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A meeting of minds

Great minds may not always think alike, but there can be little doubt that they benefit from interaction. The thriving activity on the Technology Marketplace (TMP) bears testimony to the power of collaborative research, where highly trained experts in their individual fields cooperate to create new knowledge and put it to the best possible use.

The ability to learn is central to this process; thus it comes as no surprise that it is the subject of intense research in itself. This month's selection from the latest coverage on the TMP and on the ICT Results service includes research results from several projects exploring the intricacies of learning. The Cospal project, for example, is combining artificial intelligence techniques and artificial neural network approaches to create an autonomous cognitive system. The Cospal robot can explore its environment, learn from the experience and solve increasingly complex tasks — without additional programming. How? Find out more from the lead article in the IT and telecommunications section.

The Mirror project, featured in the biology and medicine section, focused on the way in which we refine previously acquired motor skills through the observation of others, and more particularly on the activation of the mirror neuron system supporting this process. Magnetic resonance imaging was used to observe the neural activity in areas of the brain associated with sensory guidance, muscle control and coordination as individuals with highly developed motor skills watched video footage of familiar and unfamiliar sports. The greatest responses were found when experts in a particular discipline watched moves building on their existing motor repertoire, while their brain activity was much lower as they discovered a different style. These results would tend to indicate that the brain integrates observed motor behaviour with its own picture of the action.

There is always more to learn. Other highlights in this issue include an extensive survey of Europe's biomass power plants which provides valuable insights into their environmental performance, in the energy section. The environment chapter presents a range of reports analysing the state and sustainability of urban water systems. The industrial technologies section showcases new technologies for laser fabrication.

We look forward to your feedback on this issue, on the TMP and on the research*eu *publications in general. E-mails will reach us at: research-eu-supplements@publications.europa.eu*

The editorial team

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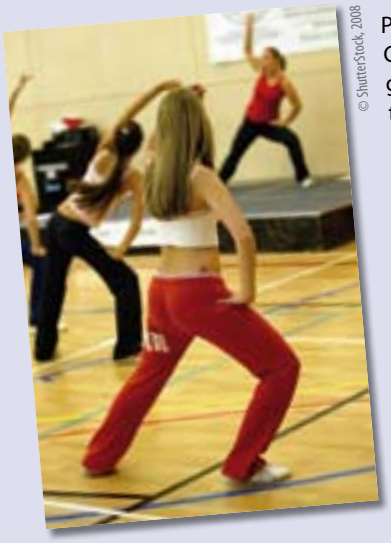
Mirror images in the brain refine motor skills

According to recent research, the brain learns and refines motor skills with the help of the mirror neuron system. European scientists have investigated how this system is activated in people who are expert in a particular motor activity.

It is very obvious that some people are better at learning motor skills than others, such as learning the steps of a dance. Researchers have discovered there may well be a scientific explanation for this. Partners in the Mirror project have studied the recently discovered system bearing the same name. A mirror neuron is one that is activated when an animal acts and when it observes the same action performed by another. Interestingly, in primates, this has proved to be true especially when the same type of animal is involved.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Project partners at University College London studied two groups of people to help unravel the process by which we learn actions from others. The experimental group were all experts in one of two fields — classical ballet and capoeira. Capoeira is an Afro-Brazilian martial art that also involves dance routines. Needless to say, both pursuits demand a high level of discipline to perform actions that are clearly defined and must be copied exactly by the practitioner. The control group consisted of non-experts in either activity.

In order to supply a picture of the brain activity of the subjects, magnetic resonance imaging (MRI) was used while showing the subjects videos of the two sports. The neural activity in four areas of the brain including the premotor cortex and the interparietal sulcus was recorded. All the chosen regions are involved in sensory guidance, muscle control or coordination, to one degree or another.

The team found that the greatest responses in the specified areas of the brain occurred when an expert watched moves they had been trained to do. When the experts watched the other style, brain activity was lower. The brain therefore appears to integrate observed motor behaviour and combine it with its own 'picture' of the action. Putting it simplistically, the brain appears to understand actions by motor simulation.

Further research on the basis of these results could have important applications in the fields of copied behaviour and learning of motor skills. Examples could include understanding the world of the autistic child and the rehabilitation of stroke patients.

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 > 3853

See also pages 27 (Robotic minds think alike?), 32 (offers 3879 and 3859) and 34 (offer 3939)

Violence tracked in mental health care settings

Violence in the form of physical and verbal attacks is an ongoing problem in the hospital- and community-based mental health workforce. Partners in the OSCAR project have devised means whereby these incidents can be recorded and therefore subject to analysis.

Care of the mentally ill client is a demanding and sometimes stressful occupation where the dedication and commitment of the staff are frequently tested. This can then cause illness, absenteeism and ultimate burnout with consequent premature retirement. The OSCAR project aimed to evaluate occupational stress and develop relevant training packages to help staff deal with problems encountered.

Partners in the Mental Health and Social Work Academic group at Middlesex University researched into one of the main reasons for work burnout in this profession — violent and aggressive behaviour. The team based their study on the definition of violence set out in the international violence and aggression form (IVAF): 'Any incident where staff are abused, threatened or assaulted in circumstances related to their work, involving an explicit or implicit challenge to their safety, well-being or health.'

Forms were used to collate comprehensive information on all types of violence inflicted in the workplace. Violence can take the form of physical threats and verbal abuse including sexual and racial harassment. The witnessing of an act of physical aggression, of the destruction of property or of violence between patients was also reported.

There were three types of forms according to the nature of the incident — verbal, physical and a third to record the consequences of violence. To ensure accuracy of reporting and security, the forms were completed within the same day of the act and secured prior to weekly collection. In total, almost 300 forms regarding the outcomes of some 400 violent incidents were collected.

The reduction of stress within the European health care workforce is obviously of prime importance. A training programme was devised on methods to prevent aggression, a supplement for previous training on how to deal with it. Studies of this nature will no doubt continue to form the basis for the reduction of stress and improvement of working conditions for staff in the mental health services.

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 > 3908

Frequent acronyms

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

Improved mapping for dairy cattle genome

Researchers within the Bovmas project have validated methods for chromosome mapping and selection of improved milk production traits within four resource herds of dairy cattle.

The EU is one of the three biggest exporters of dairy products in the world. Coupled with the fact that demand for these commodities worldwide is high, dairy farming is a very important industry. In a bid to improve data for dairy breeding programmes, Bovmas project partners proposed to map quantitative trait loci (QTLs) in breeds of cattle common in Europe. These included the dual-purpose Simmental, the Holstein, and the Brown Swiss.

The team at the Ludwig-Maximilians University of Munich searched for QTLs that were identical by descent (IBD). That is, they had originated from the same allele in previous generations. Firstly, they looked at chromosomal haplotypes in six designated regions within the Holstein herd. Haplotypes are a combination of alleles at multiple linked loci that are transmitted together. Promising results indicated that there are more IBD genes to be found within these areas.

Analysis of linkage disequilibrium (LD) on chromosome 13 within all four herds was the next technique utilised by the scientists. The LD phenomenon occurs when there is non-random association of alleles at two or more sites in the genome. Marker selection by LD appeared to be an effective means of selection.

Thirdly, the team developed an efficient protocol to implement the co-segregant pool (alleles segregating together) analysis for determining sire, or bull, haplotypes. Haplotype identification of individual dairy sires is an essential prerequisite for the interval mapping method. It can also be used for tracing identified QTLs in pedigrees for marker-assisted selection (MAS). The researchers found that co-segregant pools can serve as an efficient means for haplotype identification.

The results of this study have yielded statistically proven methods for MAS for milk production traits in dairy and dual-purpose cattle. Broad dissemination of the results could well mean that the protocols developed here will be incorporated in commercial breeding programmes to increase milk yield from dairy herds.

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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Linking genes to function

Deciphering the function of genes is often more time-consuming than shedding light on the actual genetic sequence.

Understanding 'what a gene does' essentially requires a series of functional genomics studies, which aim to link function to gene products. In terms of human genetics, these studies are made possible through the use of model organisms such as *Drosophila*, the common fruit fly.

The EU-funded FlySNP project set out to construct a genome-wide map of single nucleotide polymorphisms (SNPs) in the *Drosophila* genome, to aid the mapping of mutations. Mutation maps lead to the understanding of gene function through examination of the mutant phenotype.

The Institute of Molecular Biotechnology of the Austrian Academy of Sciences, a project partner, focused on the creation of chromosomes carrying specific genetic inserts, designated enhancer-promoters (EPs). These EP elements were used for the study and mapping of specific mutations in the *Drosophila* populations. The success of the dual EP insertions was verified using a polymerase chain reaction (PCR) technique.

Also, phenotypic differences (eye colour change) were used as the distinguishing feature of adult specimens carrying one or two insertions.

The creation of these cell lines aided the functional genomic study of *Drosophila*, and the lines are available for further studies.

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

Collaboration sought: information exchange/training.

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Sequence maps for bovine genes

Mastitis can have devastating animal health and economic consequences. Developing methods to protect farm animals is therefore of paramount importance for the European agriculture industry.

The EU-funded 'Mastitis resistance' project focused on breeding mastitis-resistant cattle, thus improving the overall health status of the herd. However, doing so based solely on phenotypic traits poses severe challenges, and project partners therefore opted for marker-assisted selection (MAS).

In other words, the selection of disease-resistant animals was based on genetic rather than phenotypic criteria. The approach was also aimed at further elucidating the aetiology of mastitis in relation to the pathogenic agent. The Roslin Institute, a project partner, constructed a series of radiation hybrid maps of specific bovine chromosomes, BTA9 and BTA11. Radiation hybrid maps are used to pinpoint the location of genetic markers on the gene sequence.

Researchers combined the results of the radiation hybrid maps with a series of contig maps, aimed at providing a more accurate overall genetic sequence for the two chromosomes. The end result was a detailed and precise sequencing map of BTA9 and BTA11 for the characterisation of quantitative trait loci linked to mastitis resistance.

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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Genetics of sheep milkability

Despite an abundant supply of sheep milk in Europe, the associated dairy industry remains as yet largely undeveloped. A study into the genetics of milk production in a Sardinian sheep population may change this situation.

Sheep milk can, without doubt, be utilised as a nutritional food. More acceptable to the human digestive system, sheep milk is not as strong as goat's milk, and its flavour may be more suitable for children. Despite abundant supply, this resource is only beginning to be tapped. Possible products include powders, cheese (France's Roquefort and traditional Greek feta being two good examples) and related protein supplements.

The aptly named GeneSheepSafety project conducted research into the safety and quality of sheep products. The emphasis was placed on the use of breeding programmes to achieve its aims. In the quest for high milk yield, the research team at the Istituto Zootecnico e Caseario per la Sardegna in Italy endeavoured to identify quantitative loci (QTLs) involved in two traits. These were udder morphology and milk emission during machine milking.

In order to study udder morphology, basic udder traits such as teat placement were scored on a linear basis and digital photographs were also used to make objective measurements. For milk emission, a measuring device for milk flow was fitted on the machine. The results showed that moment of maximum milk flow (MMF) and latency time (LT) were the most pertinent factors for measuring milking speed.

Using data collected over three years that was adjusted for environmental effects, detection of QTLs using QTLmap software was performed. Notably, the team adopted a novel approach regarding the investigation of correlated traits. Overall, over 50 significant locations throughout the sheep genome for udder morphology were detected. The importance of various traits important for milking was taken into account. For example, cistern height, or the height of the reservoir where the milk is stored, is crucial in order to obtain all the milk available.

These results represent the first step in the genetic analysis of the milkability of dairy ewes. Development of breeding programmes based on these studies could be instrumental in the reduction of chemical inputs against bacteria that cause mastitis. This represents an important contribution in the drive towards improved health for sheep and quality of their products.

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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Microsatellite marker set for Blackface sheep

The sheep industry is economically important in many otherwise unusable mountainous grassland areas in Europe. A list of genetic markers has been compiled for Blackface sheep so that important traits can be incorporated into future gene selection schemes.

For grassland areas of Europe, sheep farming can form the basis of the local economy. The sheep milk industry is expanding; it offers undeveloped potential and there is a strong market for the meat. From an ecological point of view, grazing by sheep represents a means by which the ecophysiology of the sward can be maintained. In this way, the ecosystem will not progress into a succession where the characteristic plants and animals may be lost.

Members of the GeneSheepSafety project performed research with genomics as a means by which the quality and safety of sheep products can be improved. Traits such as milk and meat yield and quality as well as disease resistance are important factors for selective breeding systems. Improved breeding programmes and fitter sheep mean that there is less need for input of pesticide chemicals into the food chain.

Workers at the Roslin Institute in Scotland investigated the occurrence of useful genetic markers in Blackface sheep. This breed is well adapted to survival in upland areas as their fleece protects them from the harshest of weather all too evident in these microclimates. Commercially, their wool is a speciality in the industry and their meat is of high quality.

The team produced a list of microsatellite markers that could be used to identify useful quantitative trait loci in this and other similar projects. Microsatellite DNA consists of short repeating units that are usually genetically neutral. As such, these are ideal for use as markers. For each sire (or breeding ram), up to 30 markers were tested per chromosome for a resulting panel or set. Because of the technique used, the panels of markers were individual for each sire.

The next step was to genotype all progeny and grandparents for the markers of the sires to ensure that those selected were informative and useful. Cost efficiency is important in studies of this type because of the sheer number of genes in a genome and the lengthy procedures used.

The set of markers produced was used in the institute's sheep population and can continue to be used in other commercial herds for verification purposes. In line with the aims of the project, there is full accessibility to the information for any interested party involved in the improvement of health and product quality in sheep. Cooperation amongst breeders across Europe and worldwide can promote this expanding and important industry.

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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Higher rewards for greater efforts in nursing

The NEXT project has conducted an analysis of the consequences of high efforts and insufficient rewards in the nursing profession.

A popular worldwide stress model known as the effort-reward imbalance model examines adverse health effects of high-effort, low-reward conditions in the workplace. According to this model, a low reciprocity between efforts and rewards in such a fundamental societal environment as the workplace can lead to a state of emotional distress. Consequently, it may also result in adverse health conditions.

These are major issues involving the nursing profession which has high emotional, physical and quantitative demands. Reward can take the form of pay, recognition, respect and public image as well as opportunities for career development and job security.

Under these auspices, the NEXT project examined the degree of perceived effort and reward in various health care settings using data from 24 328 nurses from 7 countries. More specifically, it analysed the effect that effort-reward imbalance has on the nurses in relation to physical and psychological health and the intention to exit the nursing profession.

Many important findings were derived. For example, the effort-reward imbalance is tied to an increased risk of poor physical and psychological health in nurses. Additionally, distress in nursing is not only a consequence of more intense demanding work but also of a lack of reward. Although the differences varied greatly among countries, it is clear that rewards in nursing need to be in the forms of esteem and status control as well as financial reward. Such approaches would be highly likely to improve the retention rate for nursing staff and bolster their work commitment.

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

Collaboration sought: information exchange/training.

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Impact of different age groups in the nursing sector

The NEXT project has examined the demographic change in Europe which is causing challenges and problems for the nursing profession.

There is a shortage of nursing labour in many European countries which is likely to increase. Current working conditions do not foster healthy ageing at work, and most nurses leave the profession before normal retirement age. As a result, the nursing profession is faced with a lack of nurses. However, data from the NEXT project reveals that in situations where there are limited job alternatives, nurses have to remain in their profession. Consequently, the nursing profession is ageing.

There is a prejudice against older workers among employers as well as within the general public. This is also applicable to nursing in terms of prejudices regarding physical capacity, reduced flexibility and sick leave. Since nursing is a profession with great physical, emotional and psychological demands, the question remaining is whether or not nursing is possible at an older age.

In an attempt to answer this question, an assessment was conducted in 10 countries. It considered registered nurses aged 50 years or over working in hospitals. The proportion of older nurses working in hospitals varied greatly, with the highest in Finland and Norway and the lowest in Belgium and Portugal. Some of the many interesting findings were that older nurses and younger nurses worked the same amount of hours per week, and that the groups did not vary in regard to absence from work because of illness or family obligations.

In terms of differences, the findings showed that older nurses tend to report better working conditions and comprise a positive selection of healthy and high-performance individuals. Therefore successful integration of older nurses in the nursing workforce is possible and beneficial. These findings may convince more health care institutions to acknowledge that older nurses can often be a resource with better expertise, more commitment and better psychological health, and encourage them to prevent age discrimination and promote mutual support among nurses.

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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Real-time detection and analysis of micro-emboli

The UMEDS project work has resulted in an automated embolus detection system that allows inexpensive online analysis of detected micro-embolic signals (MESs).

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Stroke is considered as one of the most rapidly increasing diseases in the western world. Due to its complexity, it may be difficult to diagnose. Motivated by this, the UMEDS project focused on a new non-invasive means for improved monitoring and early diagnosis of stroke. Taking advantage of recent advancements in microbubble technology and ultrasonographic harmonic imaging, novel ultrasound techniques for both qualitative and quantitative evaluation of brain perfusion were developed.

Key innovations included advanced ultrasound technology, new approaches to brain perfusion imaging, and novel microbubble technology for molecular imaging and thrombolysis. One of the key technologies that were developed was an automated system for detection of micro-emboli. Conventional methods for detection of micro-emboli in the cerebral circulation are based on transcranial Doppler (TCD) ultrasound information. The derived information undergoes further processing for detection and analysis of MESs, which is a costly, time-consuming and resource-intensive procedure.

To fulfil this need, UMEDS designed a knowledge-based system for automated

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Identifying links between bowel disease and pregnancy


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A study was conducted on the pregnancy outcome of inflammatory bowel disease (IBD) patients in Europe.

The IBDT2K project focused on health care in the field of gastroenterology in terms of long-term disease outcome across Europe. The study serves as an example to the medical and paramedical community as it indicates that regular updating is required for all chronic non-fatal conditions such as IBD.

IBD is known to affect patients during their fertile years. Therefore, the study focused on investigating the pregnancy outcome of a group of IBD patients and examining if pregnancy can affect disease course and phenotype.

A 10-year follow-up study was conducted by assessing patient files and giving the patients a questionnaire. Of the 1 125 patients, 543 were women. The basis of the latest findings consisted of data from 173 female ulcerative colitis patients and 93 Crohn's disease patients.

In all, 580 pregnancies were reported, 403 of which occurred before IBD was diagnosed, and 177 after diagnosis. The spontaneous abortion rate went up after IBD was diagnosed; however, there was no significant difference in the elective abortion rate. Overall the conclusions showed that pregnancy did not influence disease phenotype or surgery rates. It was, however, connected with fewer flare-ups in the years that followed.

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

Collaboration sought: information exchange/training.

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Crohn's diagnosis reflects recurrence rates

Chronic non-fatal diseases pose unique challenges for health care regimes. Scientists from a European project have collected information on Crohn's disease with the aim of maximising the efficacy of planning, treatment and counselling.

Compiling data on non-fatal diseases has often been neglected because of the complexity of measuring disability in populations. As with all chronic diseases, symptoms vary widely in their nature and frequency. Furthermore, some people have long periods of remission where they are free of symptoms.

Crohn's disease is one such condition. Overall, it causes inflammation of the digestive system, but pathology of the disease varies widely. It can affect any part of the tract from the mouth, but most commonly the ileum. While the symptoms may not always be present, they include diarrhoea, abdominal and joint pain, and fever. The disease can present itself at any age, and children with the disease may have growth problems.

The IBDT2K project aimed to study the evolution of the disease across Europe in respect to differences due to environment, therapy and social factors. The team at the Department of Gastroenterology of Maastricht University Hospital in the Netherlands focused their research on the effect of phenotype (the observed physical traits) at diagnosis on recurrence rates.

Some 350 patients were classified for phenotype according to the Vienna classification and analysed post diagnosis. This categorisation of symptoms had previously been determined at the world congress of gastroenterology held in Vienna in 1998. The scientists found that the highest frequency of recurrence occurred when the patient was first diagnosed with upper gastrointestinal disease.

Chronic diseases such as inflammatory bowel disease require an input of counselling and planning to maximise the level of health care. The epidemiology of Crohn's disease, as collated by this project, can aid the management of health provisions and may well contribute to preventative measures. Moreover, the experience gained can be extended to other chronic ailments.

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

Collaboration sought: information exchange/training.

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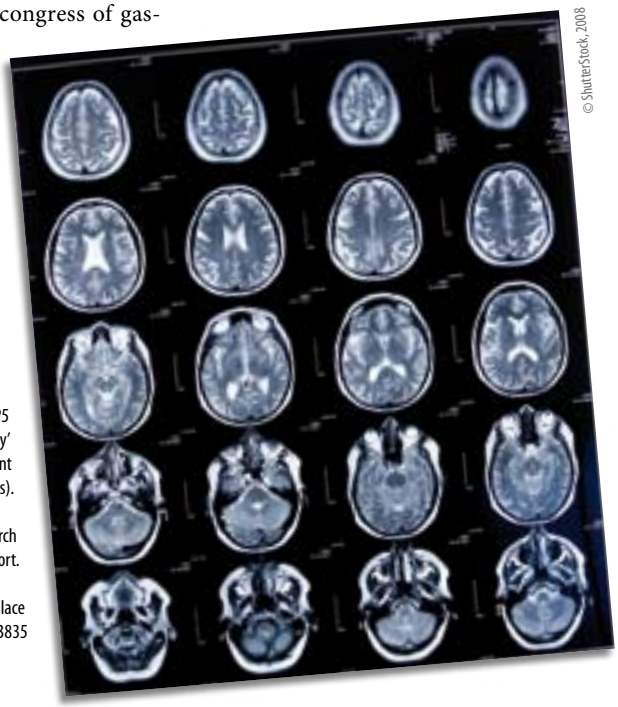
continued from page 8 **'Real-time detection and analysis of micro-emboli'**

identification and archival of MESs in real time. It includes a PC and a powerful digital signal processing (DSP) board that provides fast Fourier transform (FFT) spectral analysis and MES detection. Information extracts from the input Doppler signals concerning time, frequency and neighbourhood domains are further processed with the aid of expert system reasoning theory. Archiving includes data files with each detected event, the respective segments of the raw Doppler signal and all relevant information.

The technology has already been tested using Doppler signals derived from carotid endarterectomy patients and healthy volunteers. It was found extremely sensitive and highly specific in the detection and analysis of micro-emboli.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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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Endocrine response to pollution

Understanding the mechanisms behind the effects of pollutants on all affected species, including humans, is a crucial first step towards the development of protective methodologies.

The EU-funded Easyring project sought to improve the current understanding of pollutant levels in their environment as well as their effects on a variety of species. Affected species include aquatic and land organisms and also humans. Part of the aim were the study of the endocrine effects at different doses and the development of appropriate models that can predict overall toxicity.

The University of Bergen, a project partner, concentrated on the identification of new biomarkers suitable for monitoring pollutant-induced endocrine disruption in amphibians and fish. Four model compounds were chosen: ethynylestradiol (EE2), tamoxifen (TAM), methyldihydrotestosterone (MDHT) and flutamide (FLU). Carp and the African clawed frog (*Xenopus laevis*) were the species used for the series of studies that were conducted.

In carp, three proteins were isolated as potential biomarker candidates. Based on this group of proteins, a total of six polyclonal antibodies were raised for further validation tests. In the African clawed frog, specific protein response was studied following exposure to the test compounds. The oestrogen-regulated protein Ep45 was found to be a new candidate biomarker protein for oestrogenic exposure to *Xenopus*.

Further tests and studies are required in this area in order to understand the implication of oestrogen disruptors in pathologies and the wider role of pollutants.

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

Collaboration sought: information exchange/training.

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Scientists model MAP transmission

Economic losses within the European agricultural community from the ruminant disease MAP can be reduced by the improvement of sustainable control measures. Scientists from an EU-funded project have incorporated the results of their studies to produce realistic models to aid this process.

Mycobacterium avium subspecies *paratuberculosis* (MAP) is a chronic bacterial infection of the intestine. Symptoms are diarrhoea, weight loss and possible loss of life in domestic ruminants and some wild animals, notably the rabbit. This is obviously a serious situation as regards farm animals susceptible to the disease, including cattle, sheep and goats. Worryingly, the infection begins in young animals, but does not always manifest itself until they become adult. The disease is readily passed on through contaminated faeces and milk.

'Para-TB transmission', an EU-funded project, aimed to study the epidemiology of the disease. All available research results were then used as data to model the progression of the disease in domestic and wild hosts. Project partners at the University of Thessaly in Greece used the models to assess the potential impact of control practices in different production systems ranging from dairy farming to bull production.

Using variable parameters over a 30-year period, the expected results within herd prevalence were predicted. Analysis of the models showed no impact if the only means of control involved wildlife infection. However, reduction of the average time between signs of infection and culling had a significant effect on disease prevalence.

The pathology of the disease and its transmission via faeces imply that appropriate modifications in husbandry could limit MAP levels. The risk profile of a production system could be improved by implementing better neonatal management and hygiene. Wildlife transmission was also investigated and, from ecological studies and modelling, it would appear that the systems most under threat are those where grazing resources and feed stuff are exposed to wild rodents.

It seems therefore that the main instruments of control for MAP are routine testing, culling infected animals, improved hygiene and targeting wildlife to herd transmission wherever possible. Dissemination of these results to veterinarians and government agricultural bodies has led to their incorporation in national control programmes across Europe.

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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Monitoring paratuberculosis in the wild

Paratuberculosis can have a negative impact on livestock as well as on the livelihoods of European farmers. Understanding the role of all environmental factors on the epidemiology of the disease is key in developing novel protective methodologies.

The EU-funded 'Para-TB transmission' project focused on gaining a greater understanding of the role of wildlife species in the transmission and spread of paratuberculosis in domestic ruminants. The disease is caused by the infectious agent *Mycobacterium avium paratuberculosis* (MAP) which has been detected in a number of non-ruminant species.

It is therefore imperative to identify which species harbour the disease in order to develop ways to protect domestic animals. The Scottish Agricultural College, a project partner, studied the pathogen distribution among rabbit populations in the wild. Scotland is considered as a pathogen cluster for MAP in rabbits, containing a number of regional hotspots. The studies aimed to determine environmental patterns of infection and overall risk of interspecies transmission to livestock.

Scientists determined that regional as well as seasonal variations can be observed, with peak infections detected in spring and the lowest numbers noted during the summer season. The highly clustered distribution of rabbits in the wild can explain the clustering of pathogen-carrying rabbits in the environment.

Understanding the risks of interspecies transmission is very much dependent on gaining a clear understanding of how MAP behaves within species. Therefore studies of this nature could pave the way for a complete and comprehensive tool to minimise and even prevent MAP infection from wildlife species to domestic ruminants.

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 > 3891

Starving nematodes from infection

Inducing 'natural' resistance to plant parasites like nematodes is the key to reducing the use of environmentally harmful pesticides.

Genetic engineering can ensure that plants like potatoes and tomatoes carry the genetic 'armour' that is necessary to fight off nematode infection at many levels. The EU-funded Nonema project aimed to generate tomato and potato plants with durable resistance against root knot and cyst nematodes.

One of the key steps in engineering the genetic apparatus required for such resistance is the in-depth understanding of the host-parasite interaction from the onset all the way to infection outbreak. Project partner Universidad de Castilla-La Mancha concentrated on the gene expression mechanism induced by the presence of root-knot nematode parasites.

It was shown that nematodes can directly induce expression of certain genes in giant cells, which are generated in the plants they parasitise. The interaction between nematodes and the genetic material is thought to be facilitated through specific promoter regions, the heat shock elements (HSEs). Mutation studies indicated that the heat-shock transcription factors (HSFs) help to control the parasite-HSE mediated gene expression.

This finding is important given that this sequence of events leads to giant cell expression, the main source of nutrition of nematodes. Finding ways to cut off nutrient supplies could therefore be a way to effectively halt infection before it even begins.

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 > 3828

See also pages 14 (offer 3873), 15 (offer 3852), 16 (offer 3910) and 22 (offer 3906)

Combined QSAR model predicts toxicity in quail

A fully predictive quantitative structure activity relationship (QSAR) model for pesticides has been produced by combining two individual QSAR models. These models have used a training set of 96 pesticides, whose toxicity values were obtained from the most trustworthy pesticide databases.

The objectives of the Demetra project were to develop software for predicting the toxicity of pesticides and related compounds. This work has involved ecotoxicologists and end-users from government and industry. Suitable data sets have been defined with regard to pesticides and their toxicity values in five organisms.

A combined QSAR model was used to predict acute oral toxicity for the bobwhite quail. The model has been achieved using the rule-based approach, which is a non-continuous function that combines different individual models. The basic idea was that different models can be more or less powerful in one or another aspect. This has been improved by combining the positive performances of individual models.

A number of databases (EPA-OPP, primarily, and BBA) were used as sources for toxicological data. Only high-quality data has been used and compared between databases, as an additional check. A procedure has been drawn up for identifying single toxicity that can be reproduced when multiple values are available. A cautionary approach was taken, employing the lowest value, which is the option taken by the EU.

The potential users for the results include those providing databases used for the project. One possible use includes acting as an external audit of the results. This would enable them to provide more accurate information. The data, which has been systematically collected and stored, is also of use to industry and regulators. It can provide a rapid and easily accessible source of data. The use of this free model is cheaper than performing animal experiments, reducing the time spent in assessing the environmental risk of new pesticides/chemicals. A third group of potential users are academic researchers working on models, where reliable data is of the utmost importance.

The model has assisted research into new pesticides by enabling the evaluation of environmental risks in a prognostic way making it unnecessary to perform syntheses of the compound. This has allowed industry to deal with a larger number of chemical candidates for marketable pesticides.

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 > 3911

Modelling microsporidia epidemics in bumblebees

The Swiss Federal Institute of Technology Zurich created an epidemiological model to simulate the infiltration and spread of microsporidia parasites in bumblebee colonies.

Bumblebees are industrious pollinators, and for that reason they are invaluable to commercial agriculture. Like other insects and animals, they are susceptible to attacks from parasites such as microsporidia. Evidence exists of bumblebee infection by the microsporidium *Nosema bombi*, but detailed knowledge is lacking.

The 'Pollinator parasites' project sought to shed light on the subject through an intense three-year research programme. The work included the development of an epidemiological model by the Swiss Federal Institute of Technology Zurich.

The model was constructed based on current knowledge of transmission pathways, infection rates and mortality rates for both the bumblebees and *Nosema bombi*. All stages and types of bumblebees were addressed, including larvae, pupae, workers, young queens and males. Attacks from spores can originate both within and outside the colony.

Working with the model allowed the institute to investigate how one infected queen can compromise not just her own colony, but neighbouring colonies as well. Alarmingly, such catastrophic results can transpire within a single growing season. The model can also trace the consequences of the epidemic through subsequent seasons.

While significant progress was made during 'Pollinator parasites', the institute and its partners plan to devote additional time and effort to enhancing the model. The goal is to be able to provide recommendations to reduce the risk of microsporidia infection and thus protect bumblebee populations.

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 > 3854

Using science to aid the elderly

For many elderly citizens, motor difficulties are the key deciding factor leading to loss of functional independence. Improving the prospects of the elderly in this area is a crucial aspect of European health policy.

The EU-funded Better-ageing project investigated a variety of aspects leading to and surrounding frailty in the aged population. Efforts included research into actual muscle make-up and response as well as the effects of physical training regimes across EU Member States.

The overall aim was to improve the quality of life of elderly people and to limit the loss of independence attributed to motor difficulties. The University of Milan, a project partner, concentrated on the levels of oxidative metabolism in ageing muscle. Specifically, researchers evaluated how the manifestations of ageing, at the cardiopulmonary and the skeletal muscle level, could or did affect oxidative metabolism in muscle cells.

Results showed phenotypic changes in the ageing muscle as well as a significant decline of peak maximal aerobic power, when compared to young subjects. Elderly participants in the study took part in a one-year aerobic exercise to study the effects of exercise on muscle oxidative metabolism.

Overall, researchers showed that ageing muscle is characterised by a significant limitation of oxidative metabolism. However, there was significant oxidative potential in the ageing muscle and the effects of training were indeed positive.

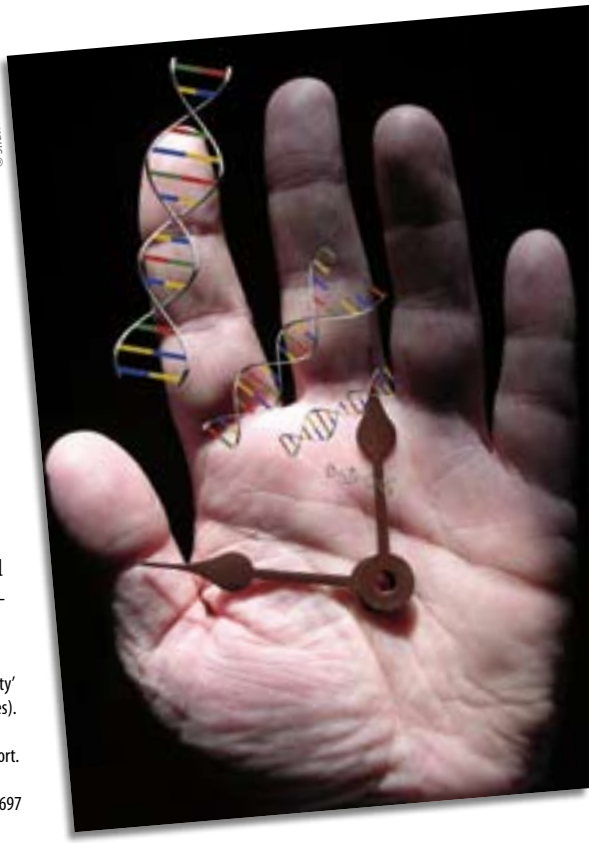
Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3584

Understanding how the immune system ages

Ageing in humans is a natural process that affects all physiological systems including the immune system.



The EU-funded 'T cell immunity and ageing' (T-CIA) project studied the ageing process from the perspective of T lymphocytes. By comparing samples from young, old, healthy and sick donors, project partners aimed to pinpoint the molecular profile of healthy ageing.

Even though ageing does imply that our immune systems overcome infections, one way or another, aged individuals are not immune per se to infections they might have previously combated. The reason behind this fact is that although memory cells do increase with age, immunity does not improve.

Project partner Jönköping University focused on the study of the immune risk phenotype (IRP) concept. Specifically, researchers examined how the IRP could be used to predict immune responses to specific pathogenic challenges. The expansion of CD8 T clones occurs as a result of ageing, possibly as a compensatory mechanism to control latent infections. However, once clonal exhaustion sets in, the immune responses are nonetheless significantly affected.

Linking the IRP to specific individuals could allow for early interventions and health-benefiting approaches, contributing to healthy ageing.

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 > 3697

The meaning of marginalisation

Marginalisation of vulnerable members of society can affect their status in society. European researchers have thrown fresh light on the meaning of social exclusion to form a platform for further studies in order to prevent this process.

Demographic changes within the EU present a constant and dynamic challenge to policy-makers concerned with the social and economic welfare of Europe. The fact that the population is ageing, with the social and economic consequences this implies, is one of the considerations involved.

The EU-funded CARMA project set its main objective as the enhancement of the welfare within the advanced ageing population as a whole. As an integral part of this study, project partners at the Social Science Research Centre in Berlin focused on the study of marginalisation among the elderly. They also reported on changes in the care structure for this section of the population. The results of the research were divided into two important categories.

Firstly, the definition of marginalisation was looked at closely to produce a comprehensive description of the process involved in the social exclusion mechanism. Variables relating to the development of the status of old age were studied on three levels — individually, within the family, and globally in society. The team found that once the definitions were in place, there was a platform on which to base further research methods and findings. Overall, the study revealed the predisposition of migrant workers to the social exclusion process and how socioeconomic class was an important factor. Equally important, the isolation and the plight of the informal carer were highlighted.

As a second strand of research, the development of approaches to care for elderly people was evaluated in terms of accessibility, availability and affordability. The extent of integration of informal and formal care was also assessed. The report found that novel means

continued on page 13

Mind over body: new hope for quadriplegics

Around 2.5 million people worldwide use a wheelchair as a result of spinal injuries. Half of them are quadriplegic, paralysed from the neck down. European researchers are now offering them new hope thanks to groundbreaking technology that uses brain signals alone to control computers, artificial limbs and even wheelchairs.

People left paralysed by spinal injuries or suffering from neurodegenerative diseases could regain a degree of independence thanks to a new type of non-intrusive brain-computer interface (BCI) developed by the MAIA project.

Using electrical signals emitted by the brain and picked up by electrodes attached to the user's scalp, the system allows people to operate devices and perform tasks that previously they could only dream of. So far, the team, led by the IDIAP Research Institute in Switzerland, has carried out a series of successful trials in which users have been able to manoeuvre a wheelchair around obstacles and people using brainpower alone.

'We have demonstrated that it is possible for someone to control a complex mechanical device with their minds, and this opens up all sorts of possibilities,' says MAIA coordinator José del R. Millán.

Though BCIs, for people with impaired movement and for other uses, have been under development for many years, they have had varying degrees of success, largely because of the difficulties of turning brain signals into accurate mechanical movement. What sets the EU-funded MAIA system apart is that it does not rely on the human brain alone to do all the work, instead incorporating artificial intelligence into the device being used.

A person using the MAIA BCI to control a wheelchair, for example, only has to think about going straight ahead or turning left and the chair follows their command. However, they do not have to worry about colliding with obstacles — even moving ones such as people — because the wheelchair itself monitors and reacts to its environment. 'A user can tell the chair to go straight ahead, but it will not just randomly roll in that direction if there is a wall or a flight of stairs in the way,' Professor Millán notes. 'What we have done is combine the intelligence of the person with the artificial intelligence of the device.'

In a sense, the artificial intelligence embedded in the chair acts much like a human's subconscious. People, for example, do not consciously send commands to every muscle in each leg in order to walk and do not think where to step to avoid an obstacle — they do it subconsciously. Similarly, a wheelchair-bound user of the MAIA BCI simply has to send the signal to go in a certain direction and the chair figures out how to get there. But the user always stays in control!

'We wanted to see how much of the movement was down to the user's brain signals and how much was due to the intelligence of the chair. It turned out that the wheelchair intervened between 10 and 40 % of the time depending on the user and the environment.'

'In one demonstration in which someone was manoeuvring the chair for six hours, the computer intelligence kicked in more frequently later on as the person became increasingly tired and made more mistakes,' Professor Millán says.

Importantly, the chair can recognise from the user's brain signals if it has made a mistake, and, through tactile devices similar to the vibrators used in mobile phones, it can send feedback to users about the direction they are going that enhances their sense of awareness beyond the visual.

Professor Millán notes that the same technology could be applied to artificial limbs to allow quadriplegics to pick up objects or unlock a door. By using the BCI to interact with computer systems, meanwhile, they could control the lighting in their homes, surf the Internet, or change the channels on the television. Those simpler brain-computer interactions, which have the potential to become the basis for commercial systems sooner, will be the focus of a follow-up EU project called TOBI that is due to begin in September and which will also be led by Professor Millán.

'For a wheelchair, such as the one developed in MAIA, to reach the market would take extensive trials to prove that the technology is robust enough. We can't have it breaking down when someone is in the middle of the street,' Professor Millán notes. Carrying out such validation trials remains a goal of the project partners who are actively seeking further funding and investment to continue their work.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89624

continued from page 12 **'The meaning of marginalisation'**

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of care funding had been introduced that did indeed address the fundamental levels of elderly care. However, limitations in funding and fragmented services were found to be a potential source of arrested development of the elderly care structure.

The unique combination of different research tactics and topics that address an all too frequently neglected topic formed the basis of the success of this report. Details of the results have been disseminated to policy-makers and carers at all levels. Moreover, the findings can continue to be used as a basis for further research and as a means of comparison of care systems between countries in Europe.

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 > 3743

Storing plants for posterity

At a time when extinction threatens numerous plant species worldwide, the need to preserve biodiversity is all the more pressing.

The EU-funded Crymcept project sought to establish specific cryopreservation methods for a series of plant germplasm collections. The overall aim is to assist planting projects and also preserve these plant species and examine their potential benefits in other industries such as the pharmaceutical sector.

Cryopreservation refers to the long-term storage and preservation of tissues or cells in sub-zero temperatures, ensuring the cessation of all cellular functions including cell death. Project partner Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH (DSMZ) developed techniques for the extraction and two-dimensional separation of proteins. The protein molecules were derived from bananas, apples and potatoes.

The aim was to investigate the protein patterns in these plant tissues, thus ensuring the highest possible efficiency of the cryopreservation step. Increasing the tolerance to cryo-treatments is very much dependent on the protein levels found in the cells and their behaviour under a variety of conditions.

Studies showed a series of metabolic changes in the banana fruit attributed to a sucrose treatment prior to cryopreservation. Further studies can examine the effect of stress metabolism and investigate the potential of a less disruptive storage method.

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 > 3750

Acceptance levels of isoflavone-enriched foods in Europe

A survey has described the acceptance of isoflavone-enriched food products that were not yet on the market. The results were based on focus group interviews with women in France, Italy, the Netherlands, Finland and the United Kingdom.

Isoflavones (IF) are a subgroup of phyto-oestrogens and are mainly contained in soy and soy products. They are believed to have beneficial properties, and the potential role of natural phyto-oestrogens in osteoporosis prevention among postmenopausal women living in Europe was investigated in the context of the Phytos project. A one-year, large-scale, multicentre, randomised and controlled intervention trial was conducted in three European countries. It used specially designed IF-enriched foods and rigorous assessments were made of the changes in bone metabolism. The acceptability of these foods among the target population (women aged 45 or older) was addressed. The expectations created by different nutritional claims were also investigated. This was done by conducting a survey in five EU Member States.

A self-administered questionnaire on attitudes, social influence, barriers and acceptance towards IF foods was developed. The questionnaire was completed by 2 500 women between 45 and 70 years of age. The mean age of the women was 56.1 years. Stages of change towards reduction of osteoporosis through dietary adjustment showed that most women were in pre-contemplation (44 %) and maintenance (39 %). The results showed that breakfast was the preferred time for consumption (70 %). According to respondents, the most suitable foods for fortification were dairy products, bread and fruit juices.

The most important properties for products are detailed information, a pleasant taste and availability in supermarkets. Reluctance to consume IF-enriched food can be explained by various concerns as well as social influences and barriers. There are also differences between countries in the level of acceptance of IF-enriched foods. This indicates differences in perception between the five countries. Therefore, with regard to product development and marketing, it is vital that strategies and products are designed that take account of cultural diversity. Further research is to be undertaken to determine if the focus should be on international differences or on cross-cultural segments.

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 > 3871

Improved analysis of poplar wood

More efficient methods for the evaluation of the growth and the material properties of poplar wood have been created.

Poplar wood is a suitable raw material for pulp and paper. This is because poplar fibres have suitable dimensions to form a smooth paper surface with good optical properties. However, it also contains vessels that can cause problems for printing. Research in wood and fibres has been limited due to a lack of efficient measurement methods.

The Popwood project has offered innovative information for exploitation regarding engineering fibres and wood properties in poplar. The aim was to improve the understanding of genetic and molecular mechanisms controlling vascular development and wood formation. In addition, analysis of juvenile poplar fibres and wood properties was conducted and compared with natural wood characteristics. Thus trees that are only a few years old can be used as raw material for pulp production, resulting in economic opportunities for rapid exploitation of transgenic traits.

One of the ways this was established was through the investigation of age-to-age relationships. This is possible by measuring property differences between individual growth rings. A new procedure was developed which permits the study of sub-samples representing individual growth rings. In order to analyse the vessel elements in the pulp, it is diluted and images are recorded from its different objects such as fibres, vessel elements and fines.

Finally it was decided that the new method for measuring pulp is most suitable for use when there are vast amounts of poplar samples for analysis. A great interest has been evidenced on behalf of industry and research. The methods were applied in other research projects and contract work on aspen and eucalyptus as well.

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 > 3873

See also pages 11 (offer 3828), 16 (offer 3910) and 22 (offer 3906)

Protecting plant cells during cryo-processing

Cryopreservation can be extremely beneficial for the long-term storage of cell and tissues. It can also prove a useful aid in environmental preservation efforts, allowing germplasms of plant species under threat to be stored in controlled conditions.

The EU-funded Crymcept project studied the effects of cryopreservation on cell integrity and sought ways to develop methodologies that can enhance cryopreservation protocols. Project partner Katholieke Universiteit Leuven in Belgium concentrated on the role of polyamines and aromatic amines on cells and tissues.

It has been suggested that polyamines along with aromatic amines play a protective role during the cryopreservation process. As polycations, these compounds display a strong binding affinity to key cellular polyanions like DNA and RNA. This binding is thought to protect DNA double-strands from damage induced during the cryopreservation process.

Studies showed that pre-treatment of cells with sugars like sucrose had a positive effect on overall polyamine production and hence, it appears, improved cryopreservation ability. It is therefore strongly suggested that addition of polyamines and/or sucrose pre-treatment could also improve post-thaw regeneration. This information could provide valuable insights for the long-term storage of plant cells, but could also form the starting point for investigations in other cell types.

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 > 3899

Cell membranes resist freezing

Resistance to freezing injury is crucial for the survival of plant tissue on cryopreservation, as well as when frost threatens crop. A team of scientists from a European project has investigated the biomolecular basis for the mechanism of resistance to freezing.

Plant systems have many defence systems against threats from the environment as they are under constant bombardment from changes in weather, soil, pests and nearby competitors. Defence against freezing injury has economic importance throughout the agriculture industry. Furthermore, cryopreservation for genetic material preservation and frost resistance in crops are both areas of high economic and social significance.

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The overall objective of the Crymcept project was to establish new methods for cryopreservation. Specifically, project partners from the Katholieke Universiteit Leuven in Belgium investigated the molecular changes in the cell membrane system on freezing. These are the primary sites of freezing injury and alterations in the biomolecular structure here hold the key to a possible underlying mechanism.

In particular, the team focused on alterations brought about by sucrose pre-treatment and desiccation. These particular procedures are implemented to ensure the survival of many plant species on preservation. The scientists discovered that these treatments resulted in changes in bound sterols, phospholipids and free fatty acids. The team concluded that application of sterols and fatty acids during the preculture stage could therefore enhance the post-thaw regeneration after cryopreservation.

Pharmaceutical and agricultural industries, together with any concern interested in the preservation of genetic material, could all benefit from these advancements. The protection of the genetic heritage of our planet is likely to hinge on our ability to preserve and regenerate the genetic integrity of many species threatened with extinction.

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 > 3842

Revisiting forest management

Introducing a potentially new era in European forest management, silviculture could provide answers for the long-term conversation of genetic and ecophysiological diversity in forests.

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Silviculture is essentially defined as a variety of techniques for the management of forests at all levels, ensuring control of growth, composition, quality and health. Traditional forest management has mostly concentrated on extensive felling in forest areas as a means to induce new growth. It is now thought that felling may have seriously disturbed the genetic balance of European forests, and a new approach is called for.

The EU-funded Dynabeech project evaluated the benefits of silviculture on ecological and genetic diversity, using European beech forests as a reference. Project partners initiated efforts to gain genetic profiling information and compile a list of guidelines to improve beech forest management.

The genetic diversity of European beech forests was documented within the Dynabeech framework, based on a series of genetic loci. Further investigations included information on phenotypic traits as well as ecophysiological and structural observations.

The knowledge gained was used to compile and populate a number of databases, which can serve users to improve on current forest management methodologies.

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 > 3852

See also pages 11 (offer 3828), 16 (offer 3910) and 22 (offer 3906)

Genetic resistance battle against Fusarium

***Fusarium** infection of wheat is of major concern to Europe's agricultural sector. Research into the genetics of resistance to the disease has revealed promising results for future plant breeding programmes.*

Fusarium, a fungal pathogen of many crops, is a threat to both agriculture and human health. It can cause widespread damage to wheat including wilt in seedlings and infection of the heads of the cereal. Wheat grains contaminated with the fungus and its mycotoxin can be especially harmful and can cause distressing symptoms if ingested. In severe cases, casualties can occur. Unfortunately for vast areas of Europe, damp, warm weather conditions prevail during the growing season when the fungus can proliferate.


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The objective of the Fucomyr project was to research and accelerate the development of genetic resistance to this pathogen. The project team of researchers at IFA-Tulln in Austria specifically studied quantitative trait loci (QTLs) for resistance in over 20 different strains of a spring wheat. QTLs are phenotypes that are controlled by multiple genes. Two lines of genetic artillery against the disease were studied — one against spreading and the other against invasion.

In a two-plot replicated trial following inoculation with *Fusarium*, variables measured included toxin contamination, mass of 1 000 grains, seed number per head and ergosterol content. Ergosterol is a component of fungal membranes and therefore a good indicator of infection. It was found that the phenotypes most effectively dealt with by the trait loci under study were damaged kernels, head blight and toxin contamination.

Data collected from the trials indicated a lot of potential for incorporation of these QTLs into breeding programmes. Most interesting for the team was the fact that the possession of both QTLs yielded a synergistic effect. Secondly, there was no difference when different species of *Fusarium* were used, meaning that the QTLs are not species specific. Furthermore, there appeared to be no environmental difference between the two plots, indicating that the genes would be effective in very different environments.

The results from this research seem very promising indeed in the battle against *Fusarium* infection. Incorporation of resistance will lead to an increasingly competitive wheat industry for Europe and a healthy, risk-free consumption of cereal products for the consumer.

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 > 3910

See also pages 11 (offer 3828), 14 (offer 3873), 15 (offer 3852) and 22 (offer 3906)

Lameness in cows tackled

Bovine laminitis is a painful debilitating disease that causes extreme discomfort and consequent economic losses. Researchers in the Lamecow project have investigated the pathology of this incompletely understood disease.

Good husbandry techniques are frequently the key to a pathogen- and stress-free herd with an optimum economic output. Lameness is a condition that is extremely distressing to the animal. Its causes are varied and range from housing conditions and diet to horn-trimming techniques and disease. The aptly named Lamecow project focused its research objectives on the improvement of dairy cattle welfare by tackling the biopathology of lameness.

One cause of lameness is laminitis. This is the result of circulation changes that cause alterations in the quality of the horn material in the hoof. Ulceration and possible haemorrhage occur to cause painful partial immobility. Costs to the farmer include body weight loss, a decrease in milk production and the possibility of culling.

An isolated cow limb obtained from routine slaughter was studied in order to research the biological mechanisms responsible for this condition. Ethical considerations were paramount in the mode of study as regards an alternative to experimentation using *in vivo* models.

The team studied the tissue using several different techniques to gain a complete understanding of the biochemistry of the syndrome. The limb was perfused over a period of five hours to remove toxic substances. Oxygen levels and pH (acidity) were carefully controlled and glucose added as a nutrient. Weight increase was used as a vitality indicator. Tissue condition was also evaluated using light and electron microscope examination. In addition, a thermographic camera to show 'cold spots' was used to indicate ischaemic areas or those with impaired blood flow.

Results showed that oxygen deficiency, histamine, toxic metabolic byproducts and endotoxin from the bacterium *Escherichia coli* promoted adverse changes in the tissue structure. Changes observed included alterations in organ resistance, cell damage and changes in vascular permeability.

The results of this research may well have far-reaching applications. The effects of impaired circulation have an impact on all hoofed animals, notably cattle, horses and sheep. Moreover, poor circulation in human limbs can cause nerve and tissue damage with the ultimate threat of gangrene and consequent loss of limbs. This creates further scope for development within the biopharmacology arena for the treatment of circulatory disorders.

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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Survey of European biomass power plants

An extensive survey was carried out in the context of the Echaine project. It provides valuable insight into the environmental performance of biomass power plants currently operating across Europe.

The Fraunhofer-Gesellschaft's Institute for Factory Operation and Automation led the study. The team produced a detailed questionnaire that was administered to wood energy plant operators in nine EU Member States. Feedback from 45 plants was collected and analysed with respect to the entire biomass lifecycle, addressing both direct and indirect effects.

The profile of the respondents was dominated by smaller installations (< 20 MW), though some larger plants (> 100 MW) did participate. The primary fuel type was wood industry waste products with an average energy content of 10 to 15 MJ/kg. With regard to combustion technology, most plants use grate firing while a few employ fluidised bed and pulverisation. It appears that gasification technology is not yet sufficiently mature for implementation. The advantages of combined heat and power (CHP) were realised at approximately half of the installations.

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A large portion of the questionnaire focused on the management of environmental impacts. The findings were encouraging as all plants were in compliance with the strict emission caps defined in the relevant legislation. A high percentage of the plants employ emissions controls (e.g. flue gas treatment) to reduce pollutant emissions. Furthermore, management of wastewater effluent and other waste products (e.g. ash residue) does not appear to pose significant challenges. Finally, some sporadic problems with noise have been successfully resolved with insulation and other noise abatement measures.

In the coming years, it is expected that the number of decentralised wood energy power plants will continue to rise across Europe. Based on the positive results of this survey, the environment stands to benefit as these plants convincingly outperform traditional coal-based power plants.

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 > 3823

Turning olives and vines into energy

A geographic information system (GIS) proved vital in the assessment of the potential for energy production from renewable biomass in southern Portugal during the Echaine project.

GIS have been used to shed light on a variety of multidisciplinary scientific problems. The ability of a GIS to incorporate, analyse and present different types of spatial data from a variety of sources makes it a truly unique tool.

The EESD programme funded a project entitled Echaine that sought to apply GIS techniques to the issue of wood energy supply chains in Europe. The Escola Superior Agrária de Beja examined the situation in its home country of Portugal.

The Portuguese research team constructed a GIS database using all available data sources (such as military maps and land-use maps). An investigation into the various types and amounts of biomass (e.g. olive tree and vine cuttings) produced in each county in southern Portugal was also performed.

The Escola Superior Agrária de Beja found that of the nearly 1 million tonnes of dry biomass produced in the region annually, just a small fraction is actually exploited for energy production purposes, mainly as firewood. The team estimated that several thousand terajoules (TJ) of energy could be gained from cuttings and residues that could be effectively distributed to users in the region.

While the GIS tools proved extremely valuable during the course of Echaine, the issues of data quality and availability as well as the cost of software licences could be limiting factors.

The results of the research have been made available to the research community via publications in peer-reviewed journals as well as through Echaine workshops and the project website.

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 > 3778

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Tempted by a technology presented in this issue?

All of the projects presented in the supplement are seeking cooperation partners in specific areas, and interest in their work is welcomed. Please contact their coordinators directly if you would like to know more about them.

FIRE® — advanced engine simulation software

In the framework of the Minknock project, AVL List GmbH (AVL) made significant improvements to its existing computational fluid dynamics (CFD) software package FIRE®, enabling it to simulate engine knock more accurately.

Europe faces strong competition from Japan and the United States in the automotive industry. Given the rising profile of climate change, the environmental performance of cars has taken on new importance. The EESD programme supported the Minknock project consortium's efforts to make Europe's vehicle fleets more fuel efficient by reducing engine knock.

Modelling can play an important role in improving our understanding of the complex thermodynamic phenomena occurring inside the internal combustion engine. AVL, a world leader in automotive three-dimensional (3D) CFD, was a key member of the Minknock consortium.

AVL owns a sophisticated 3D CFD simulation package entitled FIRE® that is suitable for a number of engine-related applications. Its core is composed of the semi-implicit pressure-linked equations (Simple), which are solved using advanced mathematical techniques. Its ability to deal with variable topology allows it to effectively simulate the effect of geometry on fuel injection, the combustion chamber, exhaust flow and so forth.

During Minknock, AVL upgraded FIRE® with new submodels that better predict the onset of engine knock. Specifically, a phase-optimised skeleton mechanism (POSM) was developed for the reaction of n-heptane with iso-octane. This was then coupled with a transported probability density function (t-PDF).

The new version of FIRE® proved extremely valuable to the Minknock consortium in their attempts to learn how to eliminate knock in modern engine design.

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 > 3707

Green, lead-free solar cell technology

The French firm Metalor has discovered how to remove lead from the process of making solar cells without compromising the quality of the end product.

While power generation from renewable solar energy is environmentally friendly, the production of photovoltaic panels is not. Lead features prominently in the creation of crystalline silicon solar cells. Unfortunately, lead is an extremely toxic heavy metal that can cause severe damage to the human nervous system.

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The 'EC2 contact' project was founded with the aim of making solar technology as green as possible while at the same time achieving substantial cost reductions. Metalor, an 'EC2 contact' partner from France, was called upon to develop lead-free alternatives to replace traditional leaded metallisation pastes.

Further to extensive research, Metalor substituted glass frit and binder for lead in the new pastes. Silver and aluminium pastes created for the new technique demonstrated performance characteristics on a par with those of their lead counterparts. In particular, fill factors and efficiencies were in the order of 77 and 17 % respectively.

Additional benefits were also detected. For instance, the resulting silicon nitride (SiN_x) cells exhibited greater resistance to bowing. Metalor and its 'EC2 contact' partners plan to promote the new technology to the rapidly expanding market for green products.

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 > 3912

Advanced ICT model for the utilities market

A report was conducted to address the inherent challenges relating to maintaining security and information protection of innovation in the field of virtual utilities. Specific emphasis was placed on business models of energy-related services and products.

The main goal of the CRISP project was to investigate advanced ICT intelligence and how to use this in the management of power networks with a high degree of distributed generation and renewable energy sources penetration.

Four key targets were set out at the beginning of the project. Research and information that came out of the project were made accessible and available to the public at large. Distributed intelligence and its application to the utilities sector were explored particularly by investigating the challenges and issues specific to this industry. Additionally, companies involved in the consortium were able to assess how this technology can improve their business as well as client relations. For the universities involved, it represents an opportunity to provide new contributions to the field and to publish results for a wide audience, which will also strengthen academia's ties with industry.

Following this, the report was compiled to provide an overview of the future possibilities in the realm of virtual utilities. Key concerns for the researchers were security issues and information protection and ownership.

The key proposals that came out of the report included a hierarchical coordination model between energy systems and business management systems, and a general framework for defining a workable model of assessing security investments in a cost-effective way. Furthermore, it proposed that so-called 'honey nets' be used to identify the potential threats to this specific system.

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 > 3934

Exploiting the sun's energy without overheating

Research supported by the EESD programme led to the creation of a highly efficient heat sink for solar power applications.

Europe has established itself as a leader in the crusade to replace fossil fuels with renewable energy sources. Solúcar Energía in Spain has made remarkable progress in concentrating the sun's rays to generate electricity. However, extremely high temperatures often limit the performance of such systems.

Solúcar Energía joined forces with four other research centres from the CAC project to assess the potential of a new concept — a controlled atmosphere photovoltaic concentrator (CAC). The system's most vulnerable components, such as reflectors, are housed in a protective enclosure. Solúcar Energía oversaw the development of a passive heat sink for the CAC.

Several different designs were tested, culminating in the choice of a model with a dozen sheet-like protrusions that increase the overall surface area, and subsequently performance, of the heat sink. The unit was constructed from an aluminium-manganese alloy.

Heat dissipation was further bolstered with the use of a ceramic-filled single-component silicone, specifically KP 30 thermal grease. Its optimal thermal conductivity properties more than doubled the rate of heat transfer. It should be noted that KP 30 can withstand extended periods of storage without degradation, though mixing is recommended prior to use.

Solúcar Energía exposed the new heat sink to a wide range of operating conditions, including high winds. The thermal resistance data collected indicate a significant level of protection for the CAC components. Based on these results, the Spanish firm is looking to incorporate the new heat sink into its future products.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3931

Website for solar rural electrification

The Taqsolre project has increased confidence in photovoltaic (PV) systems as a tool for supporting sustainable development in the rural areas of developing countries. The Taqsolre website (http://www.taqsolre.net) has created a PV reliability network.

The network disseminates results and contributes to a better understanding and knowledge of the quality aspects of PV stand-alone systems. The intention has been to gather first-hand reliable data from eight countries.

The project partners have a presence in these countries, creating a web-based database from which inferences regarding quality assurance, reliability and user satisfaction are drawn. This is based on the first-hand survey carried out by the Taqsolre partners. A tool for analysing the data is available on the website via standard and user-defined simple queries. It is available to any user once they have completed a simple online registration form. As the number of users of the website increases, contributions in the base data are to be made available from reliable users. This data may be incorporated on the website following a consensus by the Taqsolre partners after assessing its authenticity.

The website also serves as an outlet for all the public domain documents generated under the present project. As data sample size increases, statistically significant information regarding aspects such as mean time between failures, most frequent failures, quality assurance procedure applied versus the mean time between failures and so forth can be extracted. The site contains information regarding stand-alone PV systems, and all deliverables and articles developed within the project are available, along with other external related documents.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3881

Simulating transient solar energy

An innovative simulation tool allows a detailed analysis of a solar power system's response to fluctuations in irradiation.

The process of direct steam generation is considered to be a very promising solution for use in parabolic trough solar collectors. Its adoption in the absorber pipes of the collectors can bring significant cost reductions in a solar power plant since it involves great savings in the electricity produced.

Aiming at integrating this innovation in the energy market, the Inditep project developed an engineering design for a 5 MWe pre-commercial direct steam generation power plant. Advanced components such as an inexpensive water-steam separator that may improve the competitiveness of this technology were also generated. Another important project result was a socioeconomic study for the specification of potential market niches along with an assessment of the new technology's integration potential.

Researchers also focused on the enhancement of the plant's key components and its operation procedures in order to assure good performance when it becomes commercialised. In order to improve the system's response to fluctuations in solar energy, a numerical software application was developed. The tool provides a detailed analysis of the variations in solar irradiation and simulation of the transient behaviour of parabolic trough collector rows.

Based on an object-oriented code, the software modelling tool allows a large variability in the arrangement of configurations. Additionally, the model can easily be adapted to provide simulations of pipe flow applications other than those found in parabolic trough collectors. Implemented in a plant control system, the tool could provide significant savings as it may aid the system's appropriate adjustment according to solar energy supply.

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 > 3759

Reports reveal the state of urban water systems

The safeguarding and appropriate use of water resources is fundamental to our well-being and livelihood. A series of detailed case studies provides insights into the factors that are inextricably linked to the water we share in our urban environments.

Water is one of the elements responsible for life on our planet. As such, the preservation and regeneration of this resource is critical to the survival of an immeasurable number of species, including our own. However, with future demands on water expected to rise to a level that will eventually exceed water supplies, there is an urgent need to rethink our traditional water management systems.

Almost half of the water supply of western and eastern Europe and the Mediterranean area comes from urban aquifers. Groundwater is a key part of the urban water cycle of all cities located on aquifers, yet it remains inadequately integrated into urban water management practices. The driving force behind the joint Euro-Australian 'Assessing and improving sustainability of urban water resources and systems' (AISUWRS) project was to increase the knowledge base as to the current status of urban water resources and processes by providing assessments and tools for alternative planning approaches.

A key outcome of the initiative has been the production of a series of analysis reports. These represent a practical assessment of urban water management systems based on a diverse range of environmental, social and economic perspectives. Understanding these issues is an essential step towards developing long-term integrated systems that are cost effective and sustainable.

The research was conducted in the four cities of Doncaster (United Kingdom), Ljubljana (Slovenia), Mount Gambier (Australia) and Rastatt (Germany). The findings revealed that, in some instances, perceptions and priorities varied for the experts responsible for water management as well as the different stakeholders. In this regard, the AISUWRS project team developed tools to encourage deliberation processes that are both necessary and urgently required.

Formal sustainability assessment methodologies were also further developed and tested during the case studies. The Seesaw model, for example, was applied as far as possible alongside research for the socioeconomic analysis reports. The model used 17 environmental sustainable indicators that considered groundwater, drinking water production, consumption, wastewater treatment and by-products.

The AISUWRS initiative is a member of the CityNet cluster, the network of European research projects on integrated urban water management.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3866

Suite of software tools for urban water management

Seesaw and Deliberator are two complementary software applications created by FutureTec to provide decision support for water management in urban areas.

A good number of metropolitan areas throughout Europe depend on local groundwater resources for their supply of fresh drinking water. Protecting and managing these resources in a sustainable manner involves dealing with the varied interests of the local inhabitants, local business, local government, water utilities, etc. This can be quite an undertaking.

In order to meet this challenge, a suite of software tools was developed during the AISUWRS project. FutureTec, a German firm with experience in applied informatics, developed the 'Socioeconomic and environmental sustainability assessment of urban water systems' (Seesaw) and Deliberator software.

Seesaw contains multiple forms that help its users design and administer questionnaires for the various stakeholders. Once information about preferences and priorities related to water management issues (such as quality or pricing) is aggregated, additional functionality enables the statistical analysis of this data. A complete assessment of the perception of urban water management can be made using the Seesaw output files.

The role of Deliberator is to gauge the overall feasibility of various intervention measures, referred to as scenarios, based on stakeholder feedback. Decision support is assisted by three-dimensional matrices where the stakeholders, actions and decision criteria form the three axes.

With respect to user-friendliness, Seesaw is based on a common platform (Microsoft Excel®). German and English language support is available for both tools, and additional languages can easily be added in the future. FutureTec has copyrighted both software applications.

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 > 3846

See also pages 22 (offers 3808 and 3949) and 25 (offer 3876)

Modelling the hydrological cycle in urban areas

The AISUWRS project developed a new model for water resource management with a special emphasis on the urban environment.

The exodus from the countryside to cities has put pressure on Europe's ageing water systems. In the search for sustainability, computer models can help scientists and the relevant authorities gain a better understanding of the complexities of the hydrological cycle in urban areas.

The Institute of Hydromechanics of the University of Karlsruhe (Unikarl) led the development of a new water balance model for such applications during the AISUWRS project. The model, UL_flow, addresses the transport of water through soil layers to the water table as well as exchanges with other sources. The one-dimensional solution provides residence times in the different layers and recharge rates for reservoirs.

During AISUWRS, Unikarl ran the model using data collected from Rastatt in western Germany, one of the cities chosen as a case study. Unikarl performed multiple simulations where the team altered the main input data, infiltration rates, as well as the type and depth of the soil layer and other parameters. These sensitivity tests indicated an important role for the temporal resolution of UL_flow.

Another significant development was the UL_flow_UVQ extension. This enables UL_flow to directly import output files from the urban volume quality (UVQ) model, which was also run for the AISUWRS case studies. By linking the two models, Unikarl was able to generate the desired residence times and groundwater recharge rates for Rastatt with significantly less effort.

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 > 3774

Forecasting floods in Finland

A hydrological model and data assimilation algorithm for the Finnish flood forecasting system which analyses the accuracy of real-time run-off forecasts in a boreal zone has been completed.

The Envisnow project has used data for the development, validation and operation of multi-sensor and multi-temporal snow parameter retrieval algorithms for regional as well as global mapping. This has helped to satisfy the requirements of hydrology users and broadened the understanding of the way in which microwaves and light interact with snow and ground cover. As a result, innovative algorithms which employ complementary features of both optic and radar sensors have been designed.

The key factors are snow cover area, snow water equivalent, snow wetness and snow surface temperature. Signature data and models were advanced in the retrieval algorithms and joined with airborne, space-borne and *in situ* data. The resulting products have been included in updated hydrological models in order to improve the accuracy of run-off prediction.

The hydrological model and data assimilation algorithm for the Finnish flood forecasting system (SYKE-WSFS) was completed in 2004. The effect of the snow cover area (SCA) observations on forecast accuracy was examined through forecasts during the spring of the years 2003 to 2005 both with and without SCA observations. Simulated flood forecasts were compared in 14 different discharge measuring points.

The developed method has been employed in the Finnish operational hydrological forecasting system since the spring of 2005. The real-time flood forecasts are designed for all of Finland including cross-boundary watersheds and cover over 1 200 points on lakes and rivers.

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 > 3869

New algorithms for snow cover, temperature and wetness

New algorithms created by the Norwegian Computing Institute enable more accurate prediction of snow characteristics from satellite data.

A large part of Europe depends on snow melt as a source of drinking water. In addition to its role in the hydrological cycle, snow is also an important component of the earth's climate system. As such, significant social value can be gained by improving our knowledge of snow.

The Envisnow project set out to develop the necessary infrastructure to improve monitoring of snow parameters using earth observation data from satellites. Specifically, the Norwegian Computing Institute defined new algorithms to produce estimates of the fractional snow cover area (FSCA), the surface temperature of snow (STS) and snow wetness.

FSCA calculations are made difficult by the fact that snow's spectral reflectance can vary according to several different factors. These include the age of the snowpack, its impurity content, the sun's elevation and the viewing angle of the satellite instrumentation, for example. The institute's solution was to employ both a metamorphosis model and an impurity model to produce a valid snow spectrum and a local bare ground spectrum. In the final step, a linear spectral mixing algorithm is used to estimate the FSCA.

With respect to the STS, atmospheric attenuation alters the snow's original blackbody radiation signature. To account for the effects of atmospheric composition and path length, the institute tested a number of different algorithms. The team identified a pre-existing algorithm as the optimal solution, particularly for polar regions. The institute adapted this algorithm to the Envisnow integrated snow information system and verified its performance with real earth observation and surface data.

Information about snow wetness provides valuable insight into the snowmelt process. The institute was able to enhance snow wetness prediction capabilities by combining snow grain size (SGS) measurements with STS measurements. A snow wetness class is determined based on the STS and the temporal evolution of SGS. As with the other new algorithms, the results were validated at a number of different locations.

The Norwegian Computing Institute's contribution to Envisnow represents a quantum leap forward as it is now possible to accurately estimate essential snow parameters throughout the entire snow season. The institute is consequently looking to license the new algorithms.

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

Collaboration sought: licence agreement.

http://cordis.europa.eu/marketplace > search > offers > 3849

See also pages 22 (offers 3808 and 3949) and 25 (offer 3876)

Public participation in river basin management planning

A report from the Harmonicop consortium presents important findings concerning social learning and river basin management planning (RBMP). The report's policy recommendations aim to support the implementation of Europe's Water Framework Directive.

The Harmonicop project examined a fresh approach to RBMP emphasising public participation. The research, undertaken by a consortium of 15 universities, research institutes and laboratories, focused on the role of social learning.

The Autonomous University of Barcelona was assigned the task of compiling a final report summarising the findings of the project. They attempt to establish a relationship between the theoretical concepts developed during the research and actual data derived from several case studies.

The report begins with an introduction to social learning and how it interfaces with RBMP. Actions at local, regional, national and river basin scales are assessed. An important part of the report's contents is the feedback gathered from a comprehensive review of case studies. Special attention was paid to the benefits achieved with the aid of information and communications tools.

Finally, the new knowledge acquired in the context of Harmonicop was recorded. Among other aspects, the input covers lessons learned from the case studies, potential obstacles (such as cultural differences) and new learning paradigms.

The report's authors believe that long-standing perceptions of man's relationship with nature, information exchange and so forth must be overturned in order for progress to be made. While cost remains a significant constraint in RBMP, the recommendation is for investment in public education. Future research will analyse the most effective way to go about making such investments.

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 > 3808

Tackling water scarcity in western Turkey

A university study examining the changes that have occurred in the Gediz river basin over the last decade has identified the problems caused by water shortage and pollution.

This case study conducted by the SMART project focuses on the region of Western Anatolia along the Aegean Sea. Water scarcity is a significant problem which has institutional, legal, social and economic implications for the region, adding to the existing water allocation and environmental pollution problems.

Focusing on the cases of Izmir bay and the Gediz river basin, the study highlights the issues concerning the management of land and water resources. The two areas, the study found, are closely interdependent, as the inland practices of Gediz basin lead to coastal problems in Izmir bay.

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Izmir bay was studied using the Telemac model, and results showed that pollution from the Gediz river tends to move along the coastline toward the entrance of the inner bay. However, the source of pollution from the discharge points tends to cover the biggest part of the inner bay in the east-west direction.

The study of the Gediz basin utilised Waterware, the SMART analytical tool. The study found that improvement of the irrigation schemes, either in conveyance systems or in the method of field irrigation, is positively reflected in the water budget of the basin.

The study concluded that if the situation in the Gediz basin is evaluated on the basis of water budget only, the first steps to be taken for better management of the basin would be to improve the current status of the irrigation schemes. This could be done by reverting to conveyance systems and field irrigation methods that minimise water losses.

From these available scenarios, researchers recommend further research into water allocation, which could be analysed in terms of water quantity, the data on which is available. The basic limitation to research on this issue, as stated in the report, is that there is a lack of systematic data on groundwater levels and groundwater consumption.

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 > 3949

See also pages 20 (offers 3866 and 3846), 21 (offers 3774, 3869 and 3849) and 25 (offer 3876)

Poplar plants cope with saline stress

Stress-resistant plants are being bred to withstand the rigours of desertified land. Scientists from the Establish project have investigated the biochemical basis for saline resistance in poplar trees.

Desertification of our planet is occurring at an unprecedented level. Slash-and-burn practices, the increasing demands of an expanding population and deforestation are major causes of this ecological disaster. Desertification leaves the land prone to erosion, drought and possible increases in salt levels or salination. Salinity has been recognised as a major agricultural problem in arid and semi-arid regions and through mismanagement of land and irrigation areas. The rehabilitation of saline soils has proved to be very time consuming and expensive.

The aim of the Establish project was to improve the chances of reclamation of salty soils. The project planned to achieve this by researching into a genus of trees that contains naturally halophytic members as well as salt-sensitive species that will not tolerate these conditions. Within the genus *Populus (P.)*, poplar, *P. euphratica* and *P. alba* represent the salt-tolerant trees, while *P. tremula* crosses are salt-sensitive trees. This gave the project researchers at the AgroBio Institute in Bulgaria an opportunity to investigate the biochemical reasons for stress resistance within the *Populus* genus.

Abiotic stress like salinity causes increased levels of free radicals that can dam-

continued on page 23

Innovative public transport gets more convenient

Innovative travel services in Bristol continue to grow with the development of the Bristol City Car Club and Bristol Dial-a-ride. These systems permit members to reserve a car through the Internet or over the telephone, which assists in making public transport cleaner and more convenient.

The Vivaldi project has come up with innovative ways to provide clean vehicles and stimulate collective transport, new forms of vehicle use and telematics. One contribution towards this was the development of the Bristol City Car Club, for which 19 on-street parking bays for car club vehicles were implemented.

Planning agreements were signed with developers to approve the evolution of the car club plan. This was done through the introduction of new vehicles, payment of membership for residents or provision of parking schemes in association with seven new housing developments. Furthermore, car club members have an incentive to use public transport since they are given season tickets at a discount.

In addition, the Bristol Dial-a-ride, a pilot of a new booking and scheduling system, was conceived. It has several innovative features and benefits from both technical and commercial success. Some of these features include expansion to new city areas, the use of technology to improve booking vehicle access and security and implementation of plans related to new housing developments. The Bristol Dial-a-ride uses the highest clean fuel technology available, expanding membership to users from city areas that were not previously served.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3836

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Vivaldi — rehabilitating cities across Europe

In the context of the Vivaldi project, an eco-friendly transport strategy was implemented in the busy downtown shopping district of the French city of Nantes for the benefit of the local inhabitants and workforce as well as visitors.

The continuing exodus of people from the countryside to cities in search of a better life has put incredible pressure on the limited urban infrastructure. This, combined with increasingly stringent environmental constraints such as greenhouse gas emissions caps, has led engineers to seek out greener methods of transport.

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The Vivaldi project funded pioneering urban transport projects in five cities across Europe. A major renovation of the commercial area of Vannes Road in the city of Nantes was coordinated by the Nantes Métropole Urban Council (UCN), a Vivaldi project partner.

The UCN's approach focused on facilitating access to the different means of mass transit available in Nantes. For example, at a major junction between the tram and Vannes Road, a multimodal station was constructed with the aid of private and public funding. Several hundred parking spaces and easy access to buses and trams help to promote the 'park and ride' concept.

Initial observations reveal a remarkable 20 % drop in the amount of road traffic while tram passenger numbers are on the rise. As other urban reconstruction projects have not yet been completed, these results cannot be considered final at this stage, but Vivaldi appears to have made a significant positive impact.

With respect to the application of similar measures in other European cities, the UCN advises careful consideration of road ownership issues as state ownership of part of Vannes Road in Nantes posed some challenges during Vivaldi.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3735

See also page 41 (offer 3633)

continued from page 22 **'Poplar plants cope with saline stress'**

age cellular components. Two molecular candidates for cellular stress were identified — hydrogen peroxide and malondialdehyde (MDA). Within the cell, hydrogen peroxide (H_2O_2) acts as a signal at low levels and causes toxic damage when present at high concentrations. MDA is a product of the series of reactions after membrane damage.

The two groups of plants were tested for both H_2O_2 and MDA in saline and normal soil conditions. The findings showed that these damaging chemical scavengers were at the same low levels in stressed tolerant plants grown in saline soil as in the control group in normal soil. It would appear that the biochemical explanation for the ability to survive these adverse conditions lies at the feet of low levels of free radicals.

The results of this research may well be another step in the reversal of the effects of the reckless behaviour that is damaging our ecosystems. Stress-resistant trees mean that successful reforestation will be able to halt further deterioration and prevent erosion.

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 > 3906

See also pages 11 (offer 3828), 14 (offer 3873), 15 (offer 3852) and 16 (offer 3910)

Rigorous data for effective modelling

In line with the Kyoto protocol, the Camels project exploited a set of atmospheric carbon dioxide (CO_2) data for use in models which aimed to make estimations of the European land carbon sink.

Environmental change is one of the key issues that all countries need to resolve beyond their boundaries. Following international trends, Europe needs to build a suitable scientific and technological basis as well as tools in order to understand and monitor the processes of environmental change. Nevertheless, the European dimension should be considered as part of the global change phenomenon.

Addressing both European and global scales, the Camels project focused on developing a carbon cycle data assimilation system. Research work utilised existing data sources such as CO_2 fluxes, satellite retrievals of vegetation greenness, forest inventories and CO_2 measurements. In combination with the latest terrestrial ecosystem models (TEMs), this data would produce estimates of the European land carbon sink. Ultimately, process-based TEMs and suitable forest inventory models can isolate the contribution made by land management to environmental change as dictated by the Kyoto protocol.

Research work was based on data coming from the Aerocarb project in which several high-profile European institutions involved in atmospheric CO_2 measurements were engaged. Data were collected during the period between January 1997 to December 2001. They were consolidated into a single, coherent data set aimed for further use in models to retrieve the European CO_2 fluxes.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3761

Tomorrow's bipolar lead-acid batteries today

Research into new methods of depositing non-metallic conducting materials by a Dutch firm bore fruit during the Bilaps project. The results will help power the environmentally friendly vehicles of future generations.

Hybrid electric vehicles (HEVs) offer significant benefits with respect to air pollution, climate change and noise pollution in comparison with conventional vehicles. The European Commission is doing its part to get more HEVs on Europe's roads. For example, the Bilaps project was funded by the EESD programme to advance battery technology while maintaining production costs at competitive levels.

HEVs require stronger batteries than those used in today's cars. The solution proposed by the Bilaps consortium is that of bipolar lead-acid batteries, which possess excellent energy density characteristics. Philips Galvanotechniek Eindhoven (PGE), a Bilaps partner from the Netherlands, applied its expertise in electroplating to produce the new battery components.

PGE used electrochemical deposition to deposit lead alloy on the conductive fluoropolymer bipolar plates used in the new battery. The team developed a number of special treatments, applied before and after plating, to overcome the problems associated with the deposition of non-metallic conducting materials like lead alloys.

During the project, PGE also managed to successfully implement the new plating technology on a production line, thereby enabling increased output. PGE's contribution to Bilaps will facilitate the manufacture of batteries with improved power-to-energy ratios. They are also looking to exploit the process in other plating applications.

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

Collaboration sought: joint venture agreement, venture capital/spin-off funding — available for consultancy.

http://cordis.europa.eu/marketplace > search > offers > 3913

Assessing the effects of climate change on fauna

How will animals and insects react to climate change? This is the question ecologists tried to answer in the framework of the Vulcan project.

The goal of the Vulcan project was to learn how shrubland ecosystems will respond to future changes in the climate. The warmer, drier conditions expected in a CO_2-enriched atmosphere were artificially simulated at six test sites. The Mols Laboratory of the Natural History Museum of Aarhus in Denmark was responsible for monitoring the effects on the local fauna at each of these sites.

The work programme involved an intensive sampling campaign stretching over several days during the transition from spring to summer. Subplots were chosen at each site with similar vegetation profiles. Fauna was then collected from the vegetation using a unique, non-destructive suction technique and compared with samples collected using more traditional methods. Finally, soil samples were gathered and fauna extracted per a standard protocol at the Mols Laboratory.

The Danish ecologists made estimates of the number, amount and distribution of species at the different sites applying different approaches. Actual measurement of body size is more time consuming, but will provide a more accurate result than the bulk approach. A good deal of variety in biodiversity was observed between the Vulcan sites.

With respect to the effects of warmer nighttime temperatures and drought conditions, the result was, in general, negative at the taxonomic level. However, when extrapolating to higher conglomerations, such as all insects, a coherent, collective impact could not be resolved. Even the same species produced inconsistent results, increasing their numbers at one site while disappearing at others.

The results of the Vulcan research indicate that there are no easy answers to such questions. The interactions between the fauna, the flora, the soil and the atmosphere are complicated and clearly vary from one shrubland ecosystem to another.

The work resulted in a number of scientific publications by the Mols Laboratory and its partners. They are also preparing follow-up experimental campaigns in the hope of making further progress.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3831

Eco-friendly and effective disinfection of water

A new design principle for a plasma ultraviolet (UV) source with a variable wavelength and high flexibility in geometry was employed for water disinfection.

The Plaslight project focused on exploiting a high-quality and extremely efficient technique for water disinfection. The key design concept was based on a plasma UV source with high flexibility in geometry. The source featured variable wavelength for highly effective water treatment.

The source uses an assortment of suitable gas mixtures that are able to generate UV-emitting plasma under optimal conditions. Several of these mixtures were replicated from theoretical work while a few of them came from experimental literature. A significant criterion for their selection was their ability to disinfect water effectively.

The plasma source also displays a variable wavelength of light emitted for more efficient treatment of effluent waters. The different wavelengths distinguish among 222 nm, 222 nm combined with 248 nm and 248 nm, all of which are suitable for typical effluent water bacteria and other micro-organisms in real water.

The knowledge gained contributed significantly to the development of an innovative plasma-based water disinfecting process. Apart from the economic benefits derived from its use in the field of drinking water disinfection, there are also numerous social benefits. As such, the Plaslight project results may help to reduce microbiological pollution of coastal waters, rivers and lakes.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3876

See also pages 20 (offers 3866 and 3846), 21 (offers 3774, 3869 and 3849) and 22 (offers 3808 and 3949)

Improving the accuracy of carbon dioxide measurements

Research funded by the EESD programme is improving the accuracy of carbon dioxide (CO_2) measurements in the atmosphere.

Public awareness of the threat of climate change is growing. Reliable climate forecasts depend heavily on information on concentrations of CO_2 and therefore it is necessary to closely monitor the evolution of CO_2 around the globe.

This can be accomplished with instrumentation aboard earth-orbiting satellites such as Envisat. In the context of the COCO project, the Centre national de la recherche scientifique (CNRS) used data from the scanning imaging absorption spectrometer for atmospheric chartography (Sciamachy) instrument to estimate CO_2 concentrations in the atmospheric column.

The Sciamachy sensor takes advantage of CO_2 absorption at specific wavelengths in the electromagnetic spectrum. However, the analysis performed by the CNRS revealed that scattering by aerosols and undetected clouds can cause significant interference. This can distort the resulting CO_2 concentration data by as much as three parts per million.

Fortunately, the French scientists were able to resolve this problem by assimilating ground-based measurements of the solar spectra from the Kitt Peak National Observatory. The method, which is based on the concept of differential absorption, was able to reduce error levels by 50 %.

The CNRS recommends the application of the procedure to improve the quality of CO_2 column data, in particular data destined for use in inversion models.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3952

Model assesses shrubland vulnerability

A system for producing and applying socioeconomic scenarios of land-use change which may be applied to any region of Europe has been developed. Additionally, a strategy was designed for applying the system to generate quantitative and spatial scenarios of land-use change within various socioeconomic futures.

Shrubland ecosystems in Europe are threatened by many environmental stress factors. Climate change contributes to an increase in night-time temperature, more severe rainstorms and prolonged droughts. It is quite probable that such factors will affect the way the ecosystem functions in European shrublands. The Vulcan project has examined these impacts through the use of experimental manipulations of six shrubland ecosystems in Europe.

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An expert system was developed to carry out vulnerability scenarios for shrublands in order to examine and prioritise management actions. This was achieved by using experimental results and current knowledge regarding management impacts. Following this, a strategy was created so that the system could be implemented to yield quantitative and spatial scenarios of land-use change. The socioeconomic scenarios were applied to regions that require risk assessment. These included Catalonia (Spain), the Dune-Titse Interfluve (Hungary) and Wales (United Kingdom). The application of the socioeconomic scenarios varied based upon the need of each region.

Results from the land-use change scenarios were then placed into the risk assessment methodology for each country. In this way, land-use change results could be merged with the Vulcan experiments as well as with results of studies done on additional impacts, such as nitrogen deposition. This method indicated that shrubland may very well become greater with land-use and climate changes. The assessments can help offer high-quality information for decision-makers to take necessary provisions regarding threats to European shrublands.

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 > 3809

The OASYS landslide classification scheme

The Geological Bureau of China distilled the best parts of three existing landslide classification systems to create a new classification scheme for the purposes of the OASYS project.

One of the fundamental aims of R & D projects funded by the EU is to foster collaboration. Gathering several different institutions together facilitates the sharing of existing experience and expertise and the creation of new knowledge.

These collaborations frequently extend beyond the borders of the EU. In the case of the OASYS project and landslide alert systems, a partner was included from China, a country that has suffered from many devastating landslides.

An important aspect of managing landslide risk is proper classification of landslides once they have occurred. As there are numerous types of landslide, there is no single approach to classification. The Geological Bureau of China undertook the task of integrating its own classification scheme with that of a fellow OASYS partner, the University of Modena and Reggio Emilia, and a scheme commonly used in the United States.

The resulting OASYS classification scheme is based upon a number of factors. It accounts for the type of underlying rock and topsoil as well as the trigger mechanism (such as a flood or an earthquake) involved. In addition, the type of earth movement is defined as explicitly as possible: fall, slide, creep, topple, spread and flow, to name a few examples. Finally, the results of the landslide are described in detail.

The Geological Bureau of China invested considerable effort in order to preserve the optimal components of each of the three original schemes. The OASYS classification scheme was subsequently used to classify a number of landslides at test sites in both China and Europe.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3892

Integrated early warning system for landslides

A comprehensive website is helping to spread the word about an innovative early warning system for landslides.

Landslides occur naturally, but can also be triggered by anthropogenic parameters. Either way the results are often devastating, but loss of life could be avoided if early warning systems were put in place.

A landslide early warning integrated system (LEWIS) was built during a multimillion euro research project of the same name. A total of 15 research institutes, universities and regional authorities took part in LEWIS. Their approach focused on incorporating and exploiting earth observation data. An important part of the research involved analysing earth observation data for sites where ground-based instrumentation was available for comparison.

Information technology specialists at Silogic, a project partner, established a presence for the LEWIS project on the Internet (http://www.silogic.fr/lewis). Visitors will find information about the motivation for the project and its objectives. There are also links to each of the 15 LEWIS partners' websites. A special password-protected area provides advanced online capabilities to the consortium.

For those interested in learning more about the early warning system, the project's main deliverable, the LEWIS final scientific report, is available for download. This is complemented by a comprehensive list of scientific publications originating from the research. The list of 19 articles is broken down into five thematic categories.

Finally, as one of the main goals of the website is to attract new users to LEWIS, interested parties are encouraged to contact the project manager. Visitors can also subscribe to an e-mail-based interest group.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3810

Calibration of ultramodern optical seismometers

The Romanian National Institute of Research and Development for Earth Physics established a two-step calibration procedure for optical seismic sensors developed during the Optsdet project.

The EESD programme funds projects that will bolster Europe's defences against natural disasters. Earthquakes are common in many parts of Europe and can result in significant loss of life and property damage.

An EESD project entitled Optsdet aspired to create a new generation of seismic sensors based on advanced optics. The Romanian National Institute of Research and Development for Earth Physics, an Optsdet partner, tackled the challenge of calibrating the new sensors. The institute applied expertise it has accumulated while operating the national seismic network in Romania.

The main obstacle the Romanian seismologists had to overcome was the lack of existing calibration equipment designed for optical instrumentation. Their solution was to calibrate with a conventional electromagnetic seismometer. In order to cover the necessary frequency range, the institute developed a two-step approach.

Proper measurement of smaller earthquakes requires a higher signal-to-noise ratio. The institute attained this by placing the sensors in a special vault in quiet regions (such as caves or basements). Once this step is complete, the sensors are moved into the laboratory and onto a shaker table. The frequency at which the shaker table moves is known, and this information can be used to calibrate the response of the electromagnetic and optical seismometers accordingly.

For the reference electromagnetic sensor, the institute proposes the S-13 model of Teledyne Geotech, which has performed reliably in the field in the Romanian national network. More information can be found in a report, compiled by the institute for Optsdet, that describes the calibration procedure in detail.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3832

Robotic minds think alike?

Most schoolchildren struggle to learn geometry, but they are still able to catch a ball without first calculating its parabola. Why should robots be any different? A team of European researchers have developed an artificial cognitive system that learns from experience and observation rather than relying on predefined rules and models.


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Led by Linköping University in Sweden, the researchers in the Cospal project adopted an innovative approach to making robots recognise, identify and interact with objects, particularly in random, unforeseen situations.

Traditional robotics relies on having the robots carry out complex calculations, such as measuring the geometry of an object and its expected trajectory if moved. But Cospal has turned this around, making the robots perform tasks based on their own experiences and observations of humans. This trial-and-error approach could lead to more autonomous robots and even improve our understanding of the human brain.

'Gösta Granlund, Head of the Computer Vision Laboratory at Linköping University, came up with the concept that action precedes perception in learning. That may sound counterintuitive, but it is exactly how humans learn,' explains Michael Felsberg, coordinator of the EU-funded Cospal project.

Children, he notes, are 'always testing and trying everything' and by performing random actions — poking this object or touching that one — they come to understand cause and effect and can apply that knowledge in the future. By experimenting, they quickly find out, for example, that a ball rolls and that a hole cannot be grasped. Children also learn from observing adults and copying their actions, gaining greater understanding of the world around them.

Applied in the context of an artificial cognitive system (ACS), the approach helps to create robots that learn much as humans do and can learn from humans, allowing them to continue to perform tasks even when their environment changes or when objects they are not pre-programmed to recognise are placed in front of them.

'Most artificial intelligence-based ACS architectures are quite successful in recognising objects based on geometric calculations of visual inputs. Some people argue that humans also perform such calculations to identify something, but I don't think so. I think humans are just very good at recognising the geometry of objects from experience,' Dr Felsberg says.


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The Cospal team's ACS would seem to bear that theory out. A robot with no pre-programmed geometric knowledge was able to recognise objects simply from experience, even when its surroundings and the position of the camera through which it obtained its visual information changed.

A shape-sorting puzzle of the sort used to teach small children was used to test the system. Through trial and error and observation, the robot was able to place cubes in square holes and round pegs in round holes with an accuracy of 2 mm and 2 degrees. 'It showed that, without knowing geometry, it can solve geometric problems,' Dr Felsberg notes. 'In fact, I observed my 11-month-old son solving the same puzzle and the learning process you could see unfolding with both him and the robot was remarkably similar.'

Another test of the robot's ability to learn from observation involved the use of a robotic arm that copied the movement of a human arm. With as few as 20 to 60 observations, the robotic arm was able to trace the movement of the human arm through a constrained space, avoiding obstacles on the way. In subsequent trials with the same robot, the learning period was greatly reduced, suggesting that the ACS was indeed drawing on memories of past observations.

In addition, by applying concepts akin to fuzzy logic, the team came up with a new means of making the robot identify corresponding signals and symbols such as colours. Instead of specifying three numbers to represent a red, green and blue component, as used in most digital image processing applications, the team made the system learn colours from pairs of images and corresponding sets of reference colour names, such as red, dark red, blue and dark blue in a representation known as channel coding. Similar to how colours are identified by the human brain with sets of neurons firing selectively to differentiate green from black, for example, channel coding offers a biologically inspired way of representing information.

'As humans, we can use reason to deduce what an object is by a process of elimination, i.e. we know that if something has such and such a property, it must be this item, not that one. Though this type of machine reasoning has been used before, we have developed an advanced version for object recognition that uses symbolic and visual information to great effect,' Dr Felsberg says.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89632

See also pages 5 (offer 3853), 32 (offers 3879 and 3859) and 34 (offer 3939)

Web of entities: prepare to 'Okkamise'!

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Internet searching is something of an art form. The spaghetti-like tangle of documents and fragments resulting from what you thought were perfectly cogent keyword searches make the web a forbidding place. European researchers are developing a better way to publish, link and find information using a 'web of entities'. Prepare to 'Okkamise'!

That the word 'Google' has entered our vocabulary with such ease is testament to the powerful yet complex 'web of documents' that we call the Internet. If I want the number of a nearby trattoria in Brussels, but I can't remember its name, I enter the keywords 'trattoria and brussels' and ecco the results are displayed … all 25 000 of them! How am I supposed to find the restaurant I'm looking for? More searching, more hassles.

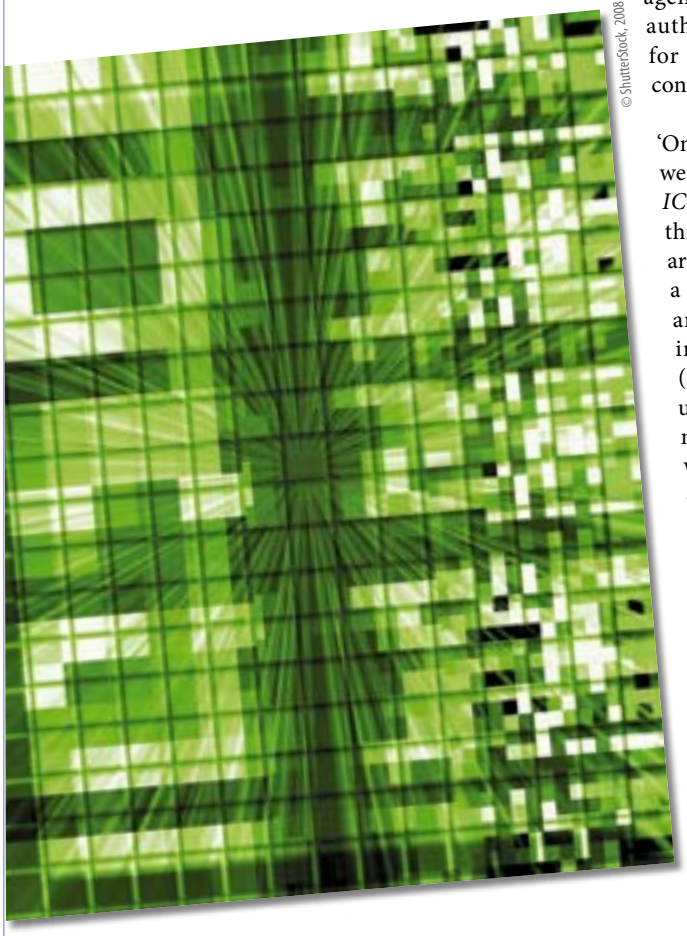
In some ways, the Internet's success threatens to undermine its ultimate utility unless a better way to structure the information is developed. This is where Okkam enters the picture.

The idea behind the EU-funded Okkam project is to unlock the full potential of the semantic web, helping people and machines to find, share and integrate information more easily. It borrows from 'Ockham's razor', a principle named after 14th-century logician William of Ockham that assumes the simplest solution is the best. 'Entities should not be multiplied beyond necessity,' it states.

With Okkam, the main 'objects' being scanned are no longer documents that just happen to contain certain keywords, but 'entities', such as people, locations, organisations or events, explains Paolo Bouquet of Trento University and Okkam's spiritual leader.

The core Okkam infrastructure will store and make available for reuse so-called 'global identifiers' which can be applied to and used by anyone or anything across formats and applications. These are not to be confused with 'certification', Dr Bouquet stresses, which he says is targeted more at making the web a safer place to transact. It is more concerned with distributed information and knowledge management.

Big companies, for example, can quickly and accurately benchmark their new products or processes against competitors or carry out internal knowledge management tasks. Project partner SAP, the enterprise software giant, is testing how Okkam can help in managing information on their public web portals like http://sdn.sap.com. Other Okkam partners, the scientific publisher Elsevier and ANSA, Italy's leading news agency, are defining the authoring environment for scholarly and news content, respectively.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'One of the biggest risks we face,' Dr Bouquet tells *ICT Results*, 'is people thinking the identifiers are a controlling device, a "Big Brother" scenario. Far from it, the information that we (and you as an Okkam user) gather is the bare minimum to improve web searches. So you can quickly discern, for example, whether "Paris" is the capital of France or a bistro in Boston, and whether it's a web page or an obscure mention in a Voltaire manuscript.'

Trends in the semantic web and social networking are ushering in a new era of meaningful and mobile information searching and interaction online. The future network is moving away from people sitting at home in front of their PCs trying to find information in billions of unstructured pages using what Dr Bouquet calls 'keyword guessing'.

Okkam's coordinator says more precision and integration are inevitable developments on the net: 'Information will be integrated and clustered from a large number of different, heterogeneous data sources all over the Internet, provided by software agents, responding to users' data needs in whatever contexts.'

Of course, this scenario calls for a serious rethink of the 'publish and be damned' approach to Web 1.0 and even 2.0. 'We believe that Okkam represents a substantial move in the direction of a "web of entities",' he posits. But are we ready for this interpretation of Web 3.0?

Okkam's entity identifiers offer a powerful departure on the traditional online social networking scene, where you post bits and pieces about yourself on, say, LinkedIn, then some more on Flickr. What happens to the data then? Can it be corralled together? Dr Bouquet thinks so.

For example, he says, with their Foaf-O-Matic application you can generate 'Friend of a friend (Foaf) profiles' using Okkam infrastructure to issue friends with globally unique identifiers which can be used on multiple social networking platforms creating one big 'distributed and decentralised social network'. But having the technical ability and making it happen is not the same thing, he concedes.

William Stevens of Europe Unlimited, a networking consultancy, echoes this view. The technology for the semantic web is sound, but getting people to perceive the new developments as useful is the trick, he suggests. 'Not just an attractive technology, but one that's actually used on the market.' A critical mass of users and entries will mean the difference between useful Okkam searching and lacklustre results, he notes.

Although very early days for the project, the plan by the end of 2008 is to have a solid starter-base of one million 'entities', with a

continued on page 29

Executable specifications for a higher level of abstraction

Aiming to bridge the gap between the design complexity of embedded software/hardware components and the designer's ability to grasp their complete behaviour, the level of abstraction in designs has been raised. The overall aim is a rapid increase in designer productivity, matching the increase in design complexity.

As the complexity of electronic systems constantly increases and at the same time design schedules become tighter, interest in new electronic design automation (EDA) methods and tools is growing. An interesting development is the adoption of executable specifications as a potential replacement for conventional written specifications, which promise to provide unambiguity and completeness.

For designers to be able to develop such executable specifications, the Odette project introduced object-oriented methods into the design of digital hardware for embedded software/hardware systems. While object-oriented methods have been a matter of course in software development for a long time, it was not possible to use them in designing integrated circuits until recently.

With the definition of object-oriented extensions to hardware description language SystemC, the development of synthesis tools supporting the design of integrated circuits at high level of abstraction was rendered possible. The high-level synthesiser proposed by project partners at OFFIS laboratories supports the transition from an algorithmic-level specification of a digital system to a register-transfer-level structure, implementing its behaviour. The resulting hardware model features the same simulation results as the input model and, more importantly, it can be processed by current EDA tools.

The extended SystemC synthesis subset contains language concepts that hold the promise for higher productivity of embedded hardware/software components. Furthermore, the synthesiser's flexible architecture allows for future enhancements, which even include support for additional data types that were not originally considered, as well as for alternative input language subsets.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3916

Telecommunications convergence towards services evolution

The convergence of formerly discrete telecommunications services over multiple digital standards has been evaluated within the FLOWS project, which aimed to define appropriate mapping schemes and complete a technical unbundling process.

Simultaneous use of several services through different systems with a single terminal is an important issue for wireless communications, as high demands on data transfer rates are anticipated. The foreseen convergence of services intends to provide the broad interoperability needed for users to seamlessly switch among different systems based on whichever is the best connection at the time.

Within the FLOWS project, R & D in emerging wireless communication technologies was based on this 'Always best connected' concept for ensuring continuity of services. More specifically, to enable the mapping between different services and multiple digital standards, a convergence manager was developed at the Technische Universität Hamburg-Harburg in Germany.

The term 'standard' was used in the framework of the FLOWS project to designate a single or a collection of specifications, which apply to standardised radio communication systems. Standards such as the global system for mobile communications (GSM), the universal mobile telecommunications system (UMTS) and high-performance radio local area network (Hiperlan) each defined a specific radio access scheme.

For mapping services to standards, different criteria needed to be evaluated in order to ensure that it will benefit all involved actors, including end-users, network operators and service providers. The final decision would be made on the basis of the different quality of service (QoS) requirements, the network capacity and channel status, as well as the mapping policy, among others.

However, the benefits from mapping services to different standards depend on the location and the complexity of the convergence manager's functionality. As possible hosting entities, the terminal and components of the access, core and backbone network components were proposed. Moreover, extensive simulations were carried out to evaluate the advantages of the possible locations of the convergence manager along with the constraints imposed.

It was found that it is imperative for the mobile terminal to have a convergence manager module, although an additional module in the core network would provide the most flexible arrangement. At a technical level, it will enhance the QoS in telecommunications transmission facilities optimised for particular data applications, such as speech telephony and asynchronous data transfer.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3858

continued from page 28 **'Web of entities: prepare to "Okkamise"!'**

further million every year for the duration of the 30-month project. Without this critical mass, it will be harder to convince early adopters, especially application developers, to take up and use Okkam.

'Having a solid business exploitation model and sustainability strategy built into the research plan is also critical,' Mr Stevens says. It will also be important to get the word out about Okkam to application developers, industry, investors and users the world over.

Having SAP and Elsevier, two big potential users, as partners is clearly no coincidence. Bouquet has also presented demos of the technology and Okkam's business plan to big names in the business, including Sisco and Microsoft, at the recent i-techpartner Software Forum in Porto, hosted by Europe Unlimited. 'Okkam definitely generated some buzz in Portugal!, Mr Stevens confirms.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89617

See also pages 30 (offer 3861), 32 (offer 3822), 33 (offer 3817), 36 (offer 3882) and 47 (offer 3888)

Fast resonators for mobile communications

With the use of innovative fast tuneable dielectric resonators, universal mobile telecommunications systems (UMTS) meet stringent EU specifications.

Base stations emitting mobile telecommunication frequencies at approximately 2 gigahertz (GHz) are obliged under strict EU regulations to satisfy specific demands posed on their filter performance. To meet current but also future EU requirements, the 'Tuneable filters based on dielectric resonators' (TUF) project has developed innovative dielectric resonator filters. These new resonators are characterised by extremely low dielectric losses and can also be used in other scientific fields for accurate measurements of total radiation power (bolometry).

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The tuning is realised with the aid of two coupled resonant modes, a cylindrical dielectric resonator with resonance at the TE01d mode and a planar microwave slotline resonator. The resonance frequency of the resulting resonator assembly changes following the variation of the coupling of the two modes. This intermodal coupling is controlled with fast microelectromechanical (MEMS) or piezoelectric switches. Such laboratory-developed and patent-protected resonator assembly with working frequency at 2 GHz is capable of tuning by 5 MHz in 0.25 MHz frequency steps. Its unloaded quality factor is about 10 000 and its measured switching time is about one millisecond.

Variation of the slotline resonator configuration alters the intermodal coupling and consequently affects the tuning range. An arrangement of the cylindrical resonator with four radial resonators symmetrically placed below it resulted in minute intermodal coupling and left the resonance frequency of the cylindrical resonator practically unaffected.

With numerical field simulations, project partners searched for the optimum slotline configuration. For the case of four symmetrically arranged slotlines on a plane, it was found that their presence in the assembly did not produce any significant effect and the frequency remained the initial cylindrical resonance frequency. By replacing the MEMS with commercial piezoelectric bimorph actuators, successful tuning has been achieved.

The above-mentioned, highly promising results oblige project partners to further optimise planar resonator structures. They are currently seeking to reach larger tuneability without dispensing with the high quality factor already achieved.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3948

Knowledge market innovations for business advantage

The knowledge collection and management toolkit designed within the 'Acceleration of innovative ideas to market' (AIM) project aims to contribute to the competitiveness of industrial companies by providing them with means to foster their innovation capabilities.

The relentless race to develop innovative products of a higher quality while reducing product costs and time-to-market has been proven to be a major challenge for all industrial companies. Most companies lack the financial capacity either to invest in the latest technology as it reaches the market or to hire specialists to integrate new methodologies into their manufacturing processes.

On the other hand, many companies have the required corporate breadth of experience to improve their manufacturing process if they could only make best use of knowledge and expertise internally. Technical and empirical knowledge coming from all participants in the product value chain can be stored, evaluated and managed in an efficient way to foster innovation with the AIM system.

Combining the ideas and feedback from all parts of the product life cycle, it encourages teamworking between people from different sites, including customer services, field engineers and suppliers. Methods and dedicated tools for collecting innovative ideas, complementing another important source of knowledge coming from problems and potential improvement points, are included in the AIM system.

Keeping in mind that the gap between knowledge and its respective use has to be eliminated, all the knowledge collected is evaluated in two phases, enabling functional and financial assessments. Information that describes products and industrial processes along with the results provided by the AIM tools are classified and stored as potential improvements or causes for problems identified.

A collection of methods, oriented towards finding robust solutions to be applied in the industrial environment, provides structured means for developing ideas stored in the ideas repository into innovation concepts. Moreover, the AIM system supports an efficient way for planning and monitoring the use of innovation knowledge during the design of new processes and products.

The project partners' intention was to further offer customisation services for adapting the AIM toolkit as a complete software package to its customers' individual structure and developing interfaces with legacy systems.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3861

See also pages 28 (Web of entities: prepare to 'Okkamise'!), 33 (offer 3817) and 47 (offer 3888)

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Emotional machines

Emotions are an intrinsic part of communications. But machines don't have, perceive or react to them, which makes us — their handlers — hot under the collar. But thanks to building blocks developed by European researchers, machines that 'feel' may no longer be confined to science fiction.

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Nearly everybody has to communicate with machines at some level, be it mobile phones, personal computers or annoying, automated customer support 'solutions'. But the communication is on the machine's terms, not the person's.

The problem is easy enough to identify: prodigious increases in processing power, giving machines greater capacities and capabilities, have not been matched by a similar leap forward in interface technology. Although researchers around the world have been working on making the human-machine interface more user friendly, most of the progress has been on the purely mechanical side.

The Humaine project has come at the problem from a quite different angle to earlier, unsatisfactory attempts. It has brought together specialists and scholars from very different disciplines to create the building blocks or tools needed to give machines so-called 'soft' skills.

Professor Roddy Cowie, coordinator of the EU-funded project, says the issue was confused by everyone trying to do the whole thing at once when nobody had the tools to do so. Commonly, systems would be developed by skilled programmers and engineers who understood how to write and record great computer programs, but knew little about defining and capturing human emotion. 'When they developed databases, the recordings were nothing like the way emotion appears in everyday action and interaction, and the codes they used to describe the recording would not fit the things that happen in everyday life,' Professor Cowie explains.

So Humaine went right back to the beginning and set up teams from disciplines as different as philosophy, psychology and computer animation. The psychologists studied and interpreted the signals people give out, signifying different emotional states from boredom through to rage. Part of this is simply what is being said, but there is also the tone in which it is being said, the expression on the face, and smaller signals like eye gaze, hand gestures and posture. Put all of these together and it is then possible for the psychologists and IT professionals to work together on a database which allows the interpretation of, and reaction to, emotion. 'Then the people who know about communications feed information to people whose job it is to get computers to generate sophisticated images,' Professor Cowie says.

This is a simplistic explanation of a highly complex project which might not come to full fruition for another 20 or 30 years, although there are already concrete results and applications of some of the technological threads the project has come up with. 'We've developed systems for recognising emotion using multiple modalities and this puts us very much at the leading edge of recognition technology,' Professor Cowie explains. 'And we've identified the different types of signal which need to be given by an agent — normally a screen representation of a person — if it is going to react in an emotionally convincing way.' Some of these technologies are close to commercial application, he tells *ICT Results*.

In trials in Scotland and Israel, museum guides, in the form of hand-held PDAs with earpieces and microphones, monitor visitors' levels of interest in different types of display and react accordingly. 'While this is still at a basic level, it is a big step up from a simple recorded message,' Professor Cowie points out. At another museum in Germany, a large avatar called Max spices up the presentation by interacting with children. 'Max is not very deep, but he is very entertaining, and he engages the kids,' according to Professor Cowie.

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Designers have also used the techniques to monitor the emotions of people playing video games and improve the design accordingly. Possible applications include learner-centred teaching, where students' interest levels can be monitored and responded to, and more user-friendly manuals for, say, installing computer software.

'People automatically assume the work is aimed towards full interaction between humans and machines, rather like HAL from *2001: A Space Odyssey*,' Professor Cowie says. 'That may never happen. Humaine's philosophers have thought through carefully whether we should allow it to,' he adds. Even if it does go that way, it is certainly not any time soon, he notes.

But the path to emotional machines is being paved today. Professor Cowie and his colleagues have already set up a new project to tie the threads together and come up with an agent which can truly interact using voice. Here, new advances in speech recognition technology from other projects will be necessary for full interaction.

In the meantime, plenty of other applications will present themselves. 'As our interactions with machines get more and more pervasive, it becomes harder and harder to ignore the emotional element. Taking it into account will become a routine part of computer science courses and computer development,' Professor Cowie concludes.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89652

Hardware implementations of reprogrammable neurons

The ability of artificial neural networks to learn and generalise complex relationships from a collection of training examples has been established through numerous research studies. A new architecture of programmable logic gates aims to provide for the training and reconfiguration of their hardware realisations.

The problems associated with the scaling limits of complementary metal-oxide semiconductor (CMOS) devices have led to the search for alternative transistor and circuit configurations. Proposals for silicon-based technologies include single electron devices, resonant tunnelling diodes (RTDs) and metal-oxide semiconductor field-effect transistors (Mosfets). Of these, RTDs appear to hold the most promise as a short- to medium-term solution offering the possibility to improve compactness and speed of very large-scale integrated (VLSI) circuits.

Research work within the QUDOS project aimed to bridge the current gap between research on functional devices based on RTDs and research into logic synthesis for field-programmable gate arrays (FPGAs). FPGAs consist of logic, input/output and routing elements, which can be programmed and reprogrammed in the field to customise FPGAs, enabling them to implement a given application in milliseconds. With the development of large and highly parallel FPGA circuits, hardware realisations of artificial neural networks (ANNs) with enhanced speed of operation and portability have become possible.

This particular application was chosen by QUDOS project partners as the future success of RTD-based threshold logic gates (TLGs) will depend on their suitability for use in VLSI circuits. The need for reliable and repeatable manufacture of such devices that display suitable performance characteristics is obvious. Gate design must also demonstrate a robustness that will be tolerant of device parameters and power supply variations. The programmable TLG, designed to realise all possible binary functions for any number of inputs, was incorporated (along with EX-OR and AND gates) in a positive Davio expansion architecture.

In addition, multiple-valued logic (MVL) weights as 'soft' parameters representing voltages allowed all binary functions to be programmed when the TLGs were arranged in an appropriate architecture. A parallel architecture, similar to that required for the ANNs, was considered by connecting multiple two-input programmable TLGs and the independence of their programmable functions was investigated. The outcome suggested that programmable TLGs can be connected in larger scale circuits; however, they appear to be more suited to highly parallel architectures.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3879

Sophisticated quantum device technology

Aiming to speed up reprogrammable nano-electronic applications, a novel quantum mechanics technology led to the design of a multi-threshold artificial neuron.

The QUDOS project focused on the development of a robust negative-differential resistance (NDR) device technology available on a silicon substrate. The innovative technology was extensively elaborated in terms of manufacturability, compatibility with silicon circuitry, and performance of emerging candidates such as resonant tunnelling devices.

Resonant tunnelling devices constitute one of the key types of quantum effect devices as they show several advantages. They operate normally under room temperatures and, with the aid of an integration process, they offer a large variety of options in design. Such devices are resonant tunnelling diodes (RTDs) and can be designed on the basis of threshold logic computational models.

RTDs are built of threshold gates instead of the commonly used Boolean gates such as AND, OR and similar. Although they can be realised very efficiently, they are able to complete more complicated functions. The project work focused on developing a new computational model — the multi-threshold threshold gates (MTTGs) that can further increase the functionalities of conventional threshold gates.

The developed MTTG circuit topology is highly suitable for implementation with mobile RTD structures. It was shown that suitable sizing of RTDs can result in two-output neurons. Furthermore, the circuit topology was also extended to implement programmable neurons and the methodology was exploited to make the design of complex neurons with RTDs more systematic.

The MTTG circuit approach has been proven useful allowing the implementation of nano-pipelining at the gate level. For further information on the project, please visit: http://www.hlt.uni-duisburg.de/research/projekt_dokumente/qudos/qudos1.html

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3859

See also pages 5 (offer 3853), 27 (Robotic minds think alike?) and 34 (offer 3939)

Advanced information and knowledge processing

Ontologies, used as shared vocabularies to improve information retrieval or to help data integration, are often developed by several researchers in parallel. Successful application of ontologies in such uncontrolled, decentralised and distributed environments requires substantial support for change management.

The idea behind applying ontologies to information management is that computers could exploit explicit descriptions of the meaning of data on web pages to handle it in a more intelligent way. However, neither the data on the web, nor the ontologies themselves are permanent and stable. How to effectively use ontologies for computerised information management is still an ongoing research issue. Applying independently developed ontologies together in a dynamic environment where they change over time is even more of a challenge.

Research work within the Wonderweb project focused on designing a component-based framework to cope with distributed ontology evolution. The description of the mechanics of the so-called 'semantic web' and the analysis of current practices for change management led to a number of guidelines for the framework design. Since different tools using the framework should agree on the basic part of the ontology, a meta-model of ontology change specifying a large number of change operations was defined initially.

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From sensing to perception systems

Under the auspices of the innovative Sensemaker project, a mixed-signal neural network chip that incorporates spiking neurons and adaptable synapses was realised.

The Sensemaker project designed electronic architectures that integrate diverse sensory information into a complete perceptual model of the environment. By mimicking the biological principles of sensory receptor and nervous system function, the environmental space is represented at a higher cognitive level.

Similar to the brain, the Sensemaker system can extract correlated information from sensory representations that are simultaneously refined with the aid of different sensory modalities. Based on a predefined library, the system opts for a minimal set of sensory modalities that are combined to allow a reliable object/environment distinction and identification.

With the aid of neuro-mimetic modelling, the perceptual system was extensively explored and finally implemented using programmable mixed analogue/digital application-specific integrated circuits (ASICs). Given an unpredicted change in the environment or in the case of a partial impairment of some sensors, the system is capable of self-reconfiguration through formation of supplementary cross-connections.

Spiking neurons and adapting synapses were implemented using a mixed-signal neural network ASIC. The spiking neural network imitates neural behaviour which is explained using membrane models. Hence, spikes can be generated under certain threshold membrane voltage values while the conductance-related synapses offer a realistic basis for their reversal potentials.

Due to variations in the manufacture process, each one of the transistors is different from the rest just like neurons. Aiming to control these fluctuations in order to develop neural micro-circuits with a known statistical distribution of their parameters, each electronic neuron features several individually tuneable parameters.

Furthermore, a better insight on the details of the brain's adaptation to the environment is provided through plasticity. Thereby, associative plasticity rules were borrowed from the biological counterpart using spike-timing-dependent plasticity algorithms derived from mammalian neo-cortex studies and used to store long-term memories. In the spiking neural network chip, each synapse measures the correlation between pre- and post-synaptic signal.

Lifelike perception systems mimic the sophisticated interaction of a living system with its environment. Merging sensory information, such as vision, hearing and touch, with cognition, control and response, these systems can potentially extend the capabilities of machines and augment human senses.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3918

See also pages 38 (offers 3838 and 3896) and 39 (offers 3785 and 3900)

Ontology-driven knowledge management

Under the auspices of the Parmenides project, an ontology editor tool was developed for faster searches in structured and unstructured, heterogeneous, autonomous data repositories.

The expansion of e-commerce has brought new needs in the content management activities of businesses. This is due to the fact that required information may come from either internal or external sources to the company. Moreover, modern analytical software has become more proactive in driving business processes on the basis of analysis results.

Thereby, customer relationship management (CRM) and enterprise resource planning (ERP) software tools contain structured information that can be easily organised. Yet, there is a lot of unstructured data coming from various locations and in several formats that cannot be organised easily and hence utilised. The need to access, manage and analyse all knowledge sources is imperative for any organisation wishing to have the competitive advantage using its information treasure effectively.

Motivated by this, the Parmenides project focused on providing an effective organisational knowledge management system for contemporary business organisations. By realising an ontology-driven mechanism, the entire process of gathering, processing and analysing information is integrated. The management of information concerns both structured and unstructured heterogeneous data sources.

Part of the project work involved an ontology editor allowing users to build and store ontologies in a tree-based graphical interface with drag-and-drop options. The tool is capable of managing, importing and exporting multiple ontologies along with user-friendly reporting on their structure. Current ontologies can also be treated equally as single XML documents. Licence agreements for the ontology editor tool are available. For more information on the project, please visit: http://www.crim.co.umist.ac.uk/parmenides

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3817

See also pages 28 (Web of entities: prepare to 'Okkamise'!), 30 (offer 3861) and 47 (offer 3888)

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Essentially, the set of basic operations is the 'common language' that tools share for change representation or for augmenting information represented in one formalism with information in another. In order to define standard change operations, the meta-model of two well-known ontology representation formalisms, namely the open knowledge base connectivity (OKBC) and the web ontology language (OWL), was used. These change operations were precisely defined additions, removals or modifications to the definition of a concept, a property or an ontology as a whole.

Finally, the ontology for change operations for OKBC and OWL was extended to a general specification language. The ultimate aim of this specification language is to provide a vocabulary and syntax to express an accurate specification of ontology changes. Moreover, change operations were aggregated into composite operations that perform several modifications in one step. By choosing either composite or simple operations, the level of refinement of a change specification can vary. To provide some evidence of the usability of the framework, parts of it have been implemented in automated tools with the aim of conducting theoretical and practical studies.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3822

See also pages 28 (Web of entities: prepare to 'Okkamise'!) and 36 (offer 3882)

Magalia: an IPv6 real-time management tool

The Euro6IX project developed a native pan-European Internet protocol version 6 (IPv6) network including several innovative applications and services, such as the Magalia software tool.

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Aiming to introduce and support IPv6 in Europe, the Euro6IX project studied, designed and deployed a native pan-European non-commercial IPv6 Internet exchange network. The Euro6IX test bed features high service quality and increased robustness similar to those offered by Internet protocol version 4 (IPv4) Internet exchange networks.

The Euro6IX test bed allows several regional native IPv6 exchanges across Europe. Another level of the Euro6IX infrastructure is the backbone level, a core network that allows interconnection of the regional exchanges. The design architecture also offers an access level of nodes for Internet and service providers, as well as corporations and users.

Users are able to interconnect through various access technologies, even using legacy IPv4 networks and services in cases where IPv6 native links are unavailable or not feasible. The project work also focused on the research of advanced network services and development of applications, such as Magalia.

Magalia is a real-time monitoring tool for IPv6 network operation centres (NOCs). Using the simple network management protocol (SNMP), Magalia allows the exchange of management information between the network devices in the most user-friendly way. It involves various features including network map graphics, shared management functionality and nodes (hosts and routers) status monitoring potentialities.

With the aid of its different modules, Magalia offers plenty of functionalities including voice-mailing for communication among NOCs and e-mail alerting. There is also increased capability to retrieve data from other networks' webs. For further information on the project, please visit: http://www.euro6ix.org/main/index.php

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 > 3897

Towards optimal information storage

Different aspects of biological neurons that can be implemented through specific hardware architectures and used for motor control were extensively studied with the ultimate aim of constructing real-time adaptive robots.

Although significant advances have been recently made in artificial intelligence and machine learning, major issues remain unresolved. These include learning abilities as well as the movement finesse that are difficult to be mimicked by machines, but humans and animals display ubiquitously. Do brain neural cells provide a computational platform with characteristics and representations that could permit such abilities to be expressed in machines and to be applied in practice?

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By investigating neural mechanisms of information processing in the brain, the Spikeforce project sought to address similar questions raised on computational methods used in current computer and integrated circuit technologies. Neurons in the brain process analogue signals with continuous values, whereas their communication in the form of impulses or spikes is essentially digital and asynchronous in time. Project partners' research work under the coordination of the École Normale Supérieure focused on how spiking neurons enable rapid decision-making and importantly, continuous learning.

Since information is stored in the brain as changes in the efficacy of excitatory synapses, it was argued that their independent operation would have a crucial benefit: maximising the information storage. Furthermore, the complementary link between the distribution of changes in the synaptic efficacy and what has been learned as well as the manner of its learning was explored. For this purpose, a prototypical feed-forward neural network was employed. The task assigned to the neural network consisted of learning the largest possible number of input/output associations given a particular reliability level.

Analytical techniques widely employed in statistical mechanics of distributed information systems afforded the essential means to calculate the maximal information storage capacity of the neural network. This maximal capacity was found to be dependent on a number of network parameters but, crucially, the optimal distribution of synaptic modifications contained a majority of silent synapses. Moreover, the distribution resembled the distribution of synaptic modifications reported for cerebellar synapses, illustrating the insight into learning and memory processes that can be gained by studying the synaptic responses.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3939

See also pages 5 (offer 3853), 27 (Robotic minds think alike?) and 32 (offers 3879 and 3859)

Mobile grids nurture virtual organisations

Organisations cooperating on a task often have difficulties exchanging information and sharing resources. European researchers demonstrate how grid technology could let diverse players, both fixed and mobile, share a common information space both in emergencies and for routine business needs.

A bomb goes off in a crowded shopping centre. Police, fire and paramedic services respond along with the centre's own security staff. A neighbouring school is evacuated and hospitals are put on alert. Several local and national government agencies, utility companies, transport companies and businesses become drawn into the aftermath.

How the crisis is handled depends crucially on the communications systems in use. Can the police talk to the local security staff? Can the fire service exchange information on casualties with the paramedics? Who can access the images from the surveillance cameras? Where will the evacuated children go?

In situations like this, many organisations and individuals who normally work independently need to come together quickly to form a 'virtual organisation'. Unfortunately, the infrastructure to permit free communication between everyone within such virtual organisations has been lacking — until now.

The solution comes from a convergence of interest between two communities that historically have had little to do with each other. One is research scientists using the most powerful supercomputers, often based at selected universities. To share these scarce resources they use a grid, analogous to an electricity supply grid, so that subscribing users can tap into the computing power wherever they may be.

The second group is the network providers and telecom companies who are busy building ever-faster telephone and data networks, especially the next-generation networks that will bring ultrafast Internet links into every home.

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From the overlap between these two areas comes a new idea. Can we provide a service grid to supply all manner of resources not just for researchers but also for public authorities, businesses and individuals? And can mobile users be accommodated as well?

The idea crystallised as Akogrimo, an EU-funded project to develop the infrastructure to make such a grid possible. 'We're talking about a mechanism to enable dynamic collaborations between different organisations,' says project manager Stefan Wesner of Stuttgart University. Now that the project has finished, the partners, led by project coordinator Telefónica, are looking for ways to develop commercial applications.

A key difference with other grid projects is that Akogrimo is designed to link not only organisations but also individuals, often using mobile devices. It can accommodate virtual organisations that are set up in advance for day-to-day tasks and also those, such as in a crisis situation, that come into being at very short notice.

It also copes with many different kinds of devices. 'A user may connect to the grid using different devices,' Mr Wesner explains. 'It could be a fixed workstation, it could be a small PDA, or some other device. They all have different capabilities, screen size, computational power, and use different bandwidths.'

Akogrimo can also keep track of people switching from one device to another without breaking communication, ideal for individuals on the move. The imagined bomb attack was the major application demonstrated in Akogrimo with the assistance of the local authority and emergency services in Bristol. 'It was a bit like having a single information space between all the people involved in the crisis,' Mr Wesner says.

Many applications in telemedicine are possible, especially to support paramedics or other mobile response teams. Diagnostic techniques usually only available in hospitals could be brought to the patient through the grid, along with audiovisual consultations with clinical specialists.

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Likewise, service technicians in the field could access powerful diagnostic tools and expert advice wherever they go. For emergency repairs to expensive products, such as aircraft, this could be very cost effective. Akogrimo also has applications in education, not just in distance learning but, for example, in supporting students on field trips so they can easily share the information they gather.

Of course, in a commercial grid, where services are supplied by many businesses to many users, the problem arises of how to keep track of who owes what to whom. Akogrimo has solved this too. 'We have a model where you get a single bill for all these services from different companies, combined as a single payment,' Mr Wesner told *ICT Results*. 'I would say this is one of our key innovations.'

Many other projects around the world are looking at the potential of grids for providing services, but Akogrimo is the only one that has designed an infrastructure for mobile users. Some of the partners are now working on a commercial application of Akogrimo, known as Sea Cage Gateway, to support the offshore fish farming community in Norway.

'Europe is actually in a leading position in the commercial next-generation grid area,' Mr Wesner points out. 'The funding for grids in the United States is mostly provided by the departments of energy and defence so their applications are quite different. Everything to do with the commercial usage of grids is well influenced by European stakeholders.'

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89587

Software tools to support herbicide removal from soils

The Centro Nacional de Biotecnología (CNB) in Spain developed a powerful database application for organisations using biological methods to clean contaminated soils.

The Access project established scientific cooperation between several European and South American research institutes in the field of bioremediation of herbicides. Bioremediation exploits the ability of microorganisms to degrade toxic chemical compounds like atrazine in the soil environment.

Detailed knowledge of biological, chemical and soil parameters is necessary in order to be successful. In the framework of Access, the CNB of the Consejo Superior de Investigaciones Cientificas created a software tool to facilitate this process.

The heart of the application, entitled MetaRouter, is a relational database. It has been populated with data from Access as well as previous research projects and new data can easily be incorporated from both internal and external databases. The types of data addressed include organisms, chemical compounds, enzymes, reactions, genetics, etc.

MetaRouter users can compose queries to mine the database for information suitable to their particular situation, for instance known biodegradation pathways for specific herbicides. The application runs in a user-friendly web environment. In addition, flexibility has been built in that allows MetaRouter to interact with and exchange data with other software applications.

CNB and its Access partners believe MetaRouter will be a very useful tool for the scientific community involved in bioremediation projects.

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

Collaboration sought: available for consultancy.

http://cordis.europa.eu/marketplace > search > offers > 3944

Interfacing ambient electronics with nature

The Plants ontology is a software tool for formalisation and representation of the knowledge gained during the development of synergistic, scalable, mixed communities of artefacts and plants.

The emerging 'Disappearing computer' initiative has already gained wide acceptance in many fields involving closed settings, such as a house, an office or a lab. Yet, little effort has been made to bring ambient intelligence to open spaces, that is, closer to nature. As a result interfaces to nature have not previously been developed to any extent, with plants and other living organisms being thought of as inert within the space.

Motivated by this, the Plants project focused on developing synergies between living organisms (other than humans) and ambient systems. Narrowing the scope to plant life, project work investigated methods and advanced technology for creating suitable interfaces between artefacts and plants. Consequently, the project results may enable people to form mixed, interacting communities.

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One of the key project results involved the development of the Plants ontology tool for the organisation of the knowledge of the Plants system. The tool's architecture comprises the Plants core ontology for encoding general knowledge and the Plants higher ontology for encoding application-specific knowledge. Knowledge can be distinguished in major themes, including conceptualisation of the BioGadgetWorlds, characterisation of plants and sensor/actuator systems as well as definition of rules.

BioGadgetWorlds is a mixed society where communication between plants and artefacts is managed. Elaboration of the BioGadgetWorlds knowledge could also facilitate its use by other systems. The conceptualisation feature of the Plants ontology guarantees semantic interoperability among eEntities and sustains a service-discovery mechanism. Furthermore, the tool supports the decision-making process, which is one of the key features of the Plants system.

Special provision was made so that the tool is capable of gaining new knowledge through detailed specifications of a machine learning process. For example, knowledge of the plant's photosynthetic process would allow determination of optimal growing conditions.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3882

See also pages 28 (Web of entities: prepare to 'Okkamise'!), 32 (offer 3822) and 33 (offer 3817)

Synthesising haptic interactions

Software for benchmarking haptic research, representing state-of-the-art applications, has been developed.

The Touch-hapsys project created a new breed of high-fidelity haptic display technologies to address haptic interaction as well as to enhance haptic information via visual and auditory input. New technologies were developed and explored in order to enhance haptic displays. Additionally, the psychophysical basis of people's haptic perception was examined. The idea on which this approach is based is using haptic illusions to overcome fundamental technological limitations.

The investigation of how the sensation of haptic presence can be generated with relation to vision was a primary objective. Fundamentals of touch phenomena were researched and necessary cues for generating the sensation of being present and of that involved in touch were verified. Additionally, interactions of touch and vision in virtual environments were examined in order to achieve the optimum feeling of immersion and presence. Emphasis was placed on object representation and recog-

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One virtual step for man, one real leap for mankind

Imagine being able to take a step back in time and walk through the streets of ancient Pompeii hours before the eruption of Vesuvius. In April 2008, European researchers were about to demonstrate that walking through virtual environments is set to be a reality.

'In the virtual environment, you have flight simulators, car simulators, but the most natural way of locomotion for humans is walking and this was practically impossible,' says Marc Ernst, the coordinator of the CyberWalk project at the Max Planck Institute for Biological Cybernetics.

To make virtual walking a reality, the CyberWalk researchers had to address five key issues: providing a surface to walk on, controlling the surface in a way that minimised forces on the user, developing a non-intrusive tracking system, displaying a high-quality visualisation, and ensuring a natural human perception of the virtual environment.

The EU-funded researchers were about to demonstrate their treadmill allowing unconstrained walking in all directions (omni-directional) through large-scale virtual environments at a special workshop in Tübingen, Germany, in April. 'Walking through a virtual city was impossible before,' Dr Ernst says. 'We are the first to demonstrate that you can walk through a virtual city or any type of extended environment.'

Several attempts have been made to develop omni-directional treadmills, with Japanese researchers producing prototypes, and a group in the United States developing a smaller treadmill for military use. Neither allow for truly natural walking and immersion in a virtual environment.

'A key feature is that you need a relatively large treadmill to simulate natural walking,' Dr Ernst explains. 'The one that will be demonstrated is 6 m by 6 m, with an active walking area of 4.5 m by 4.5 m.' According to Dr Ernst, this is the minimum size necessary for 'natural walking'.

The treadmill, or CyberCarpet, incorporates several new mechanical solutions, which ensure smooth and safe operation. The key to the CyberCarpet is a platform with a big chain drive. The chain elements are made of conventional treadmills.

The chain moves in one direction, whereas the movement direction of the belts is orthogonal to that. Summing the two directions of the chain and the belts provides the omni-directional actuation principle and so the treadmill motion opposing the motion of the walker can be in any direction.

'Theoretically there is no limit to the size of treadmill. In fact, the bigger the better,' Dr Ernst says. 'But practicalities dictate that the size of the CyberCarpet is limited to the size of the room, the mechanical constraints of the construction and the money you have to spend.'

To track the walker, CyberCarpet wanted to dispense with the Hollywood-style suits covered in reflective marker balls. Its unique system uses cameras to track the position and posture of the individual. This helps control the velocity of the treadmill and interactions with the virtual environment. Visualising the virtual environment is achieved courtesy of a commercial head-mounted display, which does have markers on it, says Dr Ernst, because you 'simply need a fast and accurate system.'

The possibility of walking through large virtual environments has already received a lot of attention and captured the public's attention. One project partner, the Swiss Federal Institute of Technology, developed the CityEngine, a software package for quickly creating large-scale virtual environments in particular cities, in various degrees of detail.

Combining the CityEngine with CyberWalk will allow people to go beyond strolling through the streets of ancient Pompeii and Rome. Architects, for example, could transport customers into the future, and allow them to walk through buildings even before they have been built.

The Swiss Federal Institute of Technology is considering exploiting CityEngine as a tool for the gaming industry. Talks with some game production houses are already under way.

Beyond the obvious use in entertainment, the achievements of the CyberWalk project could extend to training for firemen in dangerous scenarios, while keeping them well out of harm's way. It could also help with medical rehabilitation for people after a stroke, people with Parkinson's disease, or to help them overcome phobias.

The developments have also created exciting new academic possibilities for research into behavioural science and the biomechanics of human locomotion. But the showcase demonstration is pure escapism, bringing Pompeii to life again after nearly two millennia.

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http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89667

continued from page 36 **'Synthesising haptic interactions'**

nition, attention and information integrated from vision and touch.

In order to validate the developed methods and for them to evolve into the next generation of haptic systems, demonstrators were designed to serve as platforms. One of these is the I-Touch software which can be employed to produce sample haptic applications with both commercial and non-commercial devices. Another method that was developed is the interactive 3D data navigation system which has already been applied in a clinical setting. This multi-modal segmentation system which can be used with arbitrary haptic devices has been ported to the Linux OS so that purchase costs can be reduced.

Many possibilities continue to emerge in terms of the potential of practical and commercially usable haptic feedback systems. This is good news for device manufacturers and health care institutions as well.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3927

Novel lasers from quantum nanostructures

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The optical properties of quantum nanostructures are being intensively studied aiming towards achieving novel device applications. Recent experimental results for indium arsenide/indium phosphide (InAS/InP) quantum wire show that lasers with nanostructures as the active material will be soon available.

A quantum dot is a semiconductor nanocrystal that confines its excitons in all three spatial dimensions. Excitons are solid quasi-particles consisting of an electron and a hole, and their confinement gives rise to a wealth of physical phenomena.

Growth of InAs on the dielectric InP under controlled conditions results in the formation of a series of quantum dots that now form what is called a quantum wire. The Nanomat project has studied this self-assembled formation of nanometre-sized droplets of semiconductor material on a lattice-mismatched substrate (like InAs/InP). This opens up the possibility of a new technology in which the band structure can be engineered on the nanoscale in all three dimensions.

Specifically, photoluminescence, i.e. absorption and consequently radiation of light, of an InAs/InP quantum wire has been studied experimentally, and lasing close to the critical wavelength of 1.55 µm for telecommunications has been achieved. Namely, lasing at 1.45 µm at 100 K from a single layer quantum wire device has been obtained, and lasing up to 250 K from a three-layer quantum wire device with low threshold current.

A 1.55 µm laser with nanostructures as the active material will have a variety of applications in the telecommunications industry. The project partners seek further research and development support since their current results show that such a laser is feasible. The laser will most likely work at high temperatures, dispensing with thermoelectric coolers therefore resulting in a substantial cost saving. Moreover, non-zero dispersion that now seems to be a potential barrier will be addressed with the stacking of quantum wires.

The developed high-performance laser with low threshold currents and high thermal stability seems to have a very promising medium- and long-term potential for exploitation in optical data storage and nanoelectronics and is only nanosteps away from the critical 1.55 µm wavelength.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3862

Optoelectronic interrogation unit for remote monitoring

The SOFO reading unit is a computerised system for static and dynamic measurements coming from remote monitoring sensors.

Aiming to improve the safety of composite high-pressure tanks for natural gas or hydrogen, the 'Zero-hazard gas storage by multisensing optical monitoring system' (ZEM) project developed a monitoring system for verification of the tank's integrity. Using stationary and mobile applications, the followed approach was centred around an online monitoring system based on fibre optics. Such a system is able to provide an easy, inexpensive and detailed evaluation of the tank's structural integrity.

Part of the project work involved an optoelectronic interrogation unit, the SOFO static and dynamic measurement system for remote sensing. Specifically, the so-called SOFO reading unit comprises an optical source, a mobile mirror, a photodetector and the related electronics. Contained in a special case, the system is able to operate in the harsh environment of a civil engineering construction site. The system can be powered either by an internal battery or by an alternating current source and is fully controllable by an external portable PC.

The SOFO reading unit permits measurements of an unlimited number of sensors. Moreover, it is equipped with optical switching units offering automatic multiplexing of different sensors. The system's memory can hold thousands of measurements that can later be downloaded into the system's database and used for further analysis. The SOFO dynamic reading unit provides measurements coming from SOFO sensors at very high frequencies.

Currently, the SOFO computerised system is widely used in sub-sea oil and gas exploration, but it can also find useful applications in many other domains. These include civil, geotechnical and structural engineering, as well as energy distribution. For instance, for measurements of dynamic deformations of structures under variable loads such as traffic, wind, seismic events, waves and for the evaluation of dynamic amplification factors.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3838

Smartly pre-packaged optical sensors

The quest for reliable monitoring systems to verify the integrity of hazardous high-pressure tanks has yielded innovative sensing equipment. The SmarTape optical fibre sensor has already been used in market applications outside the scope of the current project.

The motive for this research stemmed from the need to transport flammable and explosive materials like hydrogen and natural gas safely. Both are transported under high pressure in tanks made out of composite materials. Obviously, lack of integrity of such a vessel would have catastrophic consequences.

Composite materials are usually manufactured as many filaments, tapes or sheets simply stuck together. In order to monitor the mechanical properties, like shear stress of these layers, an optical fibre sensor is embedded in the structure. Unless properly bonded within the material, the sensor may affect the structure's properties, for instance causing lamina instabilities. Ironically, the sensor itself can be the cause of mechanical failure. The sensor can also be mounted on the surface of the structure, in which case it is obviously subjected to environmental degradation.

continued on page 39

Sensors with attogram mass detection sensitivity

Nanoelectromechanical resonators have been monolithically integrated on pre-processed complementary metal-oxide semiconductor (CMOS) chips by a technology that allows the combination of standard with novel nanofabrication methods.

Nanoelectromechanical systems (NEMS) derive their enhanced functionalities from the advantages of miniaturising mechanical structures such as resonating cantilevers down to submicron dimensions. It is this reduction of mechanical transducers' dimensions that has led to an unprecedented improvement of the sensitivity, spatial resolution and response time of sensor systems.

A resonating nanocantilever excited by a parallel driver electrode has been used within the Nanomass II project as the transducing element of a sensor developed for mass detection with attogram resolution. Moreover, a CMOS circuitry was monolithically integrated with the cantilever-based transducer to amplify the capacitive current, used as a read-out signal.

Mass detection is based on monitoring the resonant frequency shift when nanometre-sized particles are deposited on the cantilever. Since changes in the cantilever resonance frequency are detected as capacitance change, the read-out circuitry integrated 'on-chip' ensures the minimum parasitic capacitance by external bonding pads and wires.

During the course of the Nanomass II project, different nanolithography processes were compared to evaluate their advantages in terms of dimensions reduction, throughput and importantly, their compatibility with standard CMOS technology. Several demonstrators were fabricated from cantilevers with polysilicon as a structural layer and integrated with the CMOS read-out circuit by means of electron beam or laser lithography.

From experimental mass measurements performed with these integrated NEMS sensors at the Universitat Autònoma de Barcelona, a mass sensitivity of a few attograms has been determined. The ultimate goal of the Nanomass II project partners is to develop nanoresonator devices as integral parts of a portable system for biological, physical and chemical sensing applications.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3785

Optimisation of mass nanosensors

The feasibility of manufacturing nanocantilevers integrated with complementary metal-oxide semiconductor (CMOS) circuitry for mass detection was demonstrated in the Nanomass I project. Its successor, Nanomass II, has calibrated these extremely accurate sensors.

A novel mass detector with extraordinary measuring abilities can be manufactured by creating an array of nanometre-scale silicon cantilevers and combining them with CMOS circuitry. Nanolithography is used to place the nanomechanical structure on the already completed CMOS circuit. This fabrication technique has been extensively elaborated by Nanomass II partners.

Using the nanolithography technique as a base, an atomic force microscope (AFM) has now been used for the definition of the nanoscale structure on the CMOS circuit. AFM nanolithography not only reduces the dimensions of the nanocantilevers but also contributes to the cleaning process of the surface where the nanostructures will then be defined. A low surface roughness and lack of contaminant particles is required and is achieved using a thin layer of aluminium, which is locally oxidised by the tip of the AFM.

A silicon-on-insulator (SOI) wafer is used for the fabrication of the CMOS circuit. This gives the opportunity to further reduce the dimensions of the nanocantilevers, because crystalline silicon can now be used instead of polysilicon for their fabrication. Structurally, the CMOS circuit is on the bottom, at the silicon side of the wafer, while the nanomechanical structure is on the top SOI layer.

The developed fabrication techniques not only provide environmental and biochemical sciences with a compact and sensitive mass detector, but may also be used in general for defining nanostructures on pre-processed CMOS substrates.

The innovative technological approach that was used in the course of this project resulted in the fabrication of demonstrators that will now undergo extensive functionality tests. Therefore industrial applications may soon be expected.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3900

continued from page 38 **'Smartly pre-packaged optical sensors'**

The ZEM project set out to dispense with all the above problems, and a project partner was able to manufacture the SmarTape optical sensor that also has market applications outside the field of application of this project. A fibre-reinforced composite tape with integrated optical fibre can easily and safely be embedded in a composite structure and just as easily be mounted on top of it.

The sensors, prior to their market application, were of course extensively tested. Their properties include excellent mechanical, thermal and chemical performance. Moreover, they are compatible with other systems, in particular long-gauge interferometric SOFO sensors, well known in the civil engineering field. SOFO sensors have been in use for the last 10 years for the monitoring of civil, geotechnical, oil and gas structures.

The SmarTape optical fibre sensor is expected to find a number of applications in many multidisciplinary areas of science and industry.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3896

See also page 33 (offer 3918)

Silencing noisy machinery with active damping

A Belgian engineering firm has invented a device based on active damping theory and demonstrated its advanced performance characteristics during the Noiseless project.

Operators of machine tools are often exposed to dangerous levels of noise and vibration. A group of 10 organisations hailing from 6 different EU Member States joined forces to address this issue. The research project, entitled Noiseless, was funded in part by the Growth programme.

Micromega Dynamics, a Noiseless partner from Belgium, developed an active damping device (ADD) suitable for a number of applications. Active damping attempts to reduce noise and vibration directly at the source, as opposed to traditional measures that try to conceal these phenomena with enclosures.

The heart of the ADD is a sealed electromechanical actuator. It can be operated remotely with the aid of a box containing the essential power and control electronics. The advantage of the Belgian ADD is that it can be attached directly to its target. In addition, it has been designed to cover a wide range of frequencies, from 20 Hz to 2 kHz.

The new ADD was tested during Noiseless, achieving 15 % damping in several industrial applications. The most remarkable aspect of this result is that it was attained on the first try without any prior knowledge of the machinery. By eliminating the need for specific tuning, Micromega Dynamics has acquired a significant competitive advantage in the marketplace.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3889

New two-circuit technology saves time and energy

An exemplary cooperation between the Regloplas company and StructoForm GmbH led to the development of a new, highly efficient heating and cooling system for the thermoplastic manufacturing industry.

The Growth programme funds innovative materials science research that aims to provide a competitive advantage to this important sector of the European economy. For instance, the Amiterm project brought together nine partners to advance thermoplastic mould technology.

Regloplas, a Swiss company with extensive experience in temperature control applications, was called upon to design a better heating and cooling system. They joined forces with StructoForm, an Amiterm partner from Germany, to adapt their existing two-circuit technology to meet the requirements of thermoplastic mould applications.

A prototype was developed and its components were subjected to a battery of tests to ensure the durability necessary to withstand the rapid changes in temperature. The advantage of the two-circuit set-up is that one circuit can be cooled while the other is heated. This enables more precise control over the mould process.

The prototype was designed for use with the JETex and HTex processes developed during Amiterm. However, it can also be modified to work with other moulding methods. Tests with different materials showed major gains in both time and energy savings in comparison with the heating systems currently in use.

During the course of the Amiterm research, a second prototype with improved high-temperature valves was produced. In addition, Regloplas and StructoForm have also begun designing more complex systems based on the new technology.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3840

Innovative coatings for magnesium

Magnesium is used in many industries due to its high strength-to-weight ratio. A European project consortium has researched into environmentally safe and abrasion-resistant coatings for corrosion-prone magnesium alloys.

Magnesium is the third most commonly used metal in industry, steel and aluminium being at the top of the league table. The automotive, aerospace, medical and sports industries all manufacture products that require strength and durability, yet have a low density.

However, despite their properties, the use of magnesium alloys is still limited partly because of its predisposition to corrosion. Foreign materials that hold moisture on the surface can promote corrosion and pitting of some alloys — unless the metal is protected by coatings that have been properly applied. Another drawback is that many coatings used at present are the source of toxic pollutants including metals and fluoride anions.

The ambitious objective of the Nanomag project was to develop corrosion- and abrasion-resistant coatings using environmentally friendly processes that were also economic. A team of project partners at Haute École Arc Ingeniérie in Switzerland used a low-temperature sol-gel dip coating technology to apply SiOx and multicomponent oxide coatings to produce a thin film. The precursors used were tetraethylorthosilicate and aluminium-sec-butoxide. Both of these possess the attractive property of excellent adhesion to the alloy surface.

Several types of coating were developed including multicomponent oxides containing silicon, zirconium and cerium oxides and a polymer layer applied afterwards. After the application of the films, accelerated corrosion, adhesion and hardness tests were performed. The results showed that after almost 100 exposures to the salt and spray test, there was no pitting evident on the coated alloys. However, end-user requirements meant that the polymer layer investigations were suspended.

Also developed was a chromium nitride (CrN) coating that was applied using plasma-assisted physical vapour deposition (PAPVD) at the same low temperature of 180 °C. Not only that, but the films were applied to a new magnesium alloy that resulted from Nanomag.

Recent demand for lighter, more fuel-efficient vehicles and the 'Developing aerospace' programme that require low-density yet strong material have increased manufacturers' interest in magnesium. Both the multicomponent coatings applications and the CrN coating have been upgraded to industrial process scale for use in medium and large areas.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3868

Modelling superconductor cables for more power

The emerging market of high-temperature superconductor (HTS) applications has brought about new requirements in the development of suitable cabling technology.

The ever-increasing electricity consumption is not only environmentally unfriendly, but also costly. HTS power applications such as high-capacity transformers, motors and generators can significantly improve the efficiency in energy use and substantially reduce the electricity cost. These applications are expected to have not only technical and economic, but also environmental and social benefits.

Aiming to maximise the efficiency of multi-layer superconducting cables, an appropriate electromagnetic model was created and implemented in the Flux3D® FEM software package from Cedrat. In addition, a simple electrical model has been implemented in the Matlab software to consider the cable from a macroscopic point of view.

The Big-Powa project developed stranded and transposed Bi-2223 conductors which can be employed in the production and use of commercial HTS applications. These Bi-2223 conductors can be exploited by equipment manufacturers and international research institutions, such as CERN. The end-users of HTS applications who could take advantage of the new wires may vary from electric utilities and transport companies to medical institutions and magnet manufacturers.

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One of the key project results involved the development of a new 3D electrical model for the multi-layer superconducting cables. The model can assist in the identification of the optimal geometrical configurations in order to achieve a uniform current distribution among the layers and minimisation of alternating current (AC) losses. The latter are normally induced by fluctuations in the magnetic fields of superconductors and are deposited as heat in the cable, requiring large amounts of energy for their removal.

Taking into consideration the 3D structure of cables, the robust model implemented by Dr Francesco Grilli at the Swiss Federal Institute of Technology in Lausanne allows the user to perform a wide range of combinations of geometrical parameters. Moreover, the geometry and arrangement of tapes in the cable's structure has a great impact on AC losses. Therefore, the finite element method was also adopted to provide detailed calculations of the current and magnetic field distribution inside the tapes for a more precise evaluation of these losses.

Already implemented in Matlab, the model's use can contribute to further improvements in the design of new, more efficient geometries and quantification of the associated benefits. Potential end-users of the model would be manufacturers and end-users of superconducting power cables.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3904

Advanced programming language for global computing

The number of small-package deliveries is steadily increasing, causing high levels of traffic in urban areas. City logistics (CL) will help develop more efficient and sustainable delivery operations.

The Vivaldi project was set up to provide innovation and results in each of the policy areas of the EU-funded Civitas initiative, which aimed to improve transport in urban areas. These policy areas included clean vehicles, goods distribution and telematics.

Bremen had already participated in the project. The update of the CL project included several recommendations. These included using two low-emission trucks (compressed natural gas (CNG and bio-diesel) for testing and implementing an efficient City-Logistik GmbH goods distribution. Routes were also to be optimised by using modernised IT communication equipment and the bundling of delivery trips to large shopping malls. Other activities included testing a new city-centre-oriented concept and demonstrating a delivery service to shop keepers.

Initially, four low-emission delivery vehicles were planned and four routes set up inside and outside of Bremen. The project was unable to purchase a CNG vehicle, however, due to non-delivery and high cost. Instead, a bio-diesel truck was purchased in order to assess economic and ecological impacts and to test the new online telematics systems. The intention was to provide more efficient, cleaner transport to key target areas. End-users included freight operators in the central business district of Bremen and shopping centres in suburban areas.

Potential barriers to the growth of the CL scheme included the fact that usually only transport services were involved and value-added services were often missing. The structure of the project partner, City-Logistik GmbH, contained mostly couriers rather than retailers, resulting in a high level of competition. There were also challenges regarding the exchange of data, collections and different interfaces, plus an increase in the number of smaller shipments, which made the grouping of the goods difficult. Economic difficulties could be experienced after ending the model of financial support (the high cost of the grouping of the goods, for example, threatens economic success). Furthermore, a CL company which concentrated on delivering only to the city centre was not found to be viable.

Successful companies make their money by fulfilling their customers' specialist needs. A policy promoting regulatory support is required in order for CL companies to remain viable.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3633

See also page 23 (offers 3836 and 3735)

Limiting the problem of noise pollution at airports

The impact of aircraft noise receives more regulatory and technological attention than any other aviation environmental problem and currently represents a major bottleneck for further growth. A new method developed to 'listen' to sound emissions in order to identify airplane types and manoeuvres could help to reduce the extent of this problem.

Five aircraft types including commercial jets such as Boeing B737 and Fokker F100, popular carriers for short-haul journeys, were monitored as part of the trials that took place at a Naples airport. During both take-off and landing, the carriers were studied for more than 200 aircraft noise events. Ground noise measurements were recorded, and both the numerical simulation and the experimental measurement of aircraft noise emissions were analysed.

The trials were conducted by researchers of the Italian Aerospace Research Centre, part of the Monster project, who have led the way in developing this new method. This allows the identification of airplane types and manoeuvres by 'listening' to the sound emissions. The system differs from the existing electromagnetic or ultrasonic sonar in that it is implemented passively. It is composed of an algorithm for the acoustic signature identification and a dedicated neural network classifier.

The applied method for aircraft acoustic signature identification employs a wavelet multiresolution analysis of noise signals and a statistical analysis of the noise events for each aircraft class. The developed system processes noise time histories of airplanes, giving as output the identified airplane and manoeuvre together with an index of the percentage of successful identification. The algorithm has been developed in a Matlab programming environment with a friendly graphical user interface. It is a stand-alone executable application that requires only Matlab run-time installation on the target machine.

The results of the trial indicate that this new method can be applied as support for the radar monitoring of airports whilst limiting noise pollution to the required standards. It allows the surveillance of isolated or dangerous areas and the verification of compliance with peace agreements ('no-fly zone').

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3877

Improved air flow in car cabins

Modifications in ventilation have been designed and studied in order to create better air flow in car cabins.

There are several disadvantages to traditional flocking coating methods. These relate to cost, health, safety, environment, limited freedom of design and limited alternative effects. Thus, there is a social need to improve the quality of life through the reduction or elimination of health and safety hazards brought about by flocking dispersion in the air.

In this context, the 'Fur- and flocking-like innovative coating' (FFLIC) project has modified the ventilation in three car cabins such as glove boxes and door panels. Initially all the cabins were fed by only one air supply unit. Now every cabin can be fed independently by means of three different air supply units. The changes included modifications in the filter frame, the installation of six air veils and of a switchboard to control the revolutions per minute (rpm) of each motor connected to the ventilators.

These changes bring about many advantages. For example, work can be done only on the cabin needed which results in saving energy. Every cabin has absolute independence regarding the regulation of internal air flow which is optimised on each component that is painted. There is also improved filtration of the air that is supplied. Overall fibre contamination in complex coating units has been reduced and the coated items have an improved quality because of a higher surface resistance.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3863

Reducing the noise in automotive components

A new surface treatment technology of moulded plastic components may result in elimination of noise health and safety hazards in car cabins.

Existing surface design practices exploit fur-like fibre structure coatings in various plastic components for reasons such as aesthetics, protection or soft-touch look. The so-called 'flocking' technology has been adopted by several industries including the automotive industry, packaging, toys and home goods. However, flocking displays certain disadvantages, for instance limited freedom in design and high costs. Most importantly, it is considered to be a potentially environmentally unfriendly and unsafe technology as it may cause health problems to both workers and consumers.

Aiming to overcome the disadvantages of traditional flocking, the 'Fur- and flocking-like innovative coating' (FFLIC) project focused on developing a new alternative coating technology. Offering similar features to existing flocking technology, these innovative coatings are highly suitable for application in the same industrial products. Furthermore, they may allow an increase in the range of applications which is currently limited by existing flocking methods. Based on waterborne paints, the new coating technology offers significant benefits such as shorter process cycle, fewer quality problems and easier disposal of coated items.

continued on page 43

Map reading for dummies

A huge European project conducting research into car and road safety has developed a system that will read satellite navigation maps and warn the driver of upcoming hazards — sharp bends, dips and accident black spots — which may be invisible to the driver. Even better, the system can update the geographic database. Suddenly, all drivers can become map makers.

You are driving along an unfamiliar road, using your satellite navigation to find your way. But clever technology in your car is also tracking the route, looking at the terrain, and upcoming bends and intersections. It has information on accident blind spots, dips in the road, and more. Linking into other in-car wireless communication systems, it can even communicate with other vehicles in the vicinity.

This is the future of in-car maps, going way beyond directions and entering the zone of active hazard detection. It is one of the key strands of the Prevent project.

Prevent is the largest road safety research initiative ever launched in Europe, with a budget of over EUR 50 million and 56 partners. It has a broad but highly complementary programme of research. A dozen projects focus on specific road safety issues, but all projects support and feed into each other in some way. This means that the impact is greater than the sum of its parts and partners.

MAPS&ADAS is a great example, working on development, testing and validation of safety-enhanced digital maps, and the creation of a standard interface for an advanced driver assistance system (ADAS) to enable preventive safety applications.

It sounds a mouthful, but it is indeed a very elegant example of using existing resources in new ways to increase functionality at low costs. Essentially, the onboard computer scans the maps for the 'speed profile' of the road ahead, the right of way and other data.

'The analysis of many situations can be dramatically improved by an awareness of the location,' says Matthias Schulze, coordinator of the EU-funded Prevent project and Senior Manager for ITS & Services at Daimler AG. A lot of the sub-projects took advantage of each other's work, he tells *ICT Results*. For example, Safelane and Lateralsafe could benefit from information coming from the MAPS&ADAS system.

Lateralsafe uses sensors to scan the blind spot lane and your current lane, while Safelane ensures that drivers stay in the correct lane. Intersafe, another sub-project that helps drivers negotiate intersections, also benefited enormously from the MAPS&ADAS research, as did many others.

Because data transmission between car components varies enormously between manufacturers, MAPS&ADAS did not develop a full prototype, but it did develop a standalone system that focuses on so-called 'dynamic pass prediction' for overtaking and a driver-warning system for upcoming hazards. Manufacturers can now quickly adapt it to their own models. 'We should see the system appearing in new models in the short term,' Mr Schulze says.

But MAPS&ADAS went beyond extracting precious data from a current map. Researchers also studied systems to analyse information from the map and compare it to the environment a car actually encounters.

So a new traffic light, installed with a wireless alert system developed by Prevent sub-project Intersafe, could warn oncoming cars that it is there and about to turn red. MAPS&ADAS developed a protocol whereby the car can compare that information to the data supplied on the map. If the new traffic light is not marked on the map, the car can update the map database.

Ultimately, it would mean that cars are updating existing maps all the time. It is an elegant application with enhanced functionality and it shows just how far simple (existing) technology can squeeze the maximum out of the installed base.

But it could be a long time before that sort of map making functionality becomes available. It requires transmitters installed in the streetscapes across Europe, warning cars of upcoming hazards. 'We did not fully develop this technology, but we developed the protocols and systems required to set it up, so that when the infrastructure is in place it can be quickly integrated into new systems.'

It all means that map reading for dummies technology could be transformed into very, very smart safety systems, too.

Promoted through the ICT Results service.

http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89644

continued from page 42 **'Reducing the noise in automotive components'**

Part of the project work involved the development of a new surface treatment technology for moulded plastic parts. With the aid of photoengraving methods, the matching between the coating and the underlying material can be optimised using the most appropriate process. Paying special attention to noise reduction, a study was conducted for improving the acoustic response of the lid of the glove compartment located in the dashboard of a new car model. The noise study involved the virtual impact of a knock on a cover of a glove box and the influence of different technologies in noise attenuation: gas injection, variable thickness and temperature.

Furthermore, the behaviour of the glove box unit was also evaluated under different vibration modes and frequencies. Three different materials used in automotive parts were analysed after being characterised by variable elastic modulus values. Noise attenuation was also studied in flat panels with different contents of filler and in an airbag. These promising results are likely to be exploited in the fabrication of improved glove boxes, door panels and dashboards for new automobiles.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3905

Two-dimensional x-ray diffraction gains a trademark

The trademark Xpection has been created for the EU-funded project of the same name. It comprises the developed procedure of materials inspection and residual lifetime assessment of components using two-dimensional x-ray diffraction on site.

The Xpection project created a prototype of a unified measuring and monitoring system for residual life-time assessment of high-temperature plant components in fossil power generation and in the chemical industry. An interdisciplinary angle spanning various research fields was employed to create an innovative inspection methodology using real structure analysis with on-site x-ray diffraction. This was then incorporated into the basic structure of inspection and maintenance.

The primary innovative feature of the two-dimensional x-ray diffraction process is that it unveils the real crystallographic structure of the material. Given this, information regarding the grain size and texture which correlate with the ageing state of the material can be obtained. This can be commercially beneficial because it can lessen the replaced material using a non-destructive assessment of the ageing state.

Although the application is primarily targeted for inspection and maintenance, it can also be used for quality control in production and inspection in other fields. The many potential end uses include areas such as fossil and other electric power generation, the petrochemical industry, aircraft manufacturing and maintenance as well as the pulp and paper, chemical and food industries.

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

Collaboration sought: information exchange/training.

http://cordis.europa.eu/marketplace > search > offers > 3915

Advanced polymer processing additives

Innovative additives for polymer materials provide faster coating times for keeping effective control of surface defects (sharkskin).

Flow instabilities that normally appear as melt fracture or sharkskin on polymer materials constitute a major problem for advancing polymer materials. With the advent of new improved polymers, flow rates increased and the relevant instabilities became even more critical for the quality of the final products.

Challenged by this, the 3PI project followed a rational approach to overcome the appearance and development of flow instabilities with polymer viscoelasticity, processing conditions and boundary conditions. Rigorous software codes and suitable guidelines were generated for polymer producers and converters as well as the machinery equipment industry.

One of the key results involved new fluoropolymer-based polymer processing additives (PPAs). PPAs are conventionally introduced to a plastic formulation and are prone to surface defects such as sharkskin. Normally, the fluoropolymer results in the formulation of a thin coating at the surface of metal parts in the extrusion line. The faster the coating is formed, the lower the quality of plastic film or off-spec material and hence the more the savings in production times.

On the basis of the PPAs' formulation, chemical or physical interaction such as abrasion or adsorption may retard the coating formation. The new fluoroelastomer PPAs have shown increased capabilities to postpone sharkskin defects, offering time and cost savings for the industries. For more information, please visit: http://3pi.cemef.org

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

Collaboration sought: information exchange/training

http://cordis.europa.eu/marketplace > search > offers > 3767

Cutting-edge transistor technology

Europe is now competing with American and Japanese/Korean institutions in high-tech transistor fabrication. A high-power, high-frequency wafer suitable for current state-of-the-art transistors has been produced.

The DENIS project, comprised of leading European institutions and semiconductor engineering specialists, has fabricated gallium nitride (GaN) wafers that can be used for the production of high-quality transistors.

Two different approaches were followed. In the first one, metalo-organic vapor phase epitaxy (MOVPE) was utilised and GaN substrates were grown by hydride vapor phase epitaxy (HVPE). The wafer produced in this way exhibits physical properties, like electron mobility and carrier concentration, suitable for high-performance high electron mobility transistors (HEMTs). After processing the wafer, the resulting transistor with AlGaN barriers was extensively tested and showed parameters comparable to transistors fabricated by the leading American and Japanese manufacturers. Moreover the sophisticated epitaxial techniques used facilitated the production of wafers with reproducible and tunable physical properties, an element of critical importance for future commercial production.

The second, equally novel approach consisted of the molecular beam epitaxy (MBE) growth technique for the preparation of GaN/AlGaN heterostructures. Here, bulk GaN dopped with magnesium was used as a substrate. The outcome was quite spectacular and unexpected, namely that record mobility structures were achieved. Such structures will open up new pathways in basic research of various exciting phenomena. New effects are already expected in the quantum hall effect regime.

The techniques developed will now boost nitride technology in Europe, and in the near future it is highly expected that the consortium will move from laboratory to commercial production since both techniques are reproducible and scaleable.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3857

From opals to optical chips

Materials known as photonic crystals could form the building blocks of future optical computers and microscale communications devices. Scientists have developed a low-cost and versatile way to make photonic crystals, and combined them in ways that bring optical 'transistors' a step closer.

European research on materials known as photonic crystals has made important progress in the race to build all-optical chips for computers and communications systems. The scientists developed a relatively inexpensive way to make high-quality photonic crystals, and showed how these can be integrated into conventional silicon chips.

Photonic crystals are materials whose optical properties vary in a regular, repeating way on a scale of a few hundred nanometres. An ideal photonic crystal can be designed to transmit light of one particular wavelength and to block all other wavelengths. This gives photonic crystals some very useful properties.

The simplest material of this kind has a layered structure, like a film of oil on water. 'One-dimensional' structures like these are used as mirrors, non-reflective coatings and paints whose colours change with the viewing angle. The gemstone opal, with its shimmering colour, is a natural photonic crystal.

The 'Photonic hybrid architectures based on two- and three-dimensional silicon photonic crystals' (PHAT) project worked with more complex structures whose optical properties vary in two and three dimensions (2D and 3D). Two-dimensional photonic crystals can act as waveguides, channelling light to where it is needed, and as filters to separate different wavelengths — a valuable property in optical communications. Three-dimensional photonic crystals can even trap light within their structures, potentially allowing them to act as optical switches.

As electronic devices shrink and operating speeds increase, silicon chips are running out of room. Photons — light particles — are an obvious replacement for electrons, because they can carry more information in the same space.

Communications technology has been revolutionised by electro-optical devices based on the semiconductors gallium arsenide (GaAs) and indium phosphide (InP), optical fibres, and even all-optical amplifiers. But as PHAT spokesperson Dr Gudrun Kocher points out, these devices tend to be much larger than the components needed to make computer chips. GaAs and InP are also expensive materials, and integrating them with silicon brings extra complexities. As a result, she says, most researchers agree that it will be 10 to 15 years before we see all-optical chips based on conventional (silicon) technology.

This is where photonic crystals come in. A combination of 3D photonic crystal optical switches and 2D waveguides could yield devices that are 10 or even 100 times smaller than those made at the moment. These could be used to assemble all-optical chips made entirely from silicon.

Since the late 1980s, researchers have developed several ways to make 2D and 3D photonic crystals. Many of these are based on expensive techniques developed from those used in the electronics industry, but the EU-funded PHAT project concentrated on a simpler self-assembly process.

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Beads of plastic (polymethylmethacrylate) or silica, 250-900 nm in diameter, are first mixed with water to form a colloidal suspension. Then a solid surface is drawn slowly out of the water, and the beads stick to it in a regular lattice structure. The PHAT team assembled their 'artificial opals' by allowing capillary forces to draw the beads along microscopic channels cut in sheets of silicon or silica. In a single dip, they were able to form layers up to 10 mm long and more than 10 beads deep — the minimum practical thickness for a 3D photonic crystal.

The resulting structure of beads separated by air is known as a 'direct opal'. The resulting refractive index is too low for many applications, so that a subcontractor in St Petersburg used chemical vapour deposition (CVD) to fill the empty spaces with silicon, after which the beads themselves are removed, leaving holes.

A further task was to use electron beam lithography to create a defect layer in the 3D crystals. 'That's because if the crystal is perfect, there's no way to get light into or out of it,' Dr Kocher explains. Finally, the plan is to sandwich two 3D crystals around a 2D crystal to act as a waveguide.

PHAT was coordinated at the Tyndall National Institute in Cork, Ireland, and had four other partners: the French Atomic Energy Commission (CEA) and University of Montpellier II, Mainz University, Germany, and the Technical Research Centre of Finland (VTT). 'This was an ambitious project, and we didn't manage everything that we set out to do,' Dr Kocher says.

But by the time the project ended, in February 2007, it had two really big achievements under its belt. 'We had developed a spatially selective method of growing photonic crystals, and we had managed to integrate 3D photonic crystals with waveguides, which was a first,' Dr Kocher explains.

The crystal fabrication method was patented by two of the project partners, Tyndall and VTT. 'This was a significant advance in photonic crystals, and it brings us a step closer to a practical optical computer,' Dr Kocher concludes.

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Smart clothes: textiles that track your health

Garments that can measure a wearer's body temperature or trace their heart activity are just entering the market, but the Biotex project weaves new functions into smart textiles. Miniaturised biosensors in a textile patch can now analyse body fluids, even a tiny drop of sweat, and provide a much better assessment of someone's health.

It is 7 o'clock in the morning. You check yourself in the mirror, adjust your collar, and consider the hectic day ahead. But at least you know that the stress won't damage your health, for this is no ordinary set of clothes you are wearing. Embedded within the fabric are numerous sensors, constantly monitoring your vital signs. If danger signs are detected, the garment is programmed to contact your doctor — and send a text message telling you to take it easy.

A cluster of EU research projects (the 'Smart fabrics and interactive textiles' (SFIT) group) is supporting this burgeoning field of smart fabrics, interactive textiles and flexible wearable systems. Jean Luprano, a researcher at the Swiss Centre for Electronics and Microtechnology (CSEM), coordinates the Biotex project.

'One of the most obvious applications for smart fabrics is in the medical field,' he says. 'There has been a good deal of progress with physiological measurements, body temperature or electrocardiograms. But no one has yet developed biochemical sensing techniques that can take measurements from fluids like sweat and blood. We are developing a suite of sensors that can be integrated into a textile patch. The patch is a sensing and processing unit, adaptable to target different body fluids and biochemical species. At the very least, some basic biochemical analyses could complement the physiological measurements that can already be monitored. In some circumstances, fluidic analysis may be the only way to get information on a patient's health status.'

But there is a simple reason why researchers have shied away from developing smart textiles for fluid monitoring: it is extremely tricky. How do you collect a fluid and transport it to a biosensing unit? Can you perform non-invasive blood tests? Can measurements be reliable and accurate with tiny volumes of liquid? The Biotex partners — universities and small enterprises from Ireland, France and Italy — have collaborated with CSEM to overcome some of the technical barriers to biosensing textiles.

One of the main achievements of the project has been the development of a suite of prototype ionic biosensors, capable of measuring sodium, potassium and chloride in sweat samples. Another probe measures the conductivity of sweat and a miniaturised pH (acidity) sensor uses colour changes to indicate the pH of sweat. An immunosensor, which could be integrated into wound dressings or bandages, can detect the presence of specific proteins in fluid samples.

These biosensors are not just scaled-down versions of existing technology, Dr Luprano is keen to point out. 'Many of the chemical or biochemical reactions used in sample assays are non-reversible and some part of the biosensor has to be replaced. When you monitor continuously you cannot do that — you need a sensor that binds your substrate reversibly. Also, the Biotex sensors work on tiny volumes of liquid, so we had to come up with innovative designs and materials that would make it possible to miniaturise the sensors and make them compatible with fabrics.'

Several of the Biotex probes, including the pH sensor, use colour changes or other optical measurements. For example, as sweat passes through the pH sensor, it causes an indicator to change colour, which is detected by a portable spectrometer device. The immunosensor technology works in a similar fashion. Plastic optical fibres (POFs) are woven into the fabric so that light can be supplied to the optical sensors and the reflected light directed to the spectrometer.

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The Biotex oxygen probe measures levels of oxygen saturation in the blood around the thorax using a technique called 'reflective oximetry'. A cluster of POFs allows a large surface of the thorax to be illuminated and improves the collection of the reflected red and infrared light used for the oximeter sensor. Signal processing also improves the sensitivity of this method.

Having an array of biosensors in a textile patch is one thing, but how do you get fluids to them in the first place? 'The volume of fluid secreted from sweat glands is just a few millilitres over a small surface,' Dr Luprano says, 'and the body's heat means this is rapidly vaporised. We needed some kind of pump that could collect sweat in one area and bring it to the sensor array, where it could be channelled through each sensor.'

The solution uses a combination of hydrophilic (water-loving) and hydrophobic (water-repellent) yarns. It is possible to weave these two threads to direct the sweat through fabric channels to the sensor array. It is a passive system using no power, thereby reducing the power demands of the Biotex system (and the weight of a battery pack that the wearer would have to carry).

In the first Biotex trials, the smart patches will be worn in clothes by people with obesity and diabetes, as well as athletes. Once the technology has been validated, the plan is to take on industrial backers to commercialise it. Meanwhile, a large EU-funded project

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High-density metallurgy for nanofabrication

Aiming to improve the performance of friction joints, the TRIBO project resulted in an innovative technology for the nano-structured fabrication of microparts.

Tribological issues can seriously affect the quality and reliability of machinery employed in various sectors such as aerospace, machine building and the automotive industry, to name but a few. Therefore, new methods and equipment for addressing wear resistance and friction problems are of strategic importance for the European industry.

In particular, the performance of machinery and aerospace friction joints could be significantly improved if the allowable contact loads and operating temperatures were increased. Addressing this issue, the TRIBO project focused on the development and use of advanced high-performance solid lubricant coatings (SLCs) with finely tuned properties.

Based on new nanophased powder material, the developed SLCs are capable of improving the performance of friction joints under high contact loads and temperatures. The key innovation involves application of a suitable energy source and deposition strategy that would never affect the nanophased powder structure.

Using nanophased powder, TRIBO materials and high-density metallurgy, the project developed an innovative technology for the nano-structured fabrication of microparts. The new technology resulted in the fabrication of highly accurate components such as power chain bushings and washers.

Moreover, the advanced parts showed improved tribological properties including low coefficient of friction and high wear resistance. Operations and high-density powder metallurgy were further elaborated in detail, as was the possibility of large-scale manufacture. Exploitation tests showed that the application potential of these nano-structured minicomponents in Europe is about 2 to 5 million pieces per year.

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

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

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Manufacturing industry up to speed with competition

Users in Germany, Spain and the United Kingdom have partnered to design a solution which deals with a problem felt by manufacturers across Europe: the industry is lagging behind in building effective, modern business relationships with its customers.

Machinery manufacturers who supply automated production machinery to other manufacturers across Europe face the problem of supporting this machinery for their customers. A consortium of European software systems development companies and research institutes has developed the Remote system as a means of supporting products away from the user's site. Its aim is to extend the manufacturers' knowledge base out to the customers via the Internet.

The results will have a Europe-wide impact on the industry by bringing the manufacturing sector up to date with methods already being used extensively in other sectors. Companies will be able to reduce the difficulty of supporting customers in different geographical locations and so enable manufacturers to seek new markets.

The Remote project also incites innovative methods for business-to-business cooperation. The project has partners with an extensive reach across Europe. Furthermore, encouraging the use of Internet technologies would enable businesses to derive many extra benefits from the Internet over the long term. The Remote system for knowledge accumulation will also enable companies to support their own staff more easily, and will therefore help to promote the mobility of workers.

Moreover, the effective use of the solution will, in all likeliness, contribute to reducing environmental damages such as spillages, leakages and fumes. These problems, caused when equipment or the plant goes wrong, currently rely on the speed of delivery on the manufacturer's part, to provide the right level of service to the consumer. The Remote system would help the consumers themselves deal with any concern over machinery before it becomes a problem.

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

Collaboration sought: further research or development support.

http://cordis.europa.eu/marketplace > search > offers > 3888

See also pages 28 (Web of entities: prepare to 'Okkamise'!), 30 (offer 3861) and 33 (offer 3817)

continued from page 46 **'Smart clothes: textiles that track your health'**

within the same SFIT group, called Proetex, is integrating the technology with other micro- and nanosystems for specific applications (fire fighting and rescue teams).

However, whilst Biotex has solved several of the technical aspects of continuous biochemical monitoring, Dr Luprano calls for more research into the application of this technology.

'It's new, and health care providers are not used to it. We are not used to the information that continuous, remote monitoring can provide — so different to the one-off laboratory tests that are usually taken. Biotex makes this remote monitoring possible, but more research into the links between these indicators and disease conditions and states will make it realistic. Nevertheless, in the long term we expect continuous monitoring, made possible with smart textiles, to make a major improvement to the way we approach the treatment of metabolic disorders and leisure.'

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