of thousands of assembled subcomponents and discrete structural elements. In addition to these, there are a great number of weld joints in non-structural elements that call for alternative techniques suitable for joining different materials. However, the wider application of non-thermal techniques, such as adhesive bonding, for producing high-quality joints in ship assembly and outfitting faces one major obstacle.

Adhesive bonding has been proven in other industries to offer significant room for improvements in joining metallic structures. Some of its main advantages include the ability to join dissimilar materials, while their properties are influenced to a lesser extent. Nevertheless, before the Bondship project, the medium and long-term performance of adhesively bonded joints had not been reliably evaluated in shipbuilding.

The Bondship project was coordinated by Der Norske Veritas in Norway, an organisation with considerable experience in inspecting and evaluating the technical condition of merchant vessels. In the course of the project, Der Norske Veritas, in collaboration with its partners, investigated each individual step of the adhesive process having an effect on the quality of the finished bond.

Apart from choosing adhesive materials with the required mechanical properties (stiffness and strength), attention was paid to the adhesive application process. The surface condition of materials to be joined was found to have a crucial bearing on the quality of the bonds. In light of this, standard coating systems were tested at the laboratories of Sika Technology AG, Switzerland, for their capability to support enough strength for the chosen adhesives.

Based on the results of lap shear tests and adhesion strength tests, flexible adhesives were qualified to fulfil all design requirements.

With the use of different modelling techniques, the joint design was verified by analysing the response of large structures with adhesively bonded joints and the structural behaviour of joints directly. At the same time, the fatigue behaviour, influencing the long-term mechanical reliability of bonded joints, was evaluated during creep tests.

All the research work conducted during the Bondship project has been documented in comprehensive guidelines to ensure that adhesively bonded joints can be produced consistently.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

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Adhesive bonding for shipbuilding

Shipyards throughout Europe could become more competitive by moving away from welding. The EU-funded Bondship project has demonstrated the new possibilities that adhesive bonding offers for considerable savings in the production of passenger ships and high-speed crafts.

Joining operations are estimated to amount to about 50 % of the building cost of ships. They represent a significant proportion of the man hours worked for the construction of the hull structure consisting of numerous steel parts and the potential rework to adjust heat distortions.

The extended use of adhesive bonding to replace bimetallic joints between aluminium and steel has already gained popularity in other transport sectors. It has increased the flexibility in the build schedule by allowing smaller sections to be constructed separately.

Adhesives were first introduced into shipbuilding for bonding large windows and, in some cases, for partitions dividing the ship

into compartments and raised floors. During the Bondship project, engineers at Alcan Alesa Engineering Ltd, Switzerland, demonstrated the required long-term performance of bonded joints in the large structure of a ship.

Finite element methods provided versatile tools for evaluating the behaviour of bonded joints under both bending and shear loads. The adhesive layer was represented either by means of three-dimensional solid elements described by hyperelastic material models or a substitute system of one-dimensional spring elements.

The global analysis of the connected system of spring elements allowed for the strain and

stress of the bonded joint to be derived from the spring deformations. On the other hand, a more refined analysis of the functionality of the bonded joint was performed by using solid element models to estimate stress and strain gradient.

Both modelling methods had enabled a sufficiently accurate prediction of the overall stiffness behaviour of the bonded structure, which was confirmed by the results of mechanical tests. Besides greater torsional stiffness, it was demonstrated that larger damage tolerances could also be accommodated.

Having achieved the results they were aiming for, the industrial partners of the Bondship project intend to apply adhesive bonding in their daily work.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5019

Robots: the bizarre and the beautiful

The future is a foreign country, and nowhere is more foreign than the designs thrown up by a surge in robotics research. The feverish imagination and creativity of European robot scientists has led to dozens of robot designs — some bizarre, some beautiful, but all are inspired.

In Europe, as in the rest of the world, there is a surge in robotics development, reflected in part by the 'European network of robotic research' (EURON), an EU-funded network of excellence that completed its work in 2008.

Robotic designs can take any shape or form and, given the rich and diverse imagination of European scientists and engineers, they often do. Designers take inspiration anywhere they can, from a bare approach that stems from a desire for raw functionality to learning from the biological diversity of nature.

