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RESULTS SUPPLEMENT

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We have moved!

*Regular readers of the RTD Results Supplement may
already know that the CORDIS focus supplements have
been adopted into the research*eu family. Welcome to our
first issue under the research*eu banner!*

*The integration of the former CORDIS focus range into the
European research area magazine translates into two new
research*eu supplements. One of these is the research*eu
results supplement which, beginning with this issue, will
take over from the CORDIS focus RTD Results Supplement
in bringing you highlights from the project updates recently
published on the CORDIS Technology Marketplace (TMP)
and on the ICT Results service. The other, research*eu focus,
will be devoted to the thematic issues previously addressed by
other CORDIS focus supplements.*



*The CORDIS focus Newsletter itself, which has kept subscribers informed of the latest news in
EU research since 1994, has taken its final bow with the December issue. News and views of
EU-funded research are covered by the research*eu magazine, which in future will also carry
links to the main stories on the European Commission's research information services online.*

*If you subscribed to the CORDIS focus mailing list before the end of January 2008, you will
automatically receive the February issue of the results supplement as well as the first issue
of the research*eu focus supplement — but please note that you will have to confirm your
subscription if you would like to receive future issues of the supplements or subscribe to the
research*eu magazine itself. Please use the form on the back cover or enter your details online
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*In our inaugural issue of the new results supplement, the biology and medicine section opens
with research into the diagnosis of cystic fibrosis, which may also hold keys for the diagnosis
of other inherited diseases. The energy section notably explores the potential for producing
hydrogen energy from two renewable resources: water and sunlight. The lead article in the
environment section presents a project which helped to put 160 alternatively fuelled vehicles
on the streets of Bremen in northern Germany, whereas the IT and telecommunications
section looks into the scope for improved digital television transmission in particularly
challenging reception environments. Last but not least, the industrial technologies section
showcases innovative techniques to reduce the cost of producing polymer-based optics.*

*If you would like more information on the research and on the projects featured this month,
please access the articles online, where you will also find details of other EU-funded projects
and their work. To call up a TMP article, key the offer ID number into the 'offers' window
of the TMP's search engine (<http://cordis.europa.eu/marketplace>). ICT Results articles are
available online in the service's 'features' section (<http://cordis.europa.eu/ictresults>).*

*Comments and questions will reach us at our new address:
research-eu-supplements@publications.europa.eu*

We look forward to hearing from you!

The editorial team

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

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Identifying cystic fibrosis biomarkers

The study of cystic fibrosis (CF) is important not only for patients, but also for use as a model gene for other inherited diseases. Proteins from the expression of CF genes were analysed and compared with complementary products from non-CF individuals.

CF is one of most common life-shortening inherited diseases. The CF gene results in the production of a chloride ion channel important in the creation of sweat, digestive juices and mucus. Mutations in this gene can therefore cause a range of problems in all systems involved with these secretions.

The original overall objective of the EU-funded CF-CHIP project was to develop a new gene array technology platform. The aim was high-throughput diagnosis of CF and related diseases as well as use as a model for other genetic disorders.

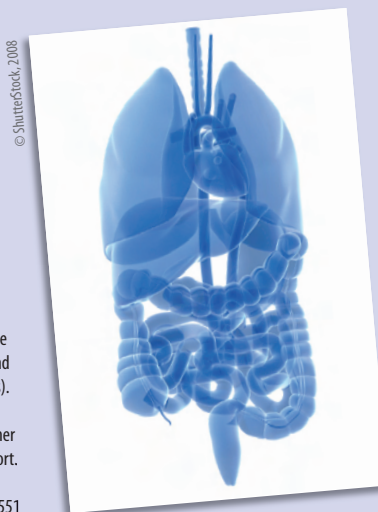
As part of the research consortium, the University of Lisbon in Portugal selected three cell lines, including nasal epithelial cells. The researchers then analysed gene expression changes which could be linked to the presence of a CF mutation. In order to perform these comparisons, the human micro-array from MWG-Biotech UK Ltd, a project partner, was used. This comprised 40 000 genes of the human gene and constituted the perfect tool to identify new target sequences and their functions. Real-time polymerase chain reaction (PCR) analysis of the genes provided further verification of the results together with analyses based on their protein products.

As a result, genes were identified that were consistently up- or down-regulated in CF tissues when compared to samples from non-CF patients. Further ongoing research based on these results is under way to increase the number of analyses and tissues under study. This may well lead to a more detailed understanding of the CF disease. In particular, the validation of gene expression changes through their protein products could be invaluable in earlier diagnosis and therapy.

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

Collaboration sought: further
research or development support.

Offer ID: 3551



Innovative cystic fibrosis diagnostics

Disease diagnosis often affects the overall prognosis. It is therefore important to be able to diagnose diseases early on and efficiently.

Gene array technologies have allowed the rapid detection of genetic mutations that are tell-tale signs of pathologies. The same is true for cystic fibrosis (CF) and CF-related conditions. Currently available screening platforms detect approximately 25 CF-linked mutations.

The EU-funded CF-CHIP project focused on the development of a new gene array technology platform for high-throughput diagnosis

of these diseases. As part of the project, plans were made for the development of an integrated, magnetic, sensor-based gene array. The diagnostic assays were to be partly based on the detection of qualitative or quantitative changes in RNA products resulting from mutations in specific genes.

The new technologies will essentially be able to detect abnormalities in gene structures and expression patterns. The innovative aspect of

the new technology is that it employs a panel of mutations with global application, and not specific to an individual region.

A series of tests, using real patient samples (some of which carried extremely rare mutations) revealed a 99 % accuracy rate. The results indicate that this new technology platform could signal a new era in CF diagnostics available to physicians.

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

Collaboration sought: further research or development support.

Offer ID: 3593

Magnetism aids detection of DNA sequences

Researchers have devised an innovative method to sequence the cystic fibrosis (CF) gene. The result was the development of a fast, yet accurate magnetic sensor platform housed in a portable device.

CF is caused by a 250 000-base-pairs long recessive gene on chromosome 7. According to some researchers, there are at least 900 known mutations for the gene. Not surprisingly, the effects on the individual, or its phenotype, vary with the mutation in question.

The aim of the EU-funded CF-CHIP project was to help unravel the vast range of mutations and phenotypes. Accordingly, the project developed a sensor platform com-

posed of an electronically addressable micro-array of magnetic spin valve sensors. The main innovation feature was the integration of magnetic sensors to detect the presence of target DNA sequences labelled with magnetic beads. When the complementary sequence hybridises, the bead is immobilised, which causes a detectable change in voltage.

Consequences of these innovations are that the whole process is accelerated and that the device is portable as the sensors are in the

platform biochip. This technology has been demonstrated with polymerase chain reaction amplified DNA, including different sequences to identify a mutation in the CF gene.

As a result of this development, two patent applications were made and the results have been published in peer-reviewed journals. Due to its portability, it is seen as ideal for use at the point of care. Furthermore, it is hoped that it will provide the basis for sequencing other complex mutations.

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

Collaboration sought: further research or development support.

Offer ID: 3497

Managing EU fishing fleets

A typology of management measures for a selection of EU fleets has been designed. Tectac, an EU-funded project, has set out to supply fisheries managers with a modelling tool that can exhibit how regulations impact on the dynamics of fleets and fishing mortality.

The primary idea behind this lies in investigating the features of the elements that cause fleet dynamics. These include the technological advances in gears and vessel equipment, as well as the overall tactical adaptation of fishing vessels. In essence, what was examined is how and why fleet dynamics occur, and what the consequences are on resources and their socioeconomics.

Fisheries management consists of various kinds of regulatory measures that may affect the behaviour of fish farms and fishing fleets. For example, it may ration the production possibilities of vessels or give fishermen economic incentives to alter their situation. However, the aims of fisheries management tools may have different goals. Therefore, a classification of

management criteria has been used for a selection of EU fleets.

Applicable regulations for various fleets have been reviewed based on this classification system. As a result, one of the key findings is that all fleets function in a context of individual access allocation. This can be effected either through the control variable of effort or catches or both.

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

Collaboration sought: further research or development support.

Offer ID: 3470

New technologies in the fight against fish diseases

Understanding the molecular mechanisms and the epidemiology linked to myxidiosis is an important aspect for the development of ways to combat this disease, which potentially affects fish all over the EU.

The EU-funded MyxFishControl project studied the *Enteromyxum leei* (*E. leei*) parasite to learn about the underlying pathology behind myxidiosis in a variety of fish populations. Evaluating the epidemiological aspect of the disease among specific fish populations was an important parameter of the project, deemed crucial in the efforts to control the parasite's spread.

Project partners worked on innovative methods to detect the *E. leei* parasite in fish tissues. Researchers have found it challenging not only to detect early stages of infection, but also to differentiate between various stages of parasite development. Spanish-based project partner Consejo Superior de Investigaciones Científicas used *in situ* hybridisation (ISH) to detect specific *E. leei* stages. The ISH method utilises specific DNA or

RNA strands to detect the presence of complementary strands in specific tissues.

ISH studies revealed that other myxozoan species are present in what was perceived to be early stages of infection in at least some fish. Furthermore, the presence of *E. leei* outside the target organs was also confirmed.

Supporting this line of research is expected to yield further insight into myxidiosis and likely ways to combat it.

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

Collaboration sought: information exchange/training.

Offer ID: 3447

Disease control management for sea bream

Intensive farming of any type is associated with inherent problems that can potentially be overcome by appropriate management. As a result of a European study, project partners have drawn up a list of recommendations to minimise the spread of myxosporosis within a maricultural environment.

This epidemiological study conducted by the MyxFishControl project was aimed at revealing relationships between exposure to biological agents, stress or physical environments with mortality or morbidity caused by the parasite *Enteromyxum leei* (*E. leei*).

For disease control, perhaps the most important phase is that of prevention of entry of infective stages into the fish culture environment. To achieve this, healthy stock that has been assayed rapidly and accurately and survey of water quality were both recommended by the report.

A strict management regime was also outlined to prevent the spread and growth of the parasite. The project's study of the life cycle of the parasite and its environmental preferences and requisites naturally formed the basis of the recommendations. Key points involved avoidance of the parasite's

optimum temperature and early marketing of the produce. During the research, it was discovered that prevalence of the disease increased with fish size. Consequently, sale of fish as early as economically feasible was recommended.

The mariculture sector has previously been dominated by the gilthead sea bream, but during recent years, other species including the sharpnose sea bream *Diplodus puntazzo* have increased in popularity. All the recommendations of the study apply not only to the gilthead, but also to the sharpnose sea bream.

This study has highlighted chemical-free control of the parasite through careful management of fish stocks, taking into account the natural requirements during the life cycle of the parasite. Its implementation could avoid such high economic losses for the mariculture industry in the future.



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

Collaboration sought: information exchange/training.

Offer ID: 3472

See also page 23 (offer 3500)

Assessing fleet and fishing distribution data

A script has been written for the evaluation of auxiliary data pertaining to fleets and fishing mortality.

Tectac, an EU-funded project, has provided fisheries managers with a modelling tool that can assist with evaluating the impact of regulations on the dynamics of fleets and fishing mortality. The supporting idea lies in the investigation of the underlying forces behind the elements that cause fleet dynamics as well as the overall tactical adaptation of fishing vessels.

Thus, the fundamental elements underlying the changing aspects of fleets were modelled

and analysed. Fleet dynamics were related to management regulations and to other external factors. Finally the impact of management on fleet dynamics, fish resources, fleets and fishing communities was evaluated.

A script was then designed in order to generate graphs of data availability. Some examples of such information include the number of ships and trips. Parameter ranges such as haul duration and time of setting

the net were also applicable from the script. Maps of catch according to species and effort distribution have been generated as well. These can be used for a prompt inventory of the substances of the data table and of possible errors in the data. An overlap in the data tables can be detected and maps of effort dispersion can be compared.

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

Collaboration sought: information exchange/training.

Offer ID: 3488

Sole research review

The sole is an important economic component of aquaculture. The aptly named, EU-funded Solemates project has conducted in-depth research into the continued development and refinement of commercial practices in the industry.

The sole is an ideal candidate for farming. There is a strong market demand from the home consumer and the restaurant trade together with a shortfall in supply. Furthermore, aspects of the sole life cycle make the fish eminently suitable for aquaculture. It spawns readily in captivity and, once fertilised, the buoyant eggs are easily collected.

The two species under study were *Solea* (S.) *solea* and *S. senegalensis*. Studies at the molecular level together with differences

in morphology and physiology confirmed their separation at the species level.

Research results recommended stocking density, optimum rearing temperature, feeding and salinity for farmed sole at different periods in the life cycle. For example, the most effective diet for weaning of the fry was found to be a mixture of inert and live food with added attractants. The simulated light pattern utilised followed the natural photoperiod, but researchers were aware that

changing the daylight length may hold the key to manipulation of maturation time.

For future research, the project partners intend to continue studying the variation of light and temperature settings on juvenile growth and weaning time together with alternative diet regimes. The project outcome has been published and broadly disseminated in the press, at conferences and in peer publications.

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

Collaboration sought: further research or development support.

Offer ID: 3468

Tropical tuna fisheries for fishing model

Researchers undertook a study of tuna purse seine fishing in the tropical Atlantic in order to accommodate a multispecies situation for a computer simulation framework.

Despite widespread concern, the oceans' wild fish stocks are still being exploited at an unacceptable level to fill an ever-increasing demand. The oceans and their ecosystems are vulnerable to the phenomenon of overfishing as a result of poor management guidelines and illegal, unregulated and unreported (IUU) fishing. Needless to say, all those interested in the conservation of the earth's ecosystems see it as essential that changes in management strategy be implemented to turn the situation around.

However, the results of any modifications to management strategies are notoriously difficult to predict. Many variables are in play including the dynamic environment, management and exploitation forces. EU project partners from the 'Framework for the evaluation of management strategies' (FEMS) consortium therefore devised a novel computer simulation framework to

assess the impact of changing management strategies and procedures.

As part of this study, to make modifications for a multispecies scenario, researchers at the Institute of Oceanography (IEO) in Madrid studied tuna catches in the tropical Atlantic. Three species are involved — bigeye, skipjack and yellowfin. For simplicity of analysis, however, the yellowfin was excluded. Assumptions made in the fishing model included catchability being constant and fishing mortality being proportional to fishing effort.