The robots attached to the EURON network, for instance, reflect every conceivable type, from the bizarre, to the beautiful, to the truly inspired. 'Nature is a rich source of design ideas,' notes Bruno Siciliano, robotics researcher and dissemination officer for EURON. 'Nature has already solved a lot of the problems that robotics researchers encounter, so it is a good place to go for ideas.'

Biomimetics, or mimicking biological systems, is a very popular approach in European robotics and has led to a host of unusual designs. Take, for example, the robot fish developed by researchers in the University of Essex, United Kingdom. It looks like a real carp and is often mistaken for one.

The fish can move 20 inches per second and, at slower speeds, has a battery that will last five hours. The researchers built three fish as an attraction for the London Aquarium, where they have proved a very popular feature.

But ultimately the design could be used for seabed exploration, to study pipelines for leaks, or even be used for intelligence gathering. The fish can avoid obstacles and swim entirely independently. The researchers hope to increase the robot's intelligence, so that it can hook itself up to a power source when it is time for a recharge.

'Sure, it would be possible to design a standard submarine robot to do similar jobs, but by replicating the designs from nature, researchers can use the advantages of that design. In the case of fish, they move through the water easily, without using much energy. As the design of robot fish improves, it will approach that level of efficiency.'

The Anna Konda is a snake-like robot that can also avoid obstacles and put out fires. The robot moves like a snake using hydraulics and is, the designers believe, both the biggest and strongest snake in the world — and the only one powered by hydraulics.

The advantage of the snake is that it can move through small spaces, it is extremely flexible and has a comparatively simple design, though at 3 m long and 70 kg it deserves its moniker as the heaviest of all snakes. It was designed by Sintef in Norway.

Spiders, too, have provided a rich seam of inspiration for researchers. The Fraunhofer Institute for Intelligent Analysis and Information Systems in Sankt Augustin, Germany, has designed three: the Amos, Morpheus and TED.

The systems are designed as experimental platforms for neural perception and networking, an essential element of multilegged systems. But if these problems are solved, they open the prospect of highly mobile, stable robots that can traverse a wide variety of terrains — even stairs — without difficulty.

Robots offer the potential to create new gaming and entertainment platforms, too. One of the most successful commercial robots of all time — Sony's Aibo — was designed primarily for entertainment.

In the games domain, football (table football) has proved a popular choice among researchers. In each case, a robot controls

one side of the game and the human player competes against the robot. It is more than just fun though, because designing an effective robot football player demands very rapid processing and fast reaction motors. It is a profoundly difficult problem but, once solved, it can feed into the wider stream of robotics research.

Education toys like the Robota dolls — a family of mini humanoid robots — can engage in complex interaction with humans, involving speech, vision and body imitation. The Robota dolls have been around since 1997, but new prototypes are in constant development at the École polytechnique fédérale de Lausanne in Switzerland.

Finally, a robot that looks perhaps odder of all, the e-Puck, is a very small, disc-like robot platform designed to allow labs to conduct experiments. And, yes, it looks like a hockey puck. e-Puck contains sound sensors, proximity sensors, a camera, Bluetooth communication and accelerometer — all in a tiny robot with the same volume as a computer mouse. It is an incredibly flexible platform.

There are many other robot designs under investigation in Europe, including a wide range of robotic vehicles, like cars and airplanes. One thing is certain: the ceaseless imagination of engineers and scientists will continue to create bizarre and beautiful robotic entities.

This is the fourth and final part of our special series of features exploring European robotics research.

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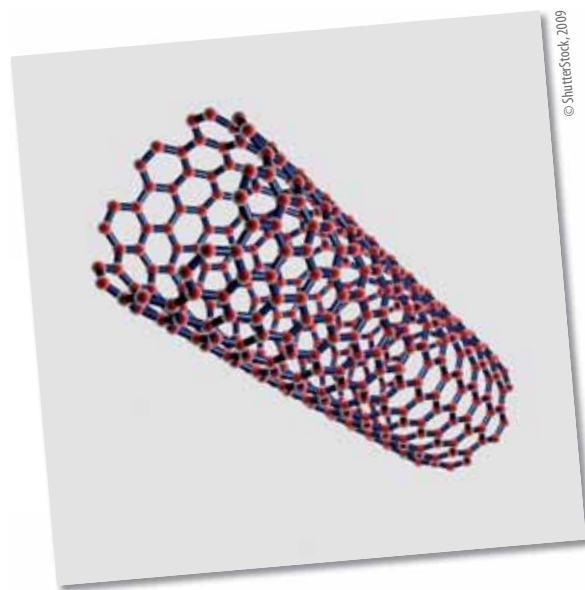
<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90053>



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Nanotubes weigh the atom

How can you weigh a single atom? European researchers have built an exquisite new device that can do just that. It may ultimately allow scientists to study the progress of chemical reactions, molecule by molecule.



Carbon nanotubes are ultra-thin fibres of carbon and a nanotechnologist's dream. They are made from thin sheets of carbon only one atom thick, known as grapheme, rolled into a tube only a few nanometres across. Even the thickest is more than a thousand times thinner than a human hair.

Interest in carbon nanotubes blossomed in the 1990s when they were found to possess impressive characteristics that make them very attractive raw materials for nanotechnology of all kinds. 'They have unique properties,' explains Professor Pertti Hakonen of Helsinki University of Technology in Finland. 'They are about 1 000 times stronger than steel and very good thermal conductors and good electrical conductors.' Professor Hakonen is coordinator of the EU-funded Cardeq project, which is exploiting these intriguing materials to build a device sensitive enough to measure the masses of atoms and molecules.

A carbon nanotube is essentially an extremely thin but stiff piece of string and, like other strings, it can vibrate. As all guitar players know, heavy strings vibrate more slowly than lighter strings, so if a suspended carbon nanotube is allowed to vibrate at its natural frequency, that frequency will fall if atoms or molecules become attached to it.

It sounds simple and the idea is not new. What is new is the delicate sensing system needed to detect the vibration and measure its frequency. Some nanotubes turn out to be semiconductors, depending on how the graphene sheet is wound, and it is these that

offer the solution that Cardeq has developed.

Members of the consortium have taken the approach of building a semiconducting nanotube into a transistor, so that the vibration modulates the current passing through it. 'The suspended nanotube is, at the same time, the vibrating element and the read-out element of the transistor,' Professor Hakonen explains.

'The idea was to run three different detector plans in parallel and then select the best one,' he says. 'Now we are down to two. So we have the single electron transfer concept, which is

more sensitive, and the field effect transistor concept, which is faster.'

In November 2008, Cardeq partners in Barcelona reported that they had sensed the mass of single chromium atoms deposited on a nanotube. But Professor Hakonen says that even smaller atoms, of argon, can now be detected, though the device is not yet stable enough for such sensitivity to be routine. 'When the device is operating well, we can see a single argon atom on short time scales. But then if you measure too long, the noise becomes large.'

Cardeq is not alone in employing carbon nanotubes as mass sensors. Similar work is going on at two centres in California, Berkeley and Caltech, though each has adopted a different method to measuring the mass. All three groups have announced they can perform mass detection on the atomic level

using nanotubes, but CARDEQ researchers provided the most convincing data with a clear shift in the resonance frequency.

But a single atom is nowhere near the limit of what is possible. Professor Hakonen is confident they can push the technology to detect the mass of a single nucleon — a proton or neutron. 'It's a big difference,' he admits, 'but typically the improvements in these devices are jump-like. It's not like developing some well-known device where we have only small improvements from time to time. This is really front-line work and breakthroughs do occur occasionally.'

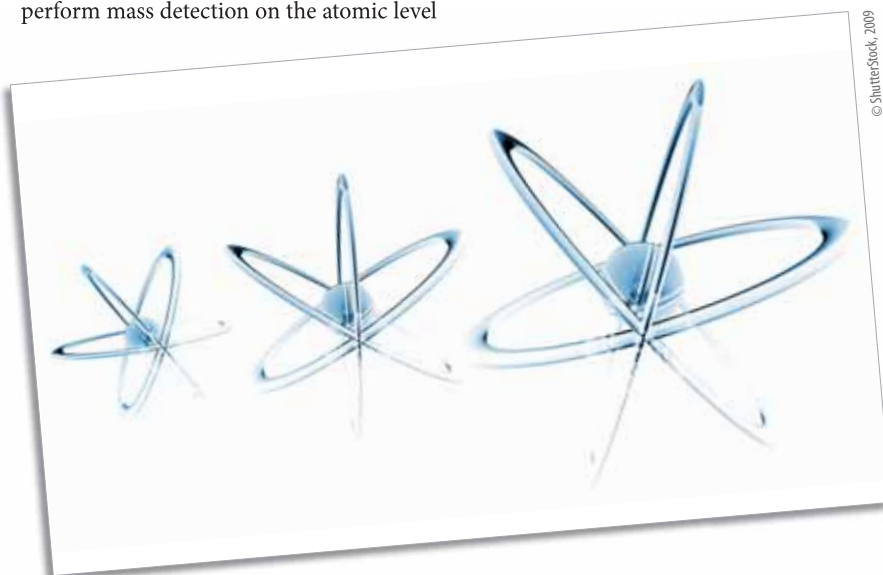
If the resolution can be pared down to a single nucleon, then researchers can look forward to accurately weighing different types of molecules and atoms in real time. It may then become possible to observe the radioactive decay of a single nucleus and to study other types of quantum mechanical phenomena.

But the real excitement would be in tracking chemical and biological reactions involving individual atoms and molecules reacting right there on the vibrating nanotube. That could have applications in molecular biology, allowing scientists to study the basic processes of life in unprecedented detail. Such practical applications are probably 10 years away, Professor Hakonen estimates.

'It will depend very much on how the technology for processing carbon nanotubes develops. I cannot predict what will happen, but I think chemical reactions in various systems, such as proteins and so on, will be the main applications in the future.'

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<http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=90708>



Coated components with less friction and wear

A new coating system has been created, exhibiting high-wear and friction resistance upon contact with automotive steel parts.



Coated components are very frequently used in tribological systems, in which surfaces of two parts are in moving contact with one another — as is the case in the automotive industry. Coatings allow for wear reduction and at times, lighter materials provide technical solutions for conforming to emerging emission laws.

Nanostructured coatings are composed of nanometre-sized grains and are known for their capacity, the unlikely combination of toughness and hardness, while also being lightweight. The Nanocoat project has developed new nanostructured coatings for challenging and extensive mechanical applications, such as gears, as well as for car engine components, such as cylinders and tappets.

More specifically, chromium and carbon-based coatings were created. Compared to steel surfaces, these coatings exhibited significantly better tribological behaviour in both dry and lubricated contact with steel.

A valve train test was conducted, indicating that the target friction reduction of 10 % was surpassed since 24 % friction reduction was achieved. Furthermore, the life span of the tribological system was increased as much as 350 times merely by applying the coating on one part of the tribological system.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4983

State-of-the-art safety assessment of nuclear reactors

A new document from the EU-funded Vocalist project provides insight into the behaviour of the critical components of nuclear reactors. It could help Europe extend the productive lifetime of its ageing population of reactors.

The safety assessment procedure is complicated by the fact that component toughness is often higher in the field than in the laboratory due to the constraint effect. In response, the Euratom programme funded the Vocalist project to develop a constraint-based assessment methodology.

An important deliverable of the project was a handbook defining the state of the art in constraint-based approaches to issues of structural integrity. The Institute for Energy of the European Commission's Joint Research Centre, located in the Netherlands, was responsible for this task.

The initial version of the document included an extensive literature review of all previous research on this topic and identified important gaps in our current understanding of this phenomenon. It was subsequently updated at the end of Vocalist, to incorporate the important advances made during the course of the project.

For example, methods based on two-parameter constraint-based modelling, energy aspects, failure assessment diagrams as well as the master curve and local approach techniques were explained and evaluated. In add-

ition, guidance from the numerous experts involved in Vocalist was also included.

The documentation is of significant value to plant operators, engineers involved in safety assessments as well as other stakeholders in the nuclear power industry.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 4967



Advanced monitoring of nuclear reactor components

Detection of flaws or defects in the piping system of light water nuclear reactors is a key part of the overall safety assessment of nuclear power plants. While operators and regulators have developed effective assessment procedures to address this issue, their reliability needs to be rigorously checked as plants accumulate many years of service.

The EU-funded research project Therfat was initiated to advance the accuracy and reliability of instrumentation and procedures currently applied for assessing the integrity of pipe tee connections. High and frequent temperature fluctuations as a result of mixing hot and cold fluids may cause the

tee-connections' material to degrade and thermal fatigue cracks to appear.

Such cyclic phenomena may not be properly detected by thermocouple instrumentation. Thus, evaluations of tee connections' integrity rely on approximations determined by

experiments and mathematical models. Scientists at the VTT Technical Research Centre of Finland concentrated on verifying selected aspects of the assessment of tee connections against the results from critical experiments and numerical analyses.

Initial stresses induced by thermal loads were estimated by using practical engineering methods, such as approximate calculations of the thermal shock parameters or advanced computational fluid dynamics analysis. Common code procedures were proven to provide accurate predictions of the threshold values for crack

continued on page 45

Memories for future electronic systems

Novel memory cells designed during the EU-funded ATHIS project have opened the way for memory blocks of different sizes and high reliability in an extended range of temperatures to be built with ease.

Locating the electronics of the injection control system on the engine allows the removal of cables which ultimately reduces the overall weight of the engine. Moreover, having control electronics on the engine could enable the stand-alone testing of its operation cycles.

The challenge undertaken by the project partners was to develop electronics that can reliably sustain the harsh environment — especially high temperatures that exceed 200 °C — within the engine. On electronically erasable, programmable read-only memory (Eeprom) electronics, IMMS GmbH in Germany collaborated with X-FAB Semiconductor Foundries AG, an expert in silicon-on-insulator (SOI) technologies.

Eeprom, a non-volatile memory used to store small amounts of data when power supply is removed, has in the past been developed with the use of SOI technology. As a result of dielectric materials not being perfect insulators, however, the increased leakage currents occurring at high temperatures imposed serious data retention problems.

An alternative approach was therefore sought for the Eeprom memory cell. The new device is a bidirectional high-voltage transistor with a separate body contact, which allows it to be connected to the ground while in read or idle mode. At the

same time, the body of the transistor is connected to the transistor source in the opposite direction, preventing charge loss from the floating gate and thereby data loss.

Apart from the development of individual memory cells, the behaviour of peripheral circuits required for building blocks of memory cells was thoroughly evaluated with the use of theoretical models. The first results from measurements on the Eeprom prototype, built according to the optimal layout identified for Eeprom memory cells, encouraged the ATHIS project partners to apply for patent protection.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: information exchange/training.

<http://cordis.europa.eu/marketplace> > search > offers > 5015

Ensuring the stable operation of aircraft engines

A new physical model of evaporation and heat transfer in pure fuel sprays was developed during the EU-funded Muscles project, to determine the necessary conditions for stable combustion for gas turbines.

Combustion instabilities are observed in numerous industrial systems, including direct injection aircraft engines. They are linked to undesirable flame extinction and flashback, as well as vibrations of the engine's mechanical structure, which can even lead to its destruction.

Improved knowledge on heat and mass transfer phenomena within the combustion chamber is therefore of utmost importance for the formation of design methodologies that will minimise such instabilities. Extensive experimental and modelling work conducted within the Muscles project was dedicated to the evaporation of liquid fuel when injected directly into the combustion chamber.

When heated in the combustion chamber, fuel droplets evaporate and finally the fuel vapour burns, delivering the essential energy for propulsion. The challenge was to develop and

validate new theoretical models of fuel evaporation that would take into account the absorption of thermal radiation by the droplets.

Researchers at the Instituto Superior Técnico in Portugal combined different optical techniques to measure the size, temperature and velocity of combusting droplets of liquid fuel under variable heat load conditions. The heat flux exchanged between the fuel droplets and the high-temperature and high-pressure environment within the combustion chamber could then be derived from their overall energy budget.

Taking another step forward in this line of research, detailed knowledge of heat transfer by thermal radiation was used by the Muscles project partners to accurately determine the fuel evaporation rate. Thermal radiation regulates the temperature distribution

and heat flux across the combustion chamber walls, the formation of soot and other products of incomplete combustion.

Although ignored in most of the existing combustion models, the thermal radiation term can lead to significant improvements in their validity. In addition, by estimating the contribution of thermal radiation to fuel evaporation, the Muscles project has strengthened the current understanding of potential sources of combustion instabilities.

Funded under the FP5 programme Growth (Competitive and sustainable growth).

Collaboration sought: further research or development support.

<http://cordis.europa.eu/marketplace> > search > offers > 5010



continued from page 44 'Advanced monitoring of nuclear reactor components'

initiation, which were verified with data from damage tests.

The typical crack caused by a thermal shock occurs as a network of surface cracks. This random crack pattern was not considered to deteriorate the tee connections' integrity, as long as dominant cracks did not develop. For assessing the resistance capability of tee connections to thermal shocks, models that provide

an estimate of the crack growth rate as a function of temperature should be used.

To transfer the results on crack initiation and propagation into improved practical methods for predicting thermal fatigue, a combined experimental and analytical approach was proposed. While focused on identifying the conditions under which thermal fatigue cracks advance or are in arrest, it can support suggestions on how to mitigate significant thermal loads.

This holistic approach for tee connections' integrity evaluation has been defined as the first step towards a new methodology that can be used to optimise nuclear plant operation conditions.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).

Collaboration sought: further research or development support; information exchange/training; available for consultancy; other.

<http://cordis.europa.eu/marketplace> > search > offers > 4940

The following upcoming events were selected from the event diary of the Directorate-General for Research and from the CORDIS event calendar. For further information on past and upcoming events, please visit:

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

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

Training sessions on gender in EU-funded research

A series of one-day training sessions on rendering research gender sensitive will be held over the next few months at different locations across Europe and will run until October 2010.

These sessions are intended for researchers, project managers, national contact points (NCPs), expert evaluators, etc. They will provide practical guidance on how the gender dimension can be integrated in research, using clear examples of how gender is relevant to existing FP7 projects.

The next such event will be held in Bonn, Germany, on 21 October 2009.

For further information, please visit:
<http://www.yellowwindow.be/genderinresearch>

Course on desalination powered by renewable energy

The EU-funded 'Promotion of renewable energy for water production through desalination' (Prodes) project is organising a course dedicated to desalination powered by renewable energy from 19 to 21 October 2009 in Almería, Spain.

The purpose of the course is to provide experts, professionals and postgraduate students with knowledge of the latest technologies which use renewable energies to drive desalination. Individual course topics include:

- design and operation of desalination plants;
- solar ponds;
- humidification and dehumidification technologies;
- high-capacity solar distillation;
- solar stills;
- economic and environmental aspects;
- desalination using solar photovoltaic (PV) energy, wind energy and other renewable energy resources.

Theory lessons will be complemented by hands-on experience through visits and activities at the Plataforma Solar de Almería experimental installations for solar desalination.

For further information, please download the flyer:
http://www.prodes-project.org/fileadmin/Files/Triptico_curso_Prodes_pantalla.pdf

European forum for industrial biotechnology

The 'European forum for industrial biotechnology' (EFIB) 2009 will be held from 20 to 22 October 2009 in Lisbon, Portugal.

EFIB 2009 will feature 50 speakers who will assess the prospects for industrial biotechnology and bio-based products in Europe. Two parallel preconference seminars will be followed by a two-day conference featuring plenary sessions, three afternoon tracks dedicated to feedstock, policy and innovation, as well as an Organisation for Economic Cooperation and Development (OECD) workshop and an exhibition.

This forum is particularly suitable for top-tier management and officials involved with white biotechnology. The following sectors are targeted:

- end users of bioproducts;
- chemicals and plastics companies;
- biotechnology companies;
- research organisations and academics.

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

eChallenges conference

The eChallenges e-2009 conference will take place from 21 to 23 October 2009 in Istanbul, Turkey.

This 19th edition of the event will aim to stimulate the rapid take-up of research and technological development (RTD) results by industry and in particular SMEs. The event will also address opening up the European research area (ERA) to other parts of the world.

The core topics for eChallenges e-2009 are:

- ICT for networked enterprise and radio frequency identification (RFID);
- e-government and e-democracy;
- e-health services to citizens;
- collaborative working environments;
- living labs;
- digital libraries and cultural heritage;
- intelligent content and semantics;
- high-performance computing;
- e-infrastructures;
- networked, smart and virtual organisations;
- mobility;
- security and identity management;
- technology-enhanced learning and ICT skills.

In addition, the EU-funded IDEAL-IST network is organising a preconference brokerage event on 20 October 2009.

For further information, please visit:
<http://www.echallenges.org/e2009>

Conference on sustainable aquaculture and seafood

The 'Acquacoltura Med' conference will be held on 22 and 23 October 2009 in Verona, Italy.

Under the title 'Growing the fish value chain from innovation to market', the event will tackle issues of sustainable aquaculture and seafood production in the Mediterranean.

Population pressures in southern and eastern Mediterranean countries, the need to rationalise exploitation of fish resources and price competition by non-Mediterranean products are just some of the factors that continue to influence modern Mediterranean fish farming.

Topics that will be addressed during the conference include:

- what is Mediterranean fish farming and its future direction;

- the specific identity of Mediterranean fish farming and its unique traits when compared to fish farming in Nordic countries;
- the possibility of combining environmental awareness and increased production trends over the next few years;
- the possibility of sustainable Mediterranean fish farming.

For further information, please visit:
http://fair.veronafiare.it/acquacoltura/home_en.asp

Artemis and ITEA 2 co-summit

The Advanced Research and Technology for Embedded Intelligence and Systems Association (Artemisia) and the 'Pan-European programme for research and development in software for software-intensive systems and services' (ITEA 2) are organising a co-summit on 30 October 2009 in Madrid, Spain.

The one-day programme will revolve around the theme 'Ecosystems driving open innovation in embedded intelligence and software-intensive systems and services'. In the afternoon, there will be parallel sessions for participants on different topics linking the theme to concrete ICT-based approaches and examples.

Both Artemis and ITEA 2 will hold separate meetings on 29 October 2009 before the co-summit.

For further information, please visit:
 ITEA 2 symposium: <http://symposium2009.itea2.org>
 Artemis autumn event: https://www.artemisia-association.org/autumn_event_2009

Workshop on avionics data, control and software systems

The European Space Agency (ESA) will hold a workshop on 'Avionics data, control and software systems' (ADCSS) from 3 to 5 November 2009 in Noordwijk, the Netherlands.

The event will cover relevant avionics topics in the form of round tables, and will provide a forum for position papers and interaction between the organisers and the participants. Sessions will cover:

- space avionics open-interface architecture;
- microprocessors for space applications;
- formal methods in software engineering;
- the 'Near Earth object micro explorer' (Neomex).

The conclusions of the workshop will be used as a basis for future initiatives in ESA's

technology research and development plans in this domain.

For further information, please visit:
<http://www.congrex.nl/09C21>

Conference on patent information

The 'Patent information conference 2009' will take place from 3 to 5 November 2009 in Biarritz, France.

The event, organised by the European Patent Office (EPO) in cooperation with the French patent office (INPI), will be composed of plenary, discussion and training sessions, revolving around issues related to patenting.

More specifically, sessions will be dedicated to some of the following issues:

- 'Quality at the front end — a burden or a duty for applicants and the EPO?'
- 'What is the EPO's role in patent mapping and visualisation?'
- 'What is the best way forward for the EPO's online patent information products?'
- 'How can we move from patent information to patent intelligence?'
- 'How will access to traditional knowledge influence the outcome of patent searches?'
- 'Patent registers in Europe — how can we improve interoperability?'

For further information, please visit:
<http://www.epo.org/about-us/events/pi-conference.html>

Russian national information day on biotechnology, health, nanotechnology

The Russian national contact points (NCPs) for biotechnology, health, nanotechnology and SMEs will hold an information day on biotechnology, health and nanotechnology research under the FP7 on 11 November 2009 in Moscow, Russia.

During the event, the main issues relevant to Russian participation in those FP7 research themes will be discussed. Participants will be able to learn about principal rules, proposal preparation and proposal evaluation. Consulting and training materials will also be provided.

The working languages of the information day will be Russian and English.

For further information, please visit:
http://fp7-bio.ru/en/detail.php?ELEMENT_ID=50

Conference on new challenges in food preservation

The European Federation of Food Science and Technology (Effost) and the EU-funded project PathogenCombat are organising a conference on new challenges in food preservation from 11 to 13 November 2009 in Budapest, Hungary.

As with previous Effost events, the programme will be comprised of lectures by invited experts, supplemented by extensive poster sessions.

Topics include:

- processing (emerging technologies, improved traditional processes, challenges in process control);
- safety (emerging pathogens, challenges in risk assessment, hygienic design and processing, water safety and security);
- sustainability (sustainable processes, sustainable products).

A parallel workshop will take place on the day before the conference. This event will give insights into the latest findings and future activities of several large-scale food projects funded under FP6 and FP7.

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

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