The software framework developed is available — please see <http://www.flr-project.org>. It is being applied in other projects as well as other assessment working groups including the most established worldwide, the

International Council for the Exploration of the Sea (ICES). Looking to the future, the assessment methods used in the FEMS framework can continue to be developed to improve the management strategies used for the preservation of the earth's resources.

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

Collaboration sought: further research or development support.

Offer ID: 3517

See also page 23 (offer 3500)



Genomic databases for bluetongue virus

Bluetongue virus (BTV) is an increasing threat to the livestock industry. A European project has set up genomic databases as a major resource in the fight against this disease.

BTV is a devastating disease affecting ruminants. Historically, there have been sporadic incursions into the most southern regions of Europe. However, since 1998 strains of bluetongue have spread north and across Europe. Its vector, the midge *Culicoides spp.*, has also increased its range, and recently there have been reported cases in the United Kingdom.

Consequently, this has made the research work of the EU-funded 'Bluetongue vaccination' project of prime importance to the agricultural world. The project partners have endeavoured to develop a safe, effica-

cious vaccination strategy to help to stem the spread of the disease.

As part of the thrust to achieve control of the virus, researchers at the Institute for Animal Health in Surrey in the United Kingdom have established a database of BTV isolates obtained worldwide. Furthermore, using sequence comparisons for all BTV isolates, primers have been developed to distinguish between genome segments from live attenuated vaccines and European field strains. These are listed at: http://www.iah.bbsrc.ac.uk/dsRNA_virus_proteins/ReoID/rt-pcr-primers.htm

For information on the possible geographic origins of the European BTV strains, please access: http://www.iah.bbsrc.ac.uk/dsRNA_virus_proteins/orbivirus-phylogenetic-trees.htm

These databases will permit epidemiological studies of BTV strains. They will also enable sourcing of European infections and early detection of vaccine breakdown. This in turn will aid speedy and effective control of future outbreaks. The service is available as a free, international resource.

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

Collaboration sought: information exchange/training.

Offer ID: 3485

Midge population dynamics for bluetongue virus control

The midge Culicoides imicola (C. imicola) is largely responsible for the transmission of the bluetongue virus (BTV) in sheep and cattle. Scientists have studied the factors responsible for the population dynamics in this important insect vector.

BTV can have devastating effects for the livestock industry. It causes severe losses financially and is a distressing condition for the animal concerned. Control of the disease is complex and the 'Bluetongue vaccin-

ation' project concentrated its resources on the development of an efficacious vaccine for the virus.

Another angle of research came from partners at the Onderstepoort Veterinary Institute in South Africa, who investigated breeding sites and changes in population numbers for the primary vector, *C. imicola*. The researchers found that moisture content and the speed with which a location dries up were the two main factors responsible for abundance of the insect. However, another significant factor was that the midge appeared to be nomadic and could occupy temporary

breeding sites. Populations could therefore readily transfer to more suitable areas when a site became too dry.

The midge is most prevalent in hot, humid conditions in the summer months. The team therefore initiated the establishment of a laboratory colony. This would mean that vector-host relationships could be studied all year round. Wild adult midges were collected and successfully induced to blood feed in the laboratory. Furthermore, their larvae survived together with the resulting adult progeny.

A more in-depth understanding of the pathology of this disease is possible, therefore, if a sustainable laboratory population is set up. Research in various locations will thus be able to continue during the winter period or when the midge is absent for any reason.

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

Collaboration sought: information exchange/training.

Offer ID: 3610

New breakthroughs against bluetongue disease

The incidence of veterinary diseases can seriously impact European livestock, consumer health and economy. New research is targeting the bluetongue virus (BTV), which affects the livestock industry across the EU.

The development of vaccines against bluetongue was the aim of the EU-funded 'Bluetongue vaccination' project. Project partners worked on all aspects of BTV, including epidemiology, policy formulation as well as scientific research. The project intended to develop inactivated vaccines utilising virus-like-particles (VLPs) and slow-release delivery systems.

The London School of Tropical Medicine and Hygiene, a project partner, developed a new technology for the synthesis of BTV VLPs. The researchers were able to generate a baculovirus, expressing BTV's four capsid proteins. The baculovirus could self-assemble into a VLP inside insects' cells, and it is then removed through a series of purification steps.

The advantage of this innovative approach is that no BTV genetic material is used in the final vaccine, rendering the final preparation extremely safe. The advantage is that, with this approach, the risk of infection with this vaccine is eliminated. Researchers were aiming to further develop this technology in order to form the basis for an anti-BTV vaccine in sheep.

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

Collaboration sought: information exchange/training.

Offer ID: 3442



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Mutant viruses provide clues to infectivity

Foot-and-mouth disease causes serious economic losses in agricultural stock. Researchers have investigated the virus-host cell interaction and consequent infectivity of the disease.

The foot-and-mouth disease virus (FMDV) causes one of the most contagious animal diseases with important losses. It leads to high mortality in young animals due to myocarditis. After the acute phase, there is often a persistent infection without symptoms. Carrier animals also arise in those vaccinated and then exposed to FMDV. Obviously, the development of these hidden carriers presents an obstacle to any vaccination scheme implemented to control the spread of the disease.

Researchers, as part of the 'FMD tropism' project, studied aspects of persistence in

carriers together with mechanisms of host cell recognition by the virus. One of the teams focused on the receptor binding sites of the virus in conjunction with integrins on the host cell surface. Integrins are very significant cell surface receptors that define the cell shape, mobility and cell cycle regulation. They are thought to be an important factor in infectivity. In order to do this, the team created recombinant viruses with mutations either side of the receptor binding site.

The scientists observed the behaviour of the recombinant viruses *in vivo* and *in vitro*. They discovered, as suspected, that

the amino acids on the viral coat and their arrangement were crucial for infectivity. In some cases, the arrangement on the virus coat was found to have changed in order to accommodate the mutations on the virus shell. Furthermore, the level of modified infectivity was linked to the particular change in the site.

To elucidate the nature of the virus-host cell interaction and its role in infectivity is a big step. Further R & D can aid the successful implementation of a vaccination programme to help the eradication of this disease.

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

Collaboration sought: further research or development support.

Offer ID: 3547

Shedding light on platelet-related diseases

Reduced platelet counts are likely to lead to bleeds, which in their most severe form can occur in the brain.

Diagnosing low platelet levels could mean the difference between life and death for some patients at risk of cerebral bleeds. Current research is therefore focused on the development of novel, fact-diagnostic products, which can accurately detect the condition and overall have a favourable impact on related conditions.

The Platelets project aimed to develop platelet diagnostics, thus reducing the potential incidence of cerebral bleeds. Project partner University of Heidelberg, in Germany, worked on the analysis of P-selectin. P-selectin is a cell adhesion molecule present in the activated platelet cells and thus important in the overall function of these cells.

The studies compared the genes involved in the P-selectin production between healthy individuals and those suffering from coronary heart disease (CHD). CHD patients

showed genetic variations in the corresponding genes, possibly linked to the disease.

As low platelet levels are sometimes attributed to self-antibodies 'attacking' these cells, studies also focused on the role of genetic polymorphisms and the emergence of alloantigens. Alloantigens can essentially wrongly instruct the immune system to attack itself. Indeed, P-selectin variants were considered as likely candidates as possible alloantigens.

Further research is needed in order to create diagnostics able to detect the presence of antibodies to such alloantigens and

thus warn about possible drops in platelet counts.

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

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

Offer ID: 3486



New generation of acidosis inhibitors

Diet has a great effect on the general well-being of ruminants and, in particular, on the amount of methane and nitrogenous products they excrete.

The Rumen-up project focused on the development of plant-extract-based dietary supplements to replace chemical additives. The aim was to reduce overall methane formation as well as bloating and lactic acidosis.

The University of Reading, a project partner, analysed the risks of the condition lactic acidosis. Under normal feeding conditions, lactic acid is produced only at low levels.

However, lactic acid production by bacteria can be life-threatening for a number of animals.

High levels of lactic acid result in a significant drop in pH, disrupting the normal fermentation process. This can occur to a degree that a balance cannot be reached again and the animal dies. In most cases, lactic acidosis is manifested as a milder pathology causing some distress, but not leading to death.

The most efficient way to reduce the symptoms and alleviate the condition is by suppressing the growth of lactic-acid-producing bacteria. Researchers showed that the plant species *Lactuca sativa* and *Urtica dioica* displayed lactic-acid-lowering activities by suppressing bacterial activity. These results could form the basis of a new generation of plant-based additives that could benefit livestock across the EU and beyond.

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

Collaboration sought: licence agreement.

Offer ID: 3635

Assessing health care for preterm births

Mosaic, an EU-funded project, supplies eminent empirical data on care conditions for very preterm babies in Europe.

Health professionals are faced with the challenge of providing the best access to intensive care for very preterm infants. These births are responsible for the most deaths and cases of severe handicap from the prenatal period. Thus, specialised care is vital for their survival and future quality of life.

When very preterm babies are born in a maternity ward with neonatal intensive care, their chances of survival increase. Several countries have specialised prenatal

units where these babies should be delivered. The problem, however, is that in most European countries, assessment of the care of these babies is not possible due to a lack of comparable data. Additionally, there is no clear consensus regarding the key structural features of a prenatal centre.

In light of this public health issue, Mosaic offers information regarding the place of very preterm births in terms of the structural characteristics of the maternity and neonatal units. Moreover, it covers the

health outcomes of babies in regard to the different models of organisation. The results are necessary in acknowledging that European countries can accomplish common goals using different models of care, and that research helps to identify the characteristics resulting in poor outcome. This information is of interest to health policy-makers, regional governments, professional societies and clinicians alike.

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

Collaboration sought: further research or development support.

Offer ID: 3498

Evaluating innovative food storage methods

Storage is a very important aspect of food processing in today's industrialised food sector. The methodologies that are used should be safe both in the short and in the long term.

Evaluating the effects of the different storage methods that can be used is the topic of research across Europe. The EU-funded 'Safe ice' project focused on the effects of pressure in low-temperature food storage conditions. Specific parameters that were examined were quality aspects, thermophysical properties and overall stability of food products.

Project partners studied the behaviour of specific enzymes at high-pressure, low-temperature conditions and how these enzymes might affect overall food quality. Enzyme inactivation is usually achieved through the application of a specific heat treatment for a

short time period. Heat-treating food products, however, might also negatively impact other parameters, lowering the nutritional value of these products.

The evaluation of high-pressure, low-temperature treatments following the 'conventional' freezing processes was deemed a necessary aspect of this research project. Although not conclusive, studies showed favourable results for at least one enzyme, polyphenoloxidase (PPO). Freezing and thawing, in the presence of the pressure,

seemed not to result in an increase in enzymatic activity.

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

Collaboration sought: information exchange/training.

Offer ID: 3493



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Food spoilage studies for novel processing methods

The effects of high pressure combined with low-temperature food processing on the viability of important food spoilage microbes have been studied.

In the wake of increasing popularity of processed foods, it is essential that the interests of the consumer are met, not only in terms of quality, but also with regard to safety. New refinements in techniques for food preservation are constantly being developed, including the use of high pressure, low temperature (HPLT) for freezing. The use of high pressure during freezing can create a higher quality food product. Researchers in the 'Safe ice' project investigated the scientific and technological hurdles related to this process. As part of the consortium, scientists at Unilever in the Netherlands investigated the viability of two important microorganisms that cause food spoilage.

The first, *Bacillus subtilis* (*B. subtilis*), is an important model microbe. By itself, it can induce 'ropiness' in bread products, i.e. a soft, stringy brown mass that smells of fruit. The Unilever research team observed *B. subtilis* using flow cytometry, staining techniques and membrane permeability to assess damage to the cells. The microbe showed heterogeneous resistance to the HPLT treatment. The researchers discovered the range of pressures combined with -25°C that were most likely to cause inactivation in *B. subtilis*.

Listeria monocytogenes, responsible for listeriosis, was also studied. As an important

and highly dangerous pathogen, it was observed under different conditions in one of its habitats, smoked salmon. The synergistic effects of high-pressure processing, sub-zero temperature and varying pH were monitored.

The ultimate goal of the project was to develop process and product technologies during the phases of freezing, thawing, chilling and storage of HPLT-processed foods. Viability data for food spoilage organisms under these conditions will provide a basis for continuing the production of safe, high-quality food for consumer protection.

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

Collaboration sought: information exchange/training.

Offer ID: 3530

Electronic bladder control

Bladder incontinence exacts a high price in terms of quality of life for the patient. An EU-funded project has investigated the development of an electronic system for bladder control.

All too often, spinal cord injury results in neurogenic incontinence. This is a debilitating condition where the bladder can empty without the conscious control of the patient. Project partners of the consortium 'REBEC neuromodulation' have investigated the development of an electronic device to detect when there are signals for the bladder to empty involuntarily.

The system operates on the basis of the so-called detrusor signals to empty the bladder

being used to suppress the resulting contraction. This stimulation is termed 'conditional neuromodulation' and is therefore only initiated when required. It involves electronic circuitry to detect the onset of the contraction that would empty the bladder together with a feedback pathway to prevent it. Implementation would significantly increase bladder capacity.

The team's intentions are to continue research using this project as a base and achieve com-

plete bladder control. To accomplish this, stimulation of an anterior nerve root is also required for emptying of the bladder.

The outcomes of this continued research will help to improve the quality of life for people with traumatic spinal cord lesions. As a result, it can improve the chances of rapid rehabilitation after such injuries. Furthermore, it could be used in any signalling device where implantable electrodes are required.

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

Collaboration sought: information exchange/training.

Offer ID: 3612

Manual for quality assurance of health services

A manual based on the theory of planned behaviour has been designed as a tool to help researchers and health workers in providing quality assurance.

Quality improvement (QI) measures are designed to improve health services. The problem, however, is that most strategies remain theoretical and do not alter professional practice or improve patient care. In order for this to change, the 'Research-based education and quality improvement' (Rebeqi) project set forth to narrow the gap between research and practice by designing a research-based approach to QI.

The way the Rebeqi project went about this was by using the theory of planned behaviour (TPB) as the foundation for a practical manual. TPB is based on a psychological model of behaviour change. The manual arose from a request from health

service researchers wanting to understand behaviour. This provides support in creating health care interventions. It can also help researchers or health workers involved in quality assurance to create a questionnaire for assessing the attitudes and beliefs inherent in health-related behaviour. Furthermore, responses from the questionnaires can be utilised in planning the development of interventions.

The manual has been used in a broad array of reviewing and testing procedures. Specifically, it has been tested in the Netherlands and in the United Kingdom to examine management of

diabetes in support of designing methods to prioritise and choose intervention elements.

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

Collaboration sought: further research or development support.

Offer ID: 3571



High-sugar grass for nitrogen efficiency

The livestock industry is an important component of the European agricultural economy. Sweetgrass, an EU-funded project, has investigated the increase of nitrogen utilisation efficiency (NUE) in ruminants under a regime of high-sugar grass feed.

In terms of environment, economics and sustainable systems of livestock production, the efficient conversion of nitrogen in plant protein to milk and meat products is essential. Higher efficiency of conversion also means less loss of nitrogen to the environment. This would remove a source of nitrogen from waterways and reduce the phenomenon of eutrophication. Excessive plant growth in rivers is particularly acute when nitrogen, not incorporated into meat and milk and excreted via urine and faeces, leaches into waterways.

To study the increase in NUE, the Sweetgrass project investigated new conventionally bred

varieties of grass selected specifically for high sugar content. This was on the premise that high-sugar feed can increase the NUE. Furthermore, this is particularly important in upland areas of northern Europe, for example alpine regions, where it is difficult to grow supplement forage with high sugar content, for example maize.

Workers at the Institute of Grassland and Environmental Research in Wales worked on the use of the highly water-soluble carbohydrate (WSC) ryegrass AberDart. Trials performed used realistic grazing and conservation settings. Nitrogen utilisation and reduction in nitrogen pollution from fae-

ces and urine were the primary parameters measured. Also monitored were the conservation of WSC in silage (fermented grass) and the ability of AberDart to accumulate WSC during large field trials.

Results were encouraging overall. It was demonstrated that under appropriate conditions, particularly in extensive grassland, it was possible to increase the efficiency of production response. There was therefore a corresponding reduction in environmental nitrogen pollution. Moreover, this was the case for both fresh and ensiled grass, important when fresh feed is unavailable.

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

Collaboration sought: further research or development support.

Offer ID: 3602

Mining the oceans for cancer-fighting drugs

For ages, man has turned to nature not just for sustenance, but also for medicine. Heading into the 21st century, increasing attention is being focused on the vast reserves of raw biological material in the oceans.

One objective of the Miracle project was to sift through the enormous marine microbial biodiversity to find new compounds that could potentially be exploited for medical purposes. Instituto Biomar in Spain, a project partner, performed a series of advanced analyses in the laboratory to detect cytotoxic substances in samples collected during the project.

Marine bacteria were fermented in broths and inspected with mass spectrometry (MS)

dereplication via electrospray (both positive and negative) and atmospheric pressure chemical ionisation (both positive and negative). The aim was to remove already known compounds.

The remaining unknown compounds were subjected to additional fermentation and MS dereplication steps. Phase separation, increased volumes and different solvents were employed in order to encourage elevated

growth rates. This led to enhanced isolation and identification of the target compounds.

The Spanish scientists found steroids such as Ergosterol as well as cyanobacteria with promising levels of cytotoxicity, an important characteristic of cancer-fighting drugs. Instituto Biomar is examining patent-related issues for these and other compounds discovered during Miracle with a view to commercial exploitation.

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

Collaboration sought: further research or development support.

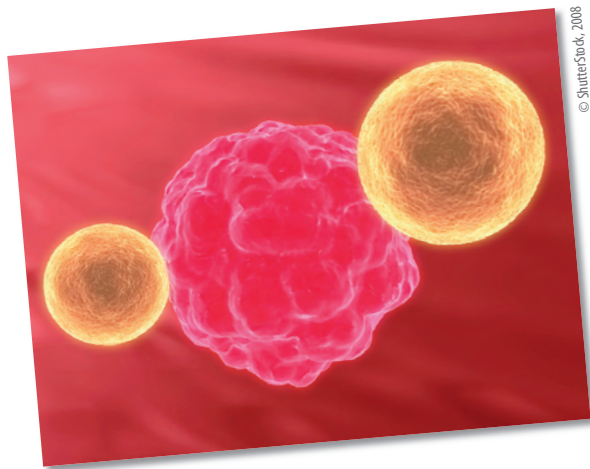
Offer ID: 3527

Target molecules identified by RNA interference

The unravelling of biochemical pathways may well hold the key to understanding cellular mechanisms in tumours. As part of this drive, a European project has investigated RNA interference as a basis for molecular target validation technology.

The production of certain proteins as a result of gene expression in tumour cells can influence the development of a cancer. RNA interference (RNAi) is a means by which gene expression can be regulated, in some cases inhibited altogether. During this pathway,

short RNA fragments known as small interfering RNA (siRNA) are produced. These are exactly complementary to the genes they are suppressing. Suppression, or the reduction of the levels of key proteins in the development of malignant cells, is an exciting area in anti-cancer drug development.



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Apoptosis, or programmed cell death, is another pathway that can be utilised in the fight against malignant cells. Partners in the EU-funded Impaled project researched these cell suicide cascades and their molecular constituents. In conjunction with this, scientists at Eirx Therapeutics in Ireland worked on a novel validation platform using siRNA.

This aimed to study the consequences of knocking out molecular targets as identified by other project partners. The objective was to identify the proteins not produced as a result of the RNA interference technology.

Knock-out rates for the proteins targeted by siRNA designed by Eirx were significantly high. The western blotting technique was used to confirm the reduction of protein expression from these target genes. Furthermore, the team at Eirx also developed a speedy method to deliver siRNA into the cells with a resultant limited toxicity due to the fast transfection rate.

The identification of these apoptotic molecular components can form the basis of the bid to determine the role of programmed cell death in cancer. It may also shed light on the reasons for resistance of cancerous cells to chemotherapy and radiotherapy treatment.

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

Collaboration sought: further research or development support.

Offer ID: 3544

Overcoming tumour resistance

One of the main obstacles to the success of anticancer therapies is tumour resistance to chemotherapeutic agents and radiation. Rendering these tumours sensitive to treatment would signal a new era in the cancer field.

The Impaled project studied the molecular interactions of the p53 family of proteins, the major sensor of DNA damage in the cells, with the mitochondria. Sensing DNA damage is the first step towards the initiation of a cascade of events leading the cell to apoptosis, rather than uncontrollable cancer growth.

The project aimed to elucidate the mechanisms that lead to tumour resistance with the ultimate goal of developing method-

ologies that could reverse the situation. Project partners EIRX Therapeutics focused their efforts on the study of the role played by the cytochrome P450 (Cyp450) group of enzymes on the metabolism of anticancer drugs. It has been shown that their enzymatic activity can enhance or impede the overall effect of anticancer regimens.

Researchers studied the expression pattern of a number of Cyp450 family members in

a series of lung cancer cell lines. Given their function in a number of key metabolic steps, the goal was to establish whether Cyp450 expression was somehow linked to tumour resistance. Further studies are likely to be instrumental in the identification of specific molecular targets for the reversal of tumour resistance in lung cancer.

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

Collaboration sought: further research or development support.

Offer ID: 3504

Investigating the mitogen-activated protein kinase pathway

The mitogen-activated protein kinase (MAPK) pathway is one of the most important signalling pathways at the cellular level. Its role covers a wide spectrum of functions, but certain questions regarding the actual mechanism behind signal transduction still persist.

The EU-funded 'MAPK signalling' project combined a number of disciplines including proteomics and knock-out technology in order to shed light on the complexity of the MAPK pathway. The ultimate goal is to gain enough knowledge to isolate new targets for therapeutic intervention in a number of pathologies.

Understanding the protein expression patterns throughout the MAPK pathway has been a goal of project partner University of Manchester. Studies revealed new information regarding protein function within the MAPK pathway. Further insight was gained in terms of internal protein organisation and interaction within the pathway.

The study results can provide information on the suitability of the potential drug targets within the pathway and data relating to each protein in particular. Specifically, scientists learned more about the potential side effects of therapeutics targeting specific proteins, following their proteomics studies. The university created a series of models mimicking the MAPK pathway, which again could find great application in the drug discovery and development process.

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

Collaboration sought: further research or development support.

Offer ID: 3512

Proteome map for mitogen-activated protein kinase cell division pathway

Raf-1 is an important protein in the mitogen-activated protein kinase (MAPK) pathway, a molecular cascade frequently involved in the cell cycle. Researchers have identified and studied Raf-1 complexes formed by this molecule on its journey through this pathway.

The MAPK pathway is a means by which many cells promote the start of cell division. It fulfils this function by coupling responses within the cell to the binding of growth fac-

tors to cell surface receptors. The pathway is extremely complex and involves many proteins. Its importance in research includes cancer and many immunological disorders when the cascade becomes deregulated in some way.

Partners of 'MAPK signalling', an EU-funded project, focused their research on one protein in particular, Raf-1. In order to isolate and characterise Raf-1 signalling complexes, researchers at the Beatson Institute for Cancer Research used mass spectrometry to identify the components of the complexes formed during the cascade.

Three strategies were used to identify important Raf-1 complexes during the execution of this molecular cascade. First, the products of the pathway were compared with

those formed by mutants of Raf-1. Secondly, the conditions for the MAPK pathway were varied, an example being serum starvation. Interestingly, this uncovered a molecule that can induce apoptosis, programmed cell death, in response to stress signals. Lastly, the isolation of Raf-1 complexes in different subcellular compartments yielded the identification of at least five Raf-1 complexes.

Identification of the myriad of protein complexes in the MAPK pathway could well be a major gateway to the identification of protein targets for therapy for cancer and other syndromes linked directly or indirectly to the cell cycle. The unravelling of the complex nature of the MAPK pathway can also lead to identification of side effects of such therapies. Project partners are interested in further collaboration and have already cooperated with other related research projects associated with the MAPK pathway.

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

Collaboration sought: further research or development support.

Offer ID: 3495

Potential new therapy for gliomas

Development of effective anticancer therapies often involves combining innovative treatments with groundbreaking delivery systems.

The Scavidin project focused on a treatment against malignant glioma. The aim was to develop a target-specific delivery system, based on the fusion gene-therapy approach. The fusion gene that was cloned successfully by the project partners was termed Scavidin, containing avidin-binding domains. The Scavidin protein acts as a membrane-spanning receptor, with extra- and intra-cellular domains.

The goal was to ensure that cells carrying the Scavidin protein on their membranes

would be able to specifically bind biotinylated anticancer therapies. The overall system could ensure specific delivery to the target with reduced side-effect impact and increased efficiency.

Using gene therapy methods, target tumour cells were transfected with the Scavidin gene. Expression of the gene resulted in tumour cells carrying the avidin-binding domains. The Scavidin system could find application as a targeted therapy for

malignant glioma and other neoplastic diseases.

Further application of the Scavidin approach might include *in vivo* purposes and studies related to biotin metabolism and functions. The researchers are seeking further collaboration on this patent-protected line of investigation in order to reap the full benefits of their approach.

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

Collaboration sought: further research or development support.

Offer ID: 3496



Hyperthermophiles: too hot to handle?

For a wide range of microorganisms, high temperatures of above 80 °C provide the perfect conditions for growth. These microorganisms, termed hyperthermophiles, can provide answers to a number of key biotechnology questions.

Using biological material for a series of applications, whatever they may be, is a broad definition of biotechnology. Over recent years, biotechnology applications have progressed to a high state of precision and scope. Materials ranging from enzymes to whole cells are used for a great number of functions.

Hyperthermophiles exhibit a more favourable profile compared to their 'normal-temperature' counterparts. However, production of hyperthermophilic material (such as enzymes and other proteins) on a large scale is still underdeveloped. Therefore, the EU-

funded Hypersolutes project explored ways to engineer a system for the production of mannosylglycerate, a widely used solute sourced from hyperthermophiles. This was considered to be one of the first key steps towards the wide-scale exploitation of hypersolutes and their benefits.

The role of mannosylglycerate is essentially to stabilise peptide structures in high-temperature environments, therefore protecting the microorganisms from the effects of the heat. However, using mannosylglycerate in an *in vitro* setting in order to fully characterise its profile has been greatly hampered

by the inability to produce this solute in sufficient quantities.

Project partners devised a new method, whereby mannosylglycerate could be produced using non-hyperthermophilic microbial systems. The genes responsible for the production of mannosylglycerate were isolated and then transfected into *Saccharomyces cerevisiae*, a commonly used microbial system. The end result was a newly engineered *Saccharomyces cerevisiae*-based system, which could produce mannosylglycerate *in vivo*.

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

Collaboration sought: further research or development support.

Offer ID: 3573

Stem cells developed for Parkinson's therapy

Parkinson's disease (PD) is a very distressing condition for all those affected. Researchers have succeeded in developing a means of producing replacement neurons that could provide a basis for an effective therapy.

In the normally functioning brain, dopaminergic (DAergic) cells produce dopamine (DA) which causes the transmission of signals for the smooth operation of muscles. In PD, the DA-producing cells die or degenerate, leaving patients unable to control their movements.

Although feasible, the use of primary foetal tissue to replace the faulty neurons is problematic due to ethical and practical reasons. As a result, partners from the EU-funded 'Development of human dopaminergic neuronal cell lines for transplantation' (DANCE) project worked on one possible alternative source: human neural stem cells (hNSCs). Previous work on these lines had been

restricted because of the inherently low yield of DAergic cells from stem cells coupled with a limited survival rate for the neurons.

Researchers at the Autonomous University of Madrid in Spain worked on the 'survival protein' Bcl-XL, famous for its properties of cell death repression. They discovered that this molecule had the overall effect of increasing the frequency with which the human stem cells differentiate into DAergic cells. These encouraging results appeared to be attributable to the ability of Bcl-XL to enhance the survival of these crucial neurons.

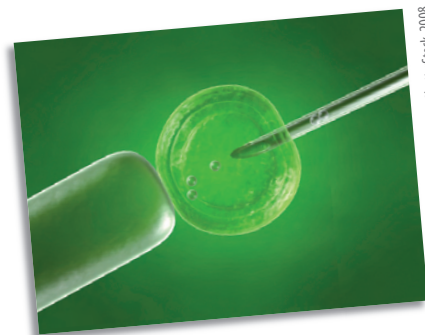
PD affects more than a million people in the EU and is a very difficult condition for the

patient and the carer. It is also expensive in terms of cost to the community health care system. Further research is expected to yield cell lines suitable for the conduction of clinical trials and a possible effective therapy for PD.

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

Collaboration sought: further research or development support.

Offer ID: 3514



New breakthrough for Parkinson's disease patients

The treatment of neurodegenerative disorders like Parkinson's disease (PD) has been particularly challenging due to the inability of nerve cells to regenerate.

The EU-funded 'Development of human dopaminergic neuronal cell lines for transplantation' (DANCE) project concentrated on the development of expandable human dopaminergic neuronal cell lines, thus allowing transplantation into large number of PD patients.

Transplanting aborted foetal nerve cell grafts to PD patients has been shown to restore function, something that medications have

been unable to achieve. It is, however, morally and even logistically impossible to apply this approach for the large-scale treatment of PD. It is therefore imperative to mimic the effects of these grafts and create other solutions which can address the existing need for efficacious treatment of this disease on a large scale.

Project partners therefore concentrated on the creation of neuronal cell lines, based

on initial neural stem cells of foetal origin. Project partner NSGENE A/S developed a protocol which was shown to result in differentiated stem cells expressing tyrosine hydroxylase.

The creation of neuronal cell lines *in vitro* could signal an important breakthrough in the treatment of PD and other neurodegenerative diseases. Further research is required, however, in order to optimise the maturation process of cells and improve their survival *in vivo* post-transplantation.

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

Collaboration sought: licence agreement.

Offer ID: 3513

Iron and infections linked to atherosclerosis

It is thought that iron may be one of the culprits causing inflammatory diseases like atherosclerosis. Researchers have attempted to elucidate links between excess iron and the development of these conditions.

Chronic inflammation of the lining of blood vessels, or endothelium, is a precursor of diseases like atherosclerosis. Researchers from the 'Nutrient iron toxic' project looked into potential catalytic agents that initiate the cytokine cascade, giving rise to the damaging inflammation.

Researchers at the Medical University of Utrecht investigated whether there may be more than one factor acting as a catalyst for atherosclerosis. Several pathogens, notably *Chlamydia pneumoniae* (Cp) and cytomegalovirus (CMV), are known to have an inflammatory effect. It is also well known

that iron plays a role in infections, and the scientists postulated that this mineral could complicate the endothelial activation.

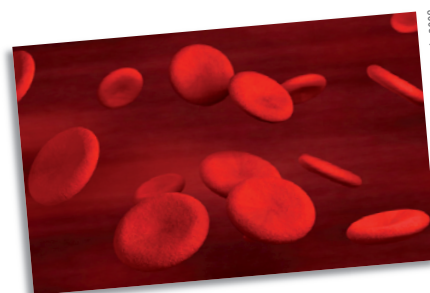
As an indication of endothelial activity, the team measured levels of intercellular adhesion molecules present during an immune response. It was discovered that iron additionally upregulated the expression of these immune response molecules when Cp or CMV were present. To implicate the role of iron further, it was discovered that the effects of the mineral could be reversed by use of chelators that attach to the iron and effectively inactivate it.

These findings could have important implications for those with disorders involving iron metabolism and individuals with a high dietary intake of the mineral, especially in populations positive for Cp or CMV infections.

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

Collaboration sought: further research or development support.

Offer ID: 3581



Analysing biomedical signals via advanced algorithms

The 'Blind source separation and applications' (BLISS) project studied and improved advanced signal processing techniques before applying them in biomedical signal analysis.

Under the auspices of the BLISS project, the theoretical, algorithmic and application aspects of important signal analysis techniques were extensively explored. The so-called blind source separation (BSS) allows separation of a signal set from a mixture of signals without requiring information about their nature. Another computational method for signal separation is the independent component analysis (ICA) that provides the additive subcomponents of a multivariate signal.

More specifically, the project work focused on developing theory and algorithms for lin-

ear and non-linear ICA, as well as for separation of non-independent signals. Theoretical work and developed algorithms found useful applications in the analysis of biomedical signals and acoustic mixtures. Biomedical applications included detection and elimination of artefacts, validation of ICA decomposition and identification of relevant sources. In addition, preliminary results were also collected concerning functional magnetic resonance imaging (fMRI), analysis and foetal electrocardiogram (ECG) extraction.

Application of the promising ICA method in the analysis of electro- and magneto-

encephalograms (EEG and MEG respectively) and fMRI has a considerable impact on human brain mapping research. Concentrating on neuroscience, researchers were able to analyse brain responses to external stimuli using both MEG and fMRI mapping modalities. Other applications involved the analysis of the haemodynamic response of the brain to auditory stimuli using fMRI. Structural MRI technique was also employed for brain tissue segmentation and classification. For further information, please visit: http://www.lis.inpg.fr/pages_perso/bliss

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

Collaboration sought: further research or development support.

Offer ID: 3533

Water pressure for a stable spine

Mechanical and biological integrity of intervertebral discs is vital for effective and pain-free functioning of the spine. Eurodisc, a European project, studied spinal discs in the young and in the elderly to ascertain the importance of water pressure in relation to load-bearing function.

The structure of a disc is simple, but ingenious and very effective in the fulfilling of its function. It consists of a soft spongy middle surrounded by rings of tough fibrous material, the annuli fibrosi. This enables the two seemingly opposed properties, support and flexibility, to occur together.

The project team at the Israel Institute of Technology measured internal water pressure in the annuli fibrosi under applied load. The swelling pressure, from a biochemical point

of view, is due to a group of molecules called the proteoglycans. As a result of their structure, they attract and hold water molecules, thus increasing the hydrostatic or osmotic pressure within the disc. The scientists used low-angle x-ray scattering and techniques to measure osmotic stress to give an indirect measure of water content. Subjects studied ranged from 25 to 77 years old.

The researchers discovered that the water content depended on age, external osmotic

pressure and tissue location. Furthermore, it appeared that disc tension in the annuli fibrosi plays only a minor role in the state of balance of the disc under load.

Artificial disc transplantation requires that physical and chemical parameters of the prosthesis are within a certain range. Project results of this nature can contribute to the effectiveness of disc replacement for sufferers of chronic back pain.

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

Collaboration sought: further research or development support.

Offer ID: 3624

Physical training programme for understanding frailty

A study was conducted in order to investigate modifications in muscles and tendons in relation to age.

Motor system condition becomes frailer as people get older, making mobility, balance and endurance limited. Frailty is associated with falls, inability to perform certain daily activities and a loss of independence. Therefore, it is imperative to know more about this phenomenon in order to lessen its impact so the elderly can lead safer and more socially inclusive lives.

In light of this, the Better-ageing project has researched causes of and remedies for physical frailty. One of the ways in which it has done this is by evaluating the effects and benefits of a 12-month physical training programme.

A total of 58 older people and 31 young adults were selected for comparisons.

One of the major findings was that sarcopenia (loss of muscle mass) is related to a decrease in fibre fascicle length as well as stiffness in the lower tendons of older people. Also, neural drive to the muscle was not like that of young adults because muscle voluntary activation was reduced in the older individuals. It is changes like these which make up approximately 50 % of the loss in peak muscle power and 70 % of the loss in isometric strength. This shows deterioration in muscle quality in old age.

Overall, the findings show that muscle weakness in old age is not only caused by a loss of muscle mass, but also by changes in the internal architecture of skeletal muscle. This is intensified by a decline in tendon stiffness as well as alterations in neural drive. It is important to note, however, that physical activity, such as aerobic, concentric/eccentric strength and proprioceptive exercises, is effective in reversing or lessening such age-related changes. If performed at least twice a week, these exercises can help to improve muscle quantity, quality and functional performance. Thus they can be recommended for future training programmes designed for older individuals.

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

Collaboration sought: further research or development support.

Offer ID: 3597



Ageing gracefully

Ageing affects physiological processes at all levels. The immune system is no exception to the rule.

The EU-funded 'T cell immunity and ageing' (T-CIA) project studied the ageing process of human T lymphocytes. Project partners carried out comparisons between young and old, very healthy and less healthy individuals. The aim was to elucidate which characteristics can be attributed to the ageing of the immune system and which could be due to pathogenic causes, thus gaining a clearer understanding of the underlying processes.

The University of Tübingen, a project partner, set out to develop a series of *in vitro* models of T cell ageing, in an effort to define appropriate biomarkers for the process. Biomarkers predictive of T cell dysfunction as a result of ageing could pave the way for the development of remediation approaches *in vivo*.

Researchers observed that the genetic characteristics of healthy aged donors are indicative of superior immune responsiveness even in chronic antigenic stress. *In vitro* models could provide evidence of these characteristics, which include polymorphisms in the genes encoding for cytokines and cytokine receptors. As such, this information could be of particular importance to healthy ageing initiatives at different levels of development.

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

Collaboration sought: further research or development support.

Offer ID: 3603

Examining marginalisation in elderly care service

A report concerning elderly care and the interactions between service providers and service clients has been produced in the hope of eliminating marginalisation.

The CARMA project has set out to improve the well-being of the increasing elderly population in Europe. It has done so by gathering various resources. The information is from academic research institutions, social service providers and educational institutions. Current social care services for the elderly were examined from various angles.

A conference was held in Graz in April 2005 with approximately 81 participants, consisting mainly of practitioners of social work with the

elderly and senior care workers. The theme of the conference was dealing with social exclusion of elderly people. Keynote speakers and workshop leaders devised a draft version of a report. The study particularly explores clients who are marginalised, also known as deviant cases. Deviance is described as the behaviour or condition of the client which can prevent admission, lead to discharge or cause friction in providing service.

Studying deviant cases of users brought to light the preconditions which a client

is required to meet in order to receive the appropriate service and support. Furthermore, pinpointing the appearance of friction or the exclusion of a particular type of client allowed the marginalisation process to be uncovered. Finally, the way in which the exclusion process may affect elderly individuals who are more vulnerable due to poor health or lack of economic, social or cultural resources was examined.

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

Collaboration sought: further research or development support.

Offer ID: 3583

Turning water and sunlight into hydrogen energy

A technologically advanced reactor can turn ordinary water and sunlight into hydrogen energy, unlocking the door to an endless source of carbon-free energy for humankind.

Using hydrogen as a source of energy for transport, electricity production and other applications is environmentally attractive. Currently, however, the most feasible methods of hydrogen production are linked with emissions to the atmosphere that negatively impact air quality and contribute to climate change. Unfortunately, this means hydrogen has little advantage over conventional fossil fuels.

Cutting-edge research funded through FP5 could turn things around. The Centre for Research and Technology Hellas (CERTH) coordinated the Hydrosol project with the goal of making hydrogen from two renewable resources: water and sunlight.

Combining their expertise with that of researchers from three other EU Member States, the CERTH's scientists designed and tested a novel solar reactor. The incident solar radiation is used to superheat water to the point where it dissociates to form hydrogen and oxygen. A special catalytic coating inside the reactor helps to reduce the temperature that must be reached for water splitting to occur. Ceramic components and a honeycomb monolith structure further enhance the reactor's efficiency.

The CERTH and its Hydrosol partners have applied for a patent for the new reactor, which is similar in size and shape to the catalytic converters on most automobiles. The new reactor could transform hydrogen into a more viable form of energy, especially in southern Europe where sunshine is plentiful all year round. Furthermore, this result can contribute to Europe's goals of energy production from renewable energy sources and reductions in carbon emissions.

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

Collaboration sought: further research or development support.

Offer ID: 3628

See also pages 18 (offers 3608, 3634 and 3562), 19 (offer 3648) and 44 (offer 3560)



Guide for testing wind turbine blade material

The 'Optimat blades' project has designed OptiDAT, a database used for its information and methodology, as a guide for testing wind turbine blade materials.

The need to expand the installed capacity of wind turbines is increasing. Therefore, reliable and structurally optimised blades are also needed. The material used for the blades of larger wind turbines needs to be optimal because blade mass increases disproportionately to the capacity of blade energy output.

The 'Optimat blades' project has provided precise design recommendations for the best use of materials for wind turbine rotor blades in order to achieve improved reliability. These relate to the design of new blades,

but also the prediction of their residual strength and duration.

The OptiDAT database contains results of various tests performed on two material systems. Both of these material systems are made up of glass-fibre-reinforced epoxy, but with a slight variation in resin systems. Results of fatigue and tests for various loading conditions are part of the database. Specific information on thermal expansion coefficients as well as the fibre volume fraction and glass transition temperatures were recorded and reported.

The results were reported in a single worksheet. The database also contains sheets explaining use, plate, geometry and test type details as well as project participants' contact information. Since the results were readily available, test progress was easier to track. The database included several progress-tracking features. OptiDAT is available free of charge to members and students and with a small maintenance fee for the general public.

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

Collaboration sought: further research or development support.

Offer ID: 3606

Environmental effects of wave energy conversion

A life cycle analysis (LCA) has been carried out to assess the environmental impact of a wave energy converter.

The Labbuoy project has focused on mathematical and physical model testing of a novel wave power converter. This is a floating wave converter which has power transmission and power conversion systems mounted on a breakwater or a pier. Its construction results in more power production, because of wave reflection on the breakwater frontage, as well as in greater reliability and operational safety.

One of the project's main objectives concerned the assessment of feasibility, socio-economic aspects and environmental impacts of

the technology for representative sea states in Europe. Before obtaining public approval in the EU, an environmental impact assessment (EIA) must be conducted to examine potential impacts on the environment, focusing on human beings, fauna and flora, soil, water, air, climate, landscape and material assets as well as cultural heritage.

Given that wave energy technologies are still in their early phase, only a few large-scale prototypes are operating worldwide to date. Thus, experience with the environmental effects

of wave energy converters is very limited. Responding to this need, LCA is a method for quantitative analysis of the environmental effects related to a product during its life cycle. This technique emerged due to further environmental awareness of the general public, industry and governments. From such analysis, quantitative results have been obtained and the impact of the technology on specific areas of major environmental concern can be quantified. These technology component configurations may be reconsidered in future projects.

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

Collaboration sought: further research or development support.

Offer ID: 3605

Getting to the bottom of gettering

Armed with new equipment, the University of Milano-Bicocca in Italy was able to closely observe how silicon-based solar cells evolve during the production process.

The NESSI project aimed to exploit waste materials from the semiconductor industry to address a shortage of raw materials in the solar cell industry.

The Department of Materials Science from the University of Milano-Bicocca was an integral partner in the project. The funding, provided by the EESD programme, enabled the university to upgrade its laboratory with new equipment. Specifically, a photoluminescence bench was outfitted with a monochromator, and an electron beam induced

current (EBIC) tool was added to an existing scanning electron microscope (SEM).

With the aid of these new tools, the Italian team was able to analyse material properties in detail during the production of new solar cells. The investigation bore fruit, particularly with respect to the mechanisms of internal gettering, a critical process which helps to isolate impurities and limit their damaging influence.

Another important aspect of the NESSI project is the experience it afforded young

researchers at the University of Milano-Bicocca. Three undergraduates participated in the ingot characterisation phase and produced relevant theses further to their efforts. Complementing theoretical studies with hands-on laboratory work enhances the educational experience of the research scientists of tomorrow. This will help to maintain Europe's edge in this very competitive industry.

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

Collaboration sought: further research or development support.

Offer ID: 3608

State-of-the-art facility for solar power research in Europe

Europe has put itself on the solar map with the establishment of the Plataforma Solar de Almería direct solar steam (PSA DISS) test facility in sun-drenched southern Spain.

The idea of harvesting energy from the sun has been around for some time. Only recently have advances in technology made solar energy more economically competitive compared to conventional forms of energy production.

The EESD programme invested in R & D projects to further improve the feasibility of solar solutions. The Inditep project, for example, sought to implement direct steam generation (DSG) technology in a full-size test facility. DSG improves efficiency and reduces operating costs by using water instead of oil inside the absorber tubes of the parabolic trough solar collectors.

Inditep partner Plataforma Solar de Almería of the Center for Energy, Environment and Technological Research (CIEMAT) in Spain constructed the PSA DISS test facility in Almería, Spain. The site was chosen because of the ideal climate and intense sunshine. Subsequent testing of DSG technology at the PSA DISS test facility during Inditep revealed that additional gains can be made, especially in the optimisation of operating and maintenance parameters.

PSA/CIEMAT offers the PSA DISS test facility to organisations looking to test new components and processes related to DSG tech-

nology. This state-of-the-art facility, which is the culmination of more than seven years of dedicated R & D, will help to keep Europe at the forefront of solar power research.

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

Collaboration sought: licence agreement.

Offer ID: 3634



Reducing the costs of solar power plants

The engineering design of the direct steam generation (DSG) process in a solar power plant of 5 MWe has been detailed, aiming to further exploit its capacity for energy supply.

The share of renewable energy systems in the energy supply is expected to double by 2010 as dictated by EU directives. The introduction and, most importantly, the widespread use of renewable energy sources is one of the most efficient ways for greenhouse gas mitigation. Yet, the abundance of solar energy, particularly in the southern European countries, has not been exploited to its full extent mainly due to related costs.

Aiming to reduce the cost of solar power plants, the Inditep project focused on implementing DSG in the absorber pipes of parabolic trough solar collectors. This is expected to bring a 26 % reduction in the cost of electricity

produced by these power plants. On the basis of previously gained experience, the Inditep project partners joined forces to introduce the DSG technology into the energy market.

To this end, an engineering detail design of a 5 MWe pre-commercial DSG power plant was developed. This involves basic electrical, mechanical, control, instrumentation and civil engineering of a DSG solar field. The detail of the design is necessary as it sets the key requirements for procuring components and implementing the first commercial plant. The basic design concept was the coupling of a DSG solar field to a power cycle delivering 5 MWe net electrical power.

In accordance with the requirements of the steam turbine, parabolic trough collector loops were sized and process values were defined. Through an iterative process, solar-to-electric efficiency of the power plant was maximised. Power cycle/solar field integration issues were carefully studied in order to identify specific equipment that is closely related to start-up and shut-down procedures for the power plant. By adopting a hybridised Rankine cycle, a thermodynamic cycle that uses steam as working fluid and exploits heat, the design of the first DSG power plant was accomplished.

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

Collaboration sought: joint venture agreement.

Offer ID: 3562

See also page 17 (offer 3628)

Ultra-low emissivity glass coatings

European R & D is developing advanced glass coatings today to ensure that the buildings of tomorrow are more energy efficient.

Windows are often responsible for the greatest thermal losses in buildings. Glassmakers have been successful in reducing these losses by applying special coatings, but there is always room for improvement.

The EESD programme charged the '3rd Genlac' consortium with taking coating technology to the next level. Semco Glastechnik in Germany and Scheuten Glasgroep in the Netherlands teamed up to produce coated glass with emissivity (E) values below 5 %. Comprehensive test-

ing of the '3rd Genlac' prototypes revealed enticing results.

For example, the new coating can withstand heat treatment above 600 °C without seriously altering its emissivity and other thermal properties. This is important, since heat treatment is often applied to improve other glass characteristics, such as strength.

In addition, with respect to aesthetics, the new low-E coating does not induce any undesirable colour shifts in the visible spec-

trum. This applies even when several glass components are combined in a stack.

The '3rd Genlac' partners have applied for patent protection for their discovery. Commercialisation of glass products bearing the new low-E coatings will help homeowners and businesses to reduce their heating bills in winter and their cooling bills in summer. Significant environmental benefits will also be achieved in tandem with the financial savings.

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

Collaboration sought: licence agreement.

Offer ID: 3627

Improving the thermal behaviour of buildings

Advanced materials science research funded under FP5 led to the development of a new silver-based glass coating that can decrease thermal losses from buildings.

Buildings consume considerable amounts of energy for lighting, heating, cooling, ventilation and other needs. Reducing the impact of buildings on climate change will require major improvements in energy efficiency.

Significant potential for savings has been identified in the field of glass coatings and treatments. The EESD programme supported an initiative in this area by a consortium of six different organisations from across Europe.

The objective of the project, entitled '3rd Genlac', was to create a new generation of coatings with optimal thermal behaviour. Experts with project partner Scheuten Glas-

groep BV in the Netherlands contributed by developing a new silver-based (Ag) coating using a jumbo sputter coater in combination with zinc-aluminium-oxide targets.

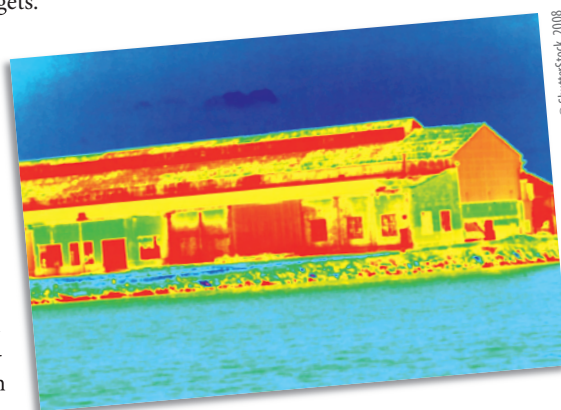
Quantification of various energy efficiency indicators in the laboratory revealed that the new double-Ag coating significantly reduces the amount of energy lost through the glass surface. This means that less energy is required to heat the building in the winter, or cool it in summer. Scheuten Glasgroep BV and its '3rd Genlac' partners are following up on

this result, which represents a remarkable improvement in comparison with currently available glass products.

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

Collaboration sought: further research or development support.

Offer ID: 3643



Bringing solar technology to developing nations

Exploiting photovoltaic technology to bring electricity to rural regions is an admirable ambition, but Innovation Energie Développement (IED), a partner in the Taqsolre project, learned that it cannot be realised without properly addressing the issues of quality assurance.

It is in everyone's best interests that developing nations develop in a sustainable manner, avoiding where possible negative impacts on the environment. In this context, energy production is a hot topic. As developed nations try to migrate away from carbon-rich fossil fuels to cleaner renewable energy sources, they have the opportunity to transfer this new technology to developing nations.

This was the idea behind the Taqsolre project supported by the EESD programme. IED, a member of the Taqsolre consortium,

helped to deliver photovoltaic technology to Mauritania, a country in western Africa where sunshine is abundant.

IED paid special attention to quality issues associated with the installation of several thousand solar home systems (SHS) in Mauritania. The team examined all the relevant phases of the project, starting with the tender procedure. Quality control tests were performed on specific components in pre-production, following delivery and installation, and upon system initialisation.

What IED learned is that support to end-users as well as local representatives is critical to ensuring a successful SHS installation. Furthermore, developing countries can benefit from the creation of the necessary infrastructure for quality assurance. This would comprise a national testing facility attuned to national standards and a staff of accredited professionals. The knowledge gained by IED and its partners during Taqsolre has been recorded in the form of quality assurance guidelines.

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

Collaboration sought: information exchange/training.

Offer ID: 3648

See also page 17 (offer 3628)

Understanding engine knock

The EESD programme funded a comprehensive study of flame behaviour inside automobile engines in order to learn about engine knock and how it can be prevented.

The problem of engine knock has been around since the inception of internal combustion engines. The premature ignition of the air-fuel mixture causes unnecessary engine wear, reduces power output and increases emissions of harmful air pollutants.



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The Minknock project sought to address the lack of knowledge regarding engine knock — a complex issue involving engine geometry, fuel characteristics and flame propagation, to name but a few factors. Mechanical engineers with the Instituto Superior Técnico in Portugal constructed an experimental set-up complete with particle image velocimetry equipment to closely monitor the conditions inside the combustion chamber.

Data collection and analysis focused on the flame-wall interaction for three types of flames: hemispherical, symmetrical and non-symmetrical. New post-processing software enabled the estimation of flame velocity and the flame stretch factor.

The Minknock experiments showed that, contrary to popular belief, stagnation points do exist in the flow field inside the combustion chamber. The positions of the stagnation points, where regions of unburned fuel exist, were determined for each type of flame geometry. In addition, a high correlation between flame velocity and stretch factor was observed. Finally, and most importantly, the research revealed that flames are remarkably robust, able to survive large positive and negative stretching without being extinguished.

The Minknock consortium will use this new knowledge to improve engine design with the aim of reducing engine knock, helping Europe's legendary automobile industry to remain globally competitive.

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

Collaboration sought: further research or development support.

Offer ID: 3644

Perennial grasses as energy crops

The potential of multi-cropping cultivation and successive harvesting of perennial crops has been explored to make the availability of environmentally friendly biomass energy meet the corresponding demand.

In the European Commission's White Paper *Energy for the future: renewable sources of energy*, an ambitious goal of doubling the share of renewable energies in the total energy demand was set. Furthermore, biomass broken down into biogas, residues and energy crops was envisaged to produce more than 80 % of the total renewable energy sources additional contribution by 2010.

Consequently, considerable efforts and funds have been devoted to research into bioenergy chains, starting from biomass production to biomass thermochemical conversion for energy production. The objective of the 'Bioenergy chains' project was to measure and evaluate the performance of

energy crops and define an integrated bioenergy chain specifically suitable for southern Europe.

To fulfil this objective, four perennial energy crops were carefully selected. Due to their different seasonal harvest times, these crops can provide all-year-round raw material for subsequent energy production. The four species — cardoon, giant reed, miscanthus and switchgrass — have also been chosen because of the availability of information about their cultivation in several countries with different climates.



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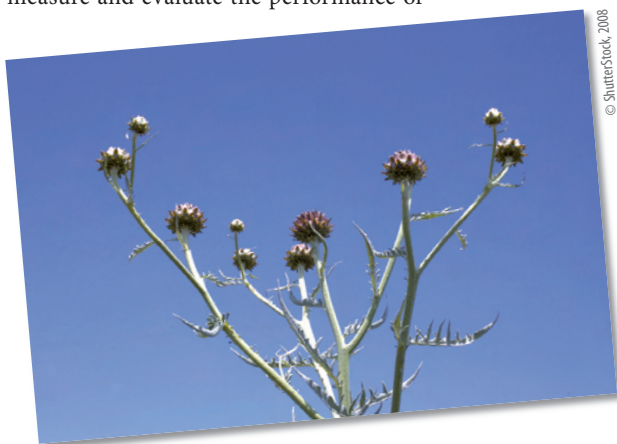
perennial grasses were also considered in order to fully characterise them.

Technical, environmental and economic aspects will be considered by the 'Bioenergy chains' project partners to identify the most promising combinations of biomass resources, cropping practices and cutting-edge biomass energy technologies. The results will provide scientists working in this field, biomass producers, manufacturers and users of biofuels with sufficient means to optimise both the production chains and energy conversion processes.

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

Collaboration sought: information exchange/training.

Offer ID: 3585



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Information on the establishment, cultivation, harvesting and packaging of all four species, using conventional equipment, were collected in small- and large-scale fields in Greece, Spain, France and Italy. For comparisons with results of previous trials in northern European countries, the biomass yields and environmental impacts of growing

See also pages 39 (offer 3556) and 40 (offers 3621, 3579 and 3546)

Putting cleaner vehicles on the street

A successful campaign implemented in the framework of the Vivaldi project helped to put more than 160 alternatively fuelled vehicles on the roads of Bremen, Germany.

Emissions from vehicles not only degrade local air quality, they also contribute to global climate change. Engineers are constantly striving to reduce these emissions and to make transport more sustainable.

Impressive emission reductions have been achieved with alternative fuels such as compressed natural gas (CNG), yet the market has been slow to adopt this technology. The Growth programme charged the Vivaldi consortium with boosting CNG usage across all sectors.

ECOLO, a Vivaldi partner based in Bremen, has implemented an extensive campaign in its hometown. The first goal was to educate the public about the environmental and other benefits of CNG versus conventional fuels (e.g. gasoline). ECOLO targeted a wide range of stakeholders, ranging from car dealers to taxi companies to service stations and even driving schools.

In addition to raising public awareness, it was also necessary to provide financial incentives since CNG-powered vehicles are still slightly more expensive than their gasoline-powered counterparts. ECOLO subsequently surpassed its original goal of receiving at least 250 applications for new CNG vehicles.

While not all approved applicants proceeded with a vehicle purchase, the Vivaldi project managed to put over 160 CNG vehicles in circulation in Bremen. Special signage on these vehicles will promote additional visibility for the project.

The majority of new CNG vehicle owners are businesses rather than private citizens, probably due to the higher allowance they were granted. Future actions will target increased private sector participation as well as expanding the vehicle range to include freighters and light trucks. Given its success, ECOLO also underlined the need to continue and enhance the CNG campaign.



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

Collaboration sought: information exchange/training.

Offer ID: 3554

Eliminating cavitation in diesel engines

The University of Ljubljana in Slovenia improved upon existing knowledge of cavitation in diesel engines through the use of an innovative experimental set-up and modelling tools.

The Prevero project aimed to reduce emissions of pollutants from diesel automobile engines that impact both human health and the global climate. The approach involved redesigning fuel flow geometry with the hope of eliminating cavitation, i.e. bubble formation, thus improving the durability of the new components.

The Laboratory for Fluid Dynamics and Thermodynamics (LFDT) of the University of Ljubljana was the Prevero partner assigned to this task. The laboratory used

a special vacuum chamber to observe the behaviour of both single bubbles and bubble conglomerations known as bubble clouds.

To deal with the complex nature of the fuel flow and bubble development, the Slovenian mechanical engineers turned to a computational fluid dynamics (CFD) model. The specific code used, named FIRE, was developed by the Prevero coordinator, Advanced Simulation Technologies. Simulations were performed for both single and multiple bubble cases.

The LFDT used FIRE to evaluate several features of cavitation, including structural function, void fraction, bubble number density, bubble clusters and bubble collapse. The resulting dataset will assist the Prevero consortium in their efforts to redesign the fuel delivery system for diesel engines. The exercise also helped to validate the suitability of FIRE for such applications.

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

Collaboration sought: further research or development support.

Offer ID: 3589

See also pages 39 (offer 3556) and 40 (offers 3621, 3579 and 3546)

Innovative noise information module

A module has been created as an innovative way to exploit the noise information measured by remote monitoring stations surrounding an airport control area.

The Monster project focused on an inexpensive system and a set of services geared toward assisting airports and neighbouring communities with airport noise problems. The project's technical goal was to design and test a modular system consisting of a streamlined network of monitoring sensors, dedicated models and supporting software. In this way, noise effects brought about by flight operations in areas near airports can be evaluated.

One of the project's main components is the Monster optimisation environment (MOE),

an offline design environment offering support for optimal design of sensor networks. It is innovative in that it is founded on a novel approach for exploiting information created by several remote noise monitoring stations. In its final stages, MOE is made up of microphones distributed throughout the area aimed at airplane noise monitoring. One of its objectives is to lessen the number of microphones. The ability to employ information regarding noise recorded by microphones is useful in obtaining information on the position the airplane is occupying and the related route. Since the reduction

of noise levels near airports is made up of restricting the access to and from the runway of specific gates, this function is crucial.

Microphones can measure noise levels rendered by the flight of an airplane. When the source of the noise is located, noise propagation algorithms are employed to approximate noise levels in each requested point of the control surface. Thus, time-averaged noise indexes like sound exposure level (SEL) can then be easily supplied. Finally, the system can estimate whether or not the airplane flight track follows noise abatement routes.

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

Collaboration sought: further research or development support.

Offer ID: 3561

Improving terrestrial ecosystem models

Scientists with the Camels project applied inversion techniques to increase the precision of terrestrial ecosystem models (TEMs), which are important tools in environmental research.

TEMs simulate the exchange of heat, momentum, water, carbon and so forth between the soil, plants, trees and the surrounding atmosphere. Like other models, TEMs are imperfect, but scientists continuously strive to improve their accuracy.

During the Camels project, the Max Planck Institute of Biochemistry teamed up with the United Kingdom's Met Office and Le laboratoire des sciences du climat et de l'environnement (LSCE) to apply new techniques in TEM validation. More specifically, these partners inverted TEM variables

against measurements of the net ecosystem exchange (NEE) of carbon dioxide (CO₂) and the latent heat flux (LE).

The biosphere energy transfer and hydrology (BETHY) as well as the organising carbon and hydrology in dynamic ecosystems (Orchidee) TEMs were employed. Sensitivity experiments were performed to test the assumptions required for the inversion procedure.

The team learned that careful selection of high-quality, representative data produced the best results. However, the reproduction of

some seasonal cycle and phenology parameters was still less than optimal. The group recommended that a sufficient number of monitoring sites be used per plant type in order to avoid misleading results.

In general, following some tweaking, the inversion technique led to greater agreement between TEM output and observations. Some weaknesses were identified, for example Orchidee's inability to account for the effects of extreme hydrological events, such as droughts. The Camels modellers are working to update the TEMs to address these flaws.

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

Collaboration sought: information exchange/training.

Offer ID: 3586

Remote sensing products for environmental research

A database of great value to the environmental research community was established from remote-sensing data during the Camels project.

The fraction of absorbed photosynthetically active radiation (FAPAR) is a very important environmental indicator, denoted by its status as a global climate observing system (GCOS) variable. It is measured by special instrumentation aboard satellites and provides insight into the amount and productivity of surface vegetation within a given area.

One of the objectives of the Camels project was to exploit FAPAR data to estimate carbon dioxide sequestration by the biosphere. The Joint Research Centre (JRC) of the European Commission, a Camels participant, contributed to this task by construct-

ing an extensive database of FAPAR data for Europe.

Data are available from 1998 through to 2004 at various projections. The data are stored in the common hierarchical data format (HDF) and boast a high spatial resolution. Database users can construct maps of FAPAR for different regions and periods of time. In addition, they can also access FAPAR by-products provided in 10-day and monthly composites for the more than 20 Camels sites across Europe and the United States.

The JRC and its Camels partners have already begun utilising the comprehensive

dataset. For instance, the JRC investigated the effects of a severe drought in Europe in 2003 on vegetation and published their findings in an international journal.

More information about the Camels project as well as the publicly available FAPAR data, documentation and additional data products are available at: http://fapar.jrc.it/WWW/Data/Pages/FAPAR_Projects/FAPAR_Projects_CAMELS_Download.php

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

Collaboration sought: information exchange/training.

Offer ID: 3604

Satellite data to estimate oceanic chlorophyll

A new algorithm developed at the University of Oslo allows scientists to estimate chlorophyll levels in the ocean from satellite data.

The North Sea is home to some of Europe's richest fishing grounds. The fish rely on phytoplankton as their basic food source, so ensuring a healthy future for the fishing industry entails close monitoring of phytoplankton activity. In contrast, and equally important, chlorophyll is an important water quality parameter indicative of algal blooms that can be harmful, primarily in coastal waters.

In this context, the Revamp project, funded under FP5, aimed to exploit data from the medium-resolution imaging spectrometer (MERIS) aboard the earth-observing satellite Envisat. More specifically, reflectance

data collected by MERIS is fed to a water quality algorithm to retrieve measurements of chlorophyll-a (CHL), a primary indicator of phytoplankton health.

The research was led by the University of Oslo, which moved beyond previous simplistic approaches and implemented the Hydrolight radiative transfer code. The code accounts for all relevant optical phenomena, including reflectance, absorption, scattering and transmission. Subsequently, the Levenberg-Marquardt non-linear optimisation scheme is applied, and modelled data are fitted to observations.

The advantages of the Revamp solution include speed, thanks to high-degree polynomial approximation techniques, and straightforward calibration. Furthermore, a measure of the quality of any particular set of CHL concentrations produced by the algorithm lets users know how well the model is performing.

During Revamp, the algorithm was used to map CHL throughout the North Sea. The University of Oslo is now seeking copyright protection for the new algorithm.

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

Collaboration sought: further research or development support.

Offer ID: 3607

Improving our understanding of jellyfish blooms

The Consejo Superior de Investigaciones Científicas (CSIC) populated a database with information drawn from all available scientific literature addressing outbreaks of jellyfish in coastal lagoons.

Most jellyfish are, in general, harmless inhabitants of the sea. Yet, when their numbers multiply out of control during blooms, they can become a real threat to the surrounding ecosystem. Given the economic importance of coastal regions to the fishing industry, including aquaculture, as well as to tourism and other industries, protecting these areas against outbreaks is imperative.

In the framework of the Eurogel project, 10 universities and research institutes from seven Member States gathered to address this concern. The CSIC led the development of an

extensive database of all known jellyfish outbreaks occurring in coastal lagoons, which are particularly vulnerable ecosystems.

Data were collected from all over the world, from the Caribbean to Australia and back to the Mediterranean. The CSIC enriched the database with information, not just about the outbreak, but about observed environmental parameters that could have triggered the event. They found that the variety of jellyfish species associated with blooms is on the rise. Human influence on the coastal lagoon is also an important factor.

By assembling data for all known events into one central database, the CSIC has greatly facilitated future research in this field. It is hoped that through analysis of the contents of the database, academics will have a more thorough understanding of the dynamics involved in jellyfish outbreaks. The next step will be to develop predictive tools and measures to avoid or at least reduce the negative impacts of blooms.

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

Collaboration sought: information exchange/training.

Offer ID: 3649

Effects of climate change on North Sea cod

Short-term stock biomass recovery and longer-term sustainable management strategies for North Sea cod were evaluated for their robustness in different plausible climatic change scenarios.

Fishery systems and the interaction which occurs between management, exploitation, environment and biology are complex in

nature. Thus, foreseeing responses to certain management actions is not always possible. The 'Framework for the evaluation of management strategies' (FEMS) project has created a computer simulation framework allowing the performance of management strategies to be evaluated.

The North Sea is an area in which climate appears to impact growth and recruitment. It was found that in the short term, climate change had only a small effect on stock recovery. Instead, this depends upon reduced fishing to allow existing year classes to

survive to maturity. However, in the longer term, climate change has a larger impact on stock status, yet higher yields and biomass are likely if fishing mortality is lessened.

The significance that climate change has on biological reference points depends largely on the mechanism through which temperature acts on recruitment. Some examples of this include juvenile survival and carrying capacity. It was found that reference points stemming from fishing mortality seem more impervious against uncertainty than those based on biomass.

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

Collaboration sought: further research or development support.

Offer ID: 3500



Database for monitoring eutrophication conditions

A database has been created which contains information on sea surface reflectance, concentrations of chlorophyll-a, suspended matter and properties such as phytoplankton absorption, particle absorption and particle backscattering.

The Revamp project has supported the monitoring of the eutrophication condition of the North Sea through assessing and verifying chlorophyll (CHL) concentration, a key biogeophysical parameter. Due to regional fluctuations in North Sea water composition, CHL products have been originated and validated.

Data were derived from various areas of the North Sea, the Celtic Sea and the Eng-

lish Channel and arranged into a database in three parts. These include historical data as well as project data gathered in 2002 and 2003. The database is essentially a relational database system with certain additions designed as a subset of tables and a special user interface permitting data retrieval in different formats. It is unique in that it has data from nearly 10 years of research in coastal waters, with parameters that are difficult to assess due to the methods and logistics.

Numerous publications have utilised the information in the database. Furthermore, it can provide an immense amount of information to case 2 water researchers in Europe and throughout the world. The documentation is available to the public, and the database is accessible online at: <http://www.mummm.ac.be/datacentre/Databases/Revamp>

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

Collaboration sought: further research or development support.

Offer ID: 3626

See also page 24 (offer 3647)

Environmentally friendly plasma technology

A three-year project has uncovered a number of prospects for environmentally friendly plasma technology in the transport, energy and textile sectors.

Nearly 40 organisations across Europe gathered to form the Plasmatech network of excellence under the auspices of the Growth programme. Aside from networking and knowledge transfer, the Plasmatech consortium also wanted to identify and promote specific plasma technologies that benefit the environment.

Environment Park, an Italian science and technology park involved in Plasmatech, researched existing patents as well as the

relevant literature accordingly. They focused on plasma applications that reduce pollutant emissions to the environment, for instance during fuel combustion, or that remove existing pollution.

For example, Environment Park found multiple research results showing that atmospheric pressure plasmas and plasma catalysis can limit emissions of particulate matter, volatile organic compounds (VOCs), greenhouse gases and so forth from engine

exhaust. In addition, combustion efficiency and fuel economy could also be improved by introducing plasma ignition. Finally, replacing chemical surface treatments with plasma-based counterparts can help to reduce hazardous waste generation.

Looking to capitalise on these opportunities, Environment Park and its Plasmatech partners are pursuing additional funding at regional and national levels as well as through FP6.

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

Collaboration sought: further research or development support.

Offer ID: 3481

Novel biomarker for coastal water pollution

Pollution of marine ecosystems often poses detoxification problems for the inhabitants. Based on this, a protein from fish liver has been modified so that it can be used as an effective biomarker for organic pollution.

The pollution of oceans and rivers is of increasing concern. The concentrations and content of the biological and chemical components of our water systems are dynamic and constantly changing. To be able to determine levels of pollution on an ongoing basis with a reliable yet easily applied test is therefore crucial. The overall aim of the Genipol project therefore was to develop genomics-based tools to identify and quantify organic pollutants in coastal waters.

The assays were developed on the assumption that organisms living in a habitat express certain genes according to the pollutant they encounter and hence detoxify. Scientists at the Oceanographic and Limnological Research Laboratory in Israel investigated the detection and quantification of the protein cytochrome P4501A in the liver of the striped sea bream. This protein is a

sensitive indicator of organic pollution and can therefore be used to detect low levels of pollutants.

The analytical method selected was the enzyme-linked immunosorbent assay (ELISA) which is based upon the production of an antigen-antibody complex. The procedure involved is simple, but the problem was that cytochrome P4501A is a membrane protein and therefore unsuitable in its original form for the ELISA test. The team therefore produced a modified version of the protein that was soluble and thus could be targeted in the first part of the test. The native protein could then be used in the second part of the test when its concentration is determined.

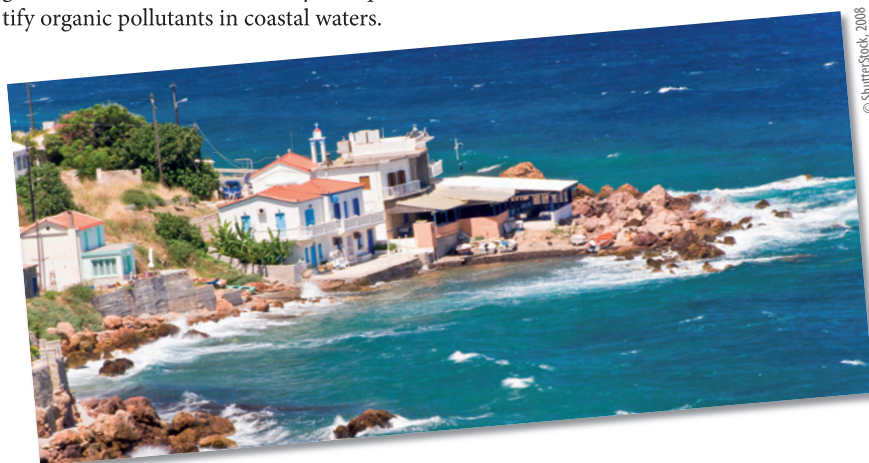
There is considerable scope for biomonitoring using biomarkers of this nature. By supplying the modified protein and antibodies necessary for the tests, commercial kits can be produced for specific pollutants.

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

Collaboration sought: information exchange/training.

Offer ID: 3647

See also page 23 (offers 3649 and 3626)



Carbon exchange in the North Atlantic

The NOCES project has provided a better insight into the variability of air-ocean carbon dioxide (CO₂) fluxes in the North Atlantic, leading to improved predictions of future atmospheric CO₂ variability.

In line with the Kyoto protocol, the assessment of carbon fluxes relies heavily on the reliable estimation of carbon budgets over different continental and oceanic regions. Until recently, estimates for inter-annual variability of air-sea CO₂ fluxes in the North Atlantic were potentially contradictory.

The conflict came from predictions from two different models, that is, inverse atmospheric models foresaw very large variability, while ocean models predicted a small variability in CO₂ flux. Moreover, the large variability was also underpinned by data collected in the subtropical gyre of the North

Atlantic. Based on the assumption that these data constituted a good representative sample, they were further extrapolated across the entire basin.

On the basis of analysed simulations, the NOCES project research work showed that the subtropical gyre was not representative of the entire North Atlantic. There were also multipolar anomalies at multiple frequencies in the subpolar and intergyre

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Eco-friendly conservation of archaeological treasures

Tackling the conservation problem for bronze archaeological artefacts, the Efestus project employed the plasma-enhanced chemical vapour deposition (PECVD) technique of organosilicon thin films to protect the artefacts for long-term exhibition purposes.

The Efestus project adopted the PECVD technique for producing new corrosion-resistant organosilicon thin films with protective barrier effects against aggressive agents on bronze archaeological artefacts. This eco-friendly, reliable and effective method was implemented in a home-made reactor. It started from such organosilicon precursors as hexamethyldisiloxane (HMDSO), tetraethoxysilane (TEOS), tetramethoxysilane (TMOS), and with different oxygen-argon mixtures and different input power values. This took place in the Department of Materials Science and Chemical Engineering of the Politecnico di Torino.

The innovative coatings similar to silicon dioxide (SiO_2) were tested and optimised on copper-based reference alloys produced by ISMN-CNR, the Institute for the Study of Nanostructured Materials in Montelibretti, Rome. This was done in the conditions in which they were received and aged in different soils. The reference alloys, possessing microchemical and microstructural characteristics similar to the ancient alloys, allow a reliable optimisation of the PECVD coatings proposed for the later stage of restoration and protection of bronze archaeological artefacts.

Extensive testing of the used parameters resulted in the optimisation of the PECVD

treatment technique. Moreover, the plasma phase, the characteristics of the obtained deposits and all possible operative scenarios were extensively explored. This information was significant for successive process scale-up and for the *in situ* process control.

Research work showed that variations in the process conditions are highly related to the chemical composition and the properties of the deposit.

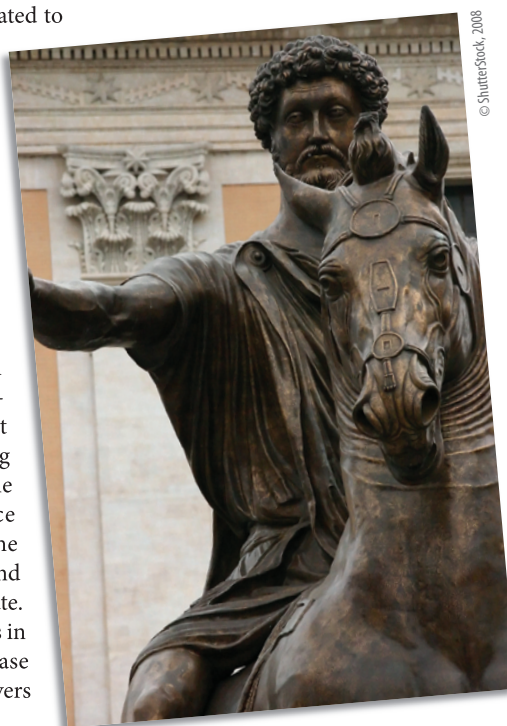
In summary, the corrosion protection properties similar to SiO_2 thin films are strongly affected by the variation of the plasma process parameters. There is a marked increase in the protective effectiveness of the coatings obtained with the increase of the discharge input power. This leads to the formation of more inorganic films. Plasma pretreatment processes play an important role in determining the inhibiting properties of the deposited film. The pretreatment removes the surface contamination, thereby reducing the defectiveness degree of the coating and enhancing its adhesion to the substrate. By performing the deposition process in oxygen-rich plasma, a further increase of the protective properties of the layers is achieved.

The versatility of the PECVD may be exploited in numerous coating applications with various substrates, ranging from metals and paper to textiles and polymers. This is due to the low-pressure and low-temperature operative conditions employed. The analysis of the environmental impact justifies the great interest of performing PECVD treatments on metallic substrates also from an industrial point of view. For further information, please visit the project website: <http://www.efestus.just.edu.jo/index.jsp>

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

Collaboration sought: further research or development support.

Offer ID: 3629



continued from page 24 'Carbon exchange in the North Atlantic'

regions. Thereby, being both high and low, these contributions displayed a tendency to cancel each other out as far as the basin-wide air-sea CO_2 flux was concerned.



Within this context, the NOCES project research offered a validated explanation of the reasons of disagreement between ocean and atmospheric inverse models. It was shown that atmospheric inverse models over-predict the variability of North Atlantic air-sea CO_2 fluxes. In comparison, the higher resolution of ocean models allows compensation of variability between regions, such as the subtropical and subpolar gyres.

The potential deficiencies of the inverse approach were mainly due to insufficient spatial resolution. Moreover, 'leakage' of high variability from

adjacent terrestrial grid cells also contributed to the high air-sea CO_2 flux variability over the North Atlantic. Identification of the problematic areas of the atmospheric inverse approach and the mechanisms by which these may occur facilitates the improvement of their future predictions.

Furthermore, optimisation of the ocean component of coupled carbon-climate models is expected to be exploited in the prediction of future changes in air-sea and air-land CO_2 fluxes. For more project information, please visit: <http://www.ipsl.jussieu.fr/projets/NOCES>

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

Collaboration sought: further research or development support.

Offer ID: 3564

IT AND TELECOMMUNICATIONS

Double antennas deliver double the signal

Digital television transmission techniques that deliver most benefit in the worst reception environments have been developed by a consortium of European researchers. The technologies promise to reduce the network infrastructure needed for mobile television, while minimising the power demands and complexity of mobile television receivers of the future.

In a typical broadcast transmission, radio signals bounce off objects in the environment, reaching the receiver over multiple paths. Distortion from multipath signals can produce fading, resulting in temporary failure of reception. Most of us have experienced this, moving a mobile phone around a room to get the strongest signal.

Modern broadband wireless technologies like WiMAX, DAB for audio, DVB-T and DVB-H for video use a modulation scheme called orthogonal frequency-division multiplexing (OFDM).

An OFDM transmission is spread across thousands of different subcarriers, each carefully organised at slightly different frequencies within the channel. Spreading the transmission across a high number of subcarriers increases the probability of maintaining error-free transmission.

Researchers have demonstrated that splitting the transmit power between multiple antennas can provide substantially more effective coverage than using a single antenna. Signal simulations carried out for the 'Physical layer DVB transmission optimisation' (PLUTO) project show that a gain of up to 5 decibels could be achieved. The PLUTO project comprises a consortium of academics, equipment manufacturers, propagation experts and broadcasters from Germany, France, Finland and the United Kingdom, co-funded by the European Commission.

The transmission-splitting technique under development by PLUTO, known as 'transmit diversity', benefits the worst environments most. Reception can be spectacularly improved indoors, or whilst walking or driving in cities. Fewer transmitters and less power are required to achieve economical coverage.

'This technique does not require revision of any WiMAX, DVB or DAB standards,' says Maurice Bard of the company Broadreach Systems in the United Kingdom, the technical leader of PLUTO. 'The great advantage is that it can be exploited by existing in-service receivers without modification. All you need is an additional box that can split the signal.'

'The transmit antennas need to be spatially separated by between 10 and 20 wavelengths and a delay applied to one antenna to achieve effective de-correlation. The amount of separation and delay depends on the type of environment to be covered,' Mr Bard says.

Coverage can be further improved if there are two or more antennas at the reception end, he explains: 'For receive diversity, you need to separate the receive antennas by at least half a wavelength, which is approximately 25 cm at UHF frequencies. If this can be achieved, then transmit and receive diversity can work together to deliver even greater benefits. The benefits of receive diversity, however, can only be exploited in terms of network design if all receivers in the network have diversity implemented.'

Even with the reception improvements promised by transmit diversity, there will be reception black spots, particularly indoors, where on-channel repeaters will be needed. An on-channel repeater receives a signal from a distant transmitter and retransmits it at the same frequency. The repeaters are prone to instability caused by the feedback of echoes from the transmitter to the receiver. Here, the academics at Brunel University, led by PLUTO project coordinator Professor John Cosmas, have developed an innovative method to remove these echoes.

'A pseudo-random sequence is buried deep in the retransmitted DVB-H signal,' Professor Cosmas explains. 'The sequence acts as a signature, allowing the repeater to differentiate the unwanted echoes from the wanted original signal and remove them from the retransmission. The method can work for repeaters of any OFDM-based network.'

Broadreach Systems has provided equipment to process signals at the transmitter and monitoring stations that intercept and measure transmitted DVB signals. The monitor stations are networked to a control centre, developed by Brunel, enabling the effects of diversity to be evaluated in real time.

There are still some hurdles to be overcome before PLUTO's transmit diversity solution is suitable for all types of broadcast networks. Transmit diversity actually results in a degradation in reception, where the receiver is in clear line of sight with the transmitter and the signals from each antenna are received at exactly the same power level.

The line-of-sight reception loss may not prove to be a problem for many networks. In a mobile television network, all receivers will be in a non- or near-line-of-sight situation, very few will have rooftop antennas. But 'good enough' is not a position that the PLUTO consortium is prepared to stop at if they are to change traditional thinking.

'We need to show that the performance we saw in the lab can be achieved in all real situations, rain, snow, cities,' Professor Cosmas says. 'And, we have to convince the broadcasters who designed traditional analogue networks, where multipaths had to be avoided, that multipaths are good.'

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89327>



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Advanced programming language for global computing

Urged on by the global computing initiative, the Mikado project developed a new distributed and mobile programming language for increased mobility, ubiquity, dynamicity and interactivity.

Global computing research is focusing on the generation of general-purpose computer systems to satisfy and exceed the needs of a distributed world. Developed global computing techniques have possible useful applications in various domains including web services, ambient intelligence or grids. Independently of the application domain, the global availability of computational infrastructures may be exploited to offer uniform services for secure, mobile and ubiquitous computation.

Aiming to advance global computing, the Mikado project specified and produced prototypes of new formal models for programming of highly distributed and mobile systems. In addition, new specification and analysis techniques were introduced in order to improve the safety and trustworthiness of computer systems. All these were built on the basic concept of domain for reliable, distributed, mobile computation. Moreover, the domain element formed the

mathematical basis for a secure standard for distributed computing in open systems.

One of the key project results involved the kernel language for agent interaction and mobility (KLAIM), an experimental language for global computing. It constitutes a unique paradigm for moving processes, for example to move data from one computing environment to another, and supports programming with explicit localities. It is comprised of a Linda coordination model with multiple distributed tuple spaces, which are multisets of sequences of information items and a set of operators for building processes.

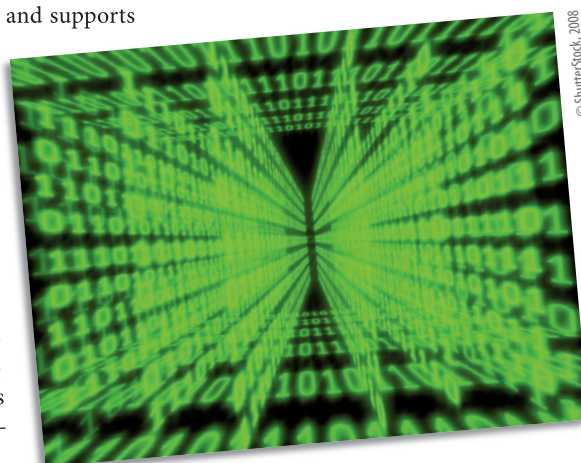
Based on KLAIM, a full-fledged programming language called X-KLAIM was implemented on top of a run-

time system developed in Java for reasons of portability. X-KLAIM combines the benefits of programming various distributed applications with agent and code mobility, along with the capability of running over different platforms due to its compilation in Java. This language allows exchange of data and processes as well as programming mobile agents to retrieve information over the net. For more information, please visit: <http://mikado.di.fc.ul.pt>

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

Collaboration sought: further research or development support.

Offer ID: 3632



A modular framework for global computing

To speed up the development of prototype applications over global computers and relieve programmers of low-level details, a Java software framework has been developed within the Mikado project.

Technological advances in telecommunication networks and the development of more efficient communication protocols are leading to an ever-increasing integration of computing systems. Massive networked and dynamically reconfigurable infrastructures interconnecting heterogeneous, autonomous and mobile components can now operate on the basis of limited information.

These network components have instigated the proposal of new techniques for the development and deployment of global computational environments. To support the implementation of languages designed for distributed programming fostered by these 'global computers', a generic software framework called integrated mobile calculi (IMC) has been introduced.

The basic idea and motivation of the Mikado project partners was to provide for all the functionalities and abstractions required for arbitrary components to communicate and move in a distributed setting. IMC therefore provides concrete implementations for the standard functionalities of the Java mobile framework, such as code mobility, node topology, naming and binding, among others.

In this respect, IMC is straightforward to use if there is no need for specific advanced features. Nevertheless, the framework is open to customisations if this is required by the mobility system to be implemented. The user can customise parts of the framework

by providing their own implementations for all the interfaces used within the IMC package.

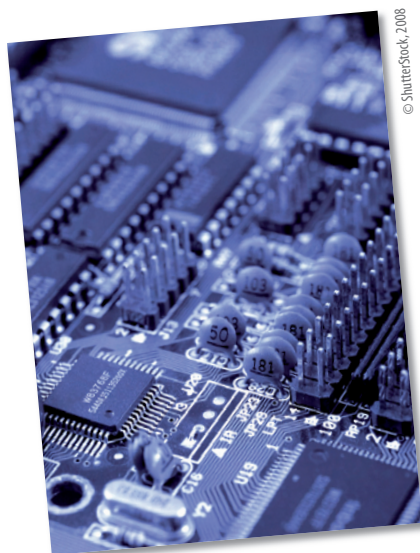
It enables platform designers to customise communication protocols and network architectures. At the same time, it provides language designers with primitives to develop run-time supports for languages oriented towards global computing. Within the IMC framework, the most recurrent notions of network-aware programming were packed together to permit developers to concentrate on the specificities of their system.

A primordial version of the IMC framework was initiated within the Mikado project and released as open-source software. Since then, it has been completely redesigned and reimplemented to improve usability and to provide many additional features. The actual code of the different IMC components can be found at: <http://sourceforge.net/projects/imc-fi>

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

Collaboration sought: further research or development support.

Offer ID: 3596



Real-time videoconferencing and media streaming

Aiming to meet the continued growth of the Internet, Internet protocol (IP) multicast conferencing technologies and applications have been developed to support collaborative research, technical development and distance education.

Innovative Internet services promise to provide users with the essential means to hear and see each other in real time, to share information and learn, as well as to be entertained. Users, coming together in pairs for intimate conversations or forming large groups, can be located anywhere in the world, while their image and voice are transmitted instantly.

With the use of software technology that is readily available for all modern computer systems, videoconference sessions are supported on specific networks around the world. Partners of 6NET, the largest Internet research project related to IP version 6 (IPv6), came together to develop intra-domain multicast services for a native IPv6 network throughout Europe, North America and the Asia-Pacific region.

The 6NET infrastructure connects more countries and delivers higher capacity

bandwidth than any other native IPv6 network deployed ever before. It therefore offered the necessary test bed for MBone videoconferencing tools. The dedicated versions of videoconferencing tools, to be made available with IPv6 multicast support, were produced or recommended by the University College London's Networked Multimedia Research Group.

The robust audio tool (RAT), based on the Internet Engineering Task Force standards, is an open-source audio conferencing and streaming application. It allows users to participate in audio conferences over the Internet without requiring special features for point-to-point communication — just a network connection and a soundcard. On the other hand, IP multicast technology and network design for multicast support is needed for multiparty conferencing RATs.

The videoconference tool, covering the entire chain from video capture to full-screen and high-quality video delivery over the Internet, allows users to participate in videoconferences. For the simultaneous editing of a shared text during the conference session, the network text editor tool can be employed as a support tool rather than as the only channel of communication.

Having benefited from testing and use, both for demonstration and communication purposes throughout the 6NET project, all conference tools are available for a wide range of operating systems. With improvements incorporated and bugs fixed, the core tools and the common library they depend on are accessible through the 6NET website: <http://www-mice.cs.ucl.ac.uk/multimedia/projects>

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

Collaboration sought: further research or development support.

Offer ID: 3568

The go-between: IT firms play the dating game

The single market and EU enlargement are just what Europe's ambitious SMEs need to develop new business. But while ICTs should theoretically pave the way for rapid transition into new markets, many smaller firms are struggling to scale up and out without costly enterprise resource planning (ERP) systems. That may soon change, if one research team gets its way.

With the EU going up a shoe size, the single market now has a bigger footprint for enterprises to step into. In theory, this means smaller firms should be able to branch out into other countries like their larger brothers, the multinationals. But in reality, SMEs lack the financial clout or reliable contacts on the ground.

One of the major hurdles they face is resource management between plants and branches, giving a more complete and timely picture of their operations. Of course, big IT firms like SAP, Oracle or Microsoft can develop a customised solution, but they are usually out of smaller firms' league. So, the

solution is to use affordable national software developers. That is where the problems can begin, because SMEs need gold-strength enterprise resource planning on tin-pot budgets.

SMEs contact local or national IT firms first to help them to implement an ERP across borders, but they struggle to understand and develop them in other countries — local customs, language problems, different operations stand in the way. What's more, the costs can quickly mount up as consultants travel back and forth.

'So, we are a matchmaker of sorts, between the ERP community — ERP vendors and dealers, IT firms and IT consultants — which is obviously keen to expand markets in Europe while trying to keep their SME clients happy,' says Iakovos Delioglani of Q-PLAN North Greece, the coordinating partner in a European research consortium called PANDA.

The idea is actually to help the IT firms and consultancies (ERP vendors and their dealers), not the expanding SMEs themselves. 'It's unique: we're the only ones targeting IT firms that specialise in smaller ERP deployments,' Mr Delioglani says, Exploitation Manager of PANDA.



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Advancing the quantum information society

Under the Atesit project, the process of stimulated emission generated by a single photon into an optical parametric amplifier (OPA) led to the successful development of two machines. These are the universal NOT (U-NOT) gate and the optimal quantum cloning that can be utilised in quantum information processing and communications.

The Atesit project focused on teleportation and entangled state information technology aiming to develop new methods for generation and exploitation of different types of two- and multi-particle entangled states. These could be further employed in quantum communication protocols. Furthermore, the project work concentrated on fundamental protocols such as universal quantum cloning, demonstrating their scalability.

Researchers aimed to produce an operational universal optimum quantum cloning machine, but there were certain limitations. Due to the linearity aspect of quantum mechanics, it was difficult to 'clone', that is to reproduce, an arbitrary quantum state perfectly. In addition, the realisation of a universal NOT gate, that may flip any qubit into an orthogonal one, was unachievable.

The cloning effect in quantum optics relates to the photon amplification process in an optical parametric amplifier (OPA). Thereby, identical photons that are generated in an arbitrary quantum polarisation state are further injected into the amplifier on the input mode. The amplifier on the output 'cloning mode' provides 'clones' of the input qubit. On the output 'anticlone' (AC) mode, the OPA realises a quantum NOT gate that performs the operation to flip a qubit.

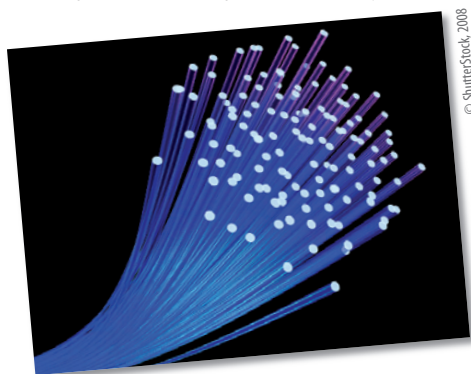
Based on this process, the U-NOT transformation, that is the performance of the best possible approximation of an anti-unitary operation using a universal quantum machine, was demonstrated. The U-NOT gate is highly associated with the quantum estimation of an unknown state. The system that was employed in the experimental demonstration was a quantum self-injected optical parametric amplifier (QI-OPA) of entangled photon states.

The universal cloning method can be used in the design of new algorithms and protocols. Quantum cloning allows redistribution of the initial information content into many parts and forms the basis of quantum cryptography. Quantum cryptography bases its security on the impossibility to clone unknown quantum states, and optimal quantum cloning is considered as the best eavesdropping attack on some quantum cryptography protocols.

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

Collaboration sought: information exchange/training.

Offer ID: 3613



continued from page 28 **'The go-between: IT firms play the dating game'**

PANDA's e-collaboration platform matches IT firms on the ground to carry out the work reliably and to the satisfaction of their clients. It works as a prototype B2B web platform that cost-effectively serves international e-collaborations among actors in the European ERP industry, Mr Delioglanis says.

IT firms and consultants can, in effect, get to know one another before cooperating for real. They can establish ground rules in the relationship and discuss prior experience, performance availability and so on, before talking about dowries!

As any good go-between should, PANDA provides the necessary communication channel for helping the parties come to an arrangement. This includes 'intelligent agents' helping to lay down basic terms of the service agreement related to ERP partnership deals — a prenuptial of sorts — with human interaction to finalise them.

The character in L. P. Hartley's *Go-Between* knew when he was not needed any more. So, too, PANDA stops short of issuing detailed technological templates (i.e. telling people how to run their relationships). And PANDA is thoroughly modern in its approach to relationships.

'The concept we're working with here is "short-lived tie-ups" for the purpose of

negotiating, developing and implementing cross-border ERPs. And we're investigating applying this principle to other sectors, such as construction, where systems can be easily customised for their own value chain. This is also a possible extra revenue stream that we may integrate in our business model,' Mr Delioglanis tells ICT Results.

Chief among PANDA's goals is to provide a robust platform for its 'value-chain members' to manage their ERP projects. A working prototype is being launched in November 2007 with what Mr Delioglanis calls 'more enhanced intelligence'.

'Like all newborns, we expect some teething problems with it, so we'll gather feedback from the consortium and trusted partners to iron them out and assess what additional services can be put in before rolling out the platform to a wider community of ERP vendors and dealers in January or February 2008,' he confirms.

After that, Mr Delioglanis envisages a fee-paying service could be introduced, whether it be licensing, fixed annual fees or variable fee structures based on use. PANDA is keen to tap other sectors as well. The current

partners will act as an important potential (internal) market and then as 'multipliers' by promoting the platform to others in their current value chain, he says.

A series of workshops are also planned between February and June 2008 to promote the platform in partner countries across Europe.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89331>



Software wrapper for smarter, networked homes

Homes today are filled with increasing numbers of high-tech gadgets, from smart phones and PCs to state-of-the-art television and audio systems, many of them with built-in networking capabilities. Combined, these devices could form the building blocks of the smart homes of the future, but only if they can be made to work together intelligently. European researchers are addressing the challenge.

Although the idea of creating intelligent, networked home environments as a way to make life easier, safer and more enjoyable has been around for some time, the technology has yet to catch up with the vision. Home automation systems have become more commonplace and consumer electronics have more networking capability, but no one has, so far, gotten all the high-tech and not-so-high-tech gadgetry cluttering modern homes to work together in an intelligent way. It is not yet common for fridges to talk to your television set to warn that the door has been left open or for heating systems to turn on when you return home, for example.

'People are finding themselves with all these networkable devices and are wondering where the applications are that can use these devices to make life easier, and how they could be of more value together than individually,' says Maddy Janse, a researcher for Dutch consumer electronics group Philips.

There are two fundamental obstacles to realising the vision of the intelligent networked home: lack of interoperability between individual devices and the need for context-aware artificial intelligence to manage them. And, to make smart homes a reality, the two issues must be addressed together.

The EU-funded Amigo project, coordinated by Dr Janse, is doing just that, creating a middleware software platform that will get all networkable devices in the home talking

to each other and providing an artificial intelligence layer to control them.

'With the Amigo system, you can take any networkable device, create a software wrapper for it and dynamically integrate it into the networked home environment,' Dr Janse explains.

The project, which involves several big industrial and research partners, is unique in that it is addressing the issues of interoperability and intelligence together and, most significantly, its software is modular and open source.

By steering away from creating a monolithic system and making the software accessible to all, the partners believe they can overcome the complications that have held back other smart home projects. For consumer electronics companies and telecoms firms, the system has the additional benefit of providing a test bed for new products and services.

'What we are trying to do is so large and so complex that it has to be broken down into smaller parts. By making it open source and letting third-party developers create applications, we can ensure the system addresses whatever challenges arise,' Dr Janse says.

The Amigo architecture consists of a base middleware layer, an intelligent user services layer, and a programming and deployment framework that developers can use to create

individual applications and services. These individual software modules form the building blocks of the networked home environment, which has the flexibility to grow as and when new devices and applications are added.

Interoperability is ensured through support for and abstraction of common interaction and home automation standards and protocols, such as Universal Plug and



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Play (UPnP), while the definition of appropriate ontologies enables common understanding at a semantic level.

'A lot of applications are already available today and more will be created as more developers start to use the software,' Dr Janse says.

A video created by the project partners underscores their vision for the future, in which homes adapt to the behaviour of occupants, automatically setting ambient lighting for watching a movie, locking the doors when someone leaves or contacting relatives or emergency services if someone is ill or has an accident. In an extended home environment, the homes of friends and relatives are interconnected, allowing information and experiences to be shared more easily and setting the stage for the use of tele-presence applications to communicate and interact socially.

Initially, Dr Janse sees such networked systems being employed in larger-scale environments than an individual home or for specific purposes. Some subsets of applications could be rolled out in hotels or hospitals or used to monitor the well-being of elderly or infirm users, for example.

'With the exception of people with a lot of money building their homes from scratch, it will be a while before intelligent networked homes become commonplace,' the coordinator notes. 'In addition, this isn't something average consumers can easily set up themselves; currently some degree of programming knowledge is needed and installers need to become familiar with the concepts and their potential.'

Even so, the project is hoping to continue to stimulate the growth of the sector. In October 2007, it launched the 'Amigo challenge', a competition in which third-party programmers were invited to come up with new applications using the Amigo software. Dr Janse expects the initiative will lead to the software being used in even more innovative and possibly unexpected ways.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89362>



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Making interactive domestic environments tangible

A software platform has been developed in the form of a tangible toolkit which will enable users to configure their interactive domestic environments easily in the future.

The EU-funded Accord project has created a tangible toolbox that enables people to convert a physical environment into an active tangible environment. This allows functionality by combining numerous devices in practice.

The first step was to realise the required facilities for administering and managing complex activities within a domestic environment. This involves dynamic and adaptive methods, techniques and facilities so that inhabitants may develop their own environment. Thus, the project needed to determine current and new forms of applications and which home activities need support.

In light of this, the 'Tangible toolbox' was created. It consists of communication and configuration infrastructures as well as a set of editorial tools. Furthermore, there are template components which can assist developers in creating new components that can easily be integrated into the toolbox.

Scientific papers about the 'Tangible toolbox' have been published and presented at international conferences. The toolbox is also available at the project website (<http://www.sics.se/accord>) for free download and use. These different forms of documentation can support several different potential user groups. Research labs have



already expressed an interest, and the hope is that the toolbox will be used elsewhere in different R & D labs around the world.

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

Collaboration sought: further research or development support.

Offer ID: 3329

Software for speech therapy support

The Ortho-logo-paedia (OLP) project has created an integrated computer-based system for speech therapy support.

The project's software system has supplemented conventional therapy to aid individuals with speech disorders. OLP offers visual feedback to assist in improved articulation. Furthermore, it provides automatic speech recognition to assess improvement and to supply an interface for assertive technology or speech synthesis. OLP permits therapy to be conducted off-site via the Internet. In this way, it tailors the type of feedback and the recognition element to a specific group or individual.

The use of OLP software is helpful for therapists in using computers to assist with

speech therapy in various ways. It contains phonetic maps which display target speech sounds. The speech which clients produce is plotted on a phonetic map in real time, including the targets for direct comparison. In this way, articulation success can be indicated and there can be a gradual movement toward correct articulation. Maps can be made to fit the needs of individual clients. Another way OLP software is helpful is that it automatically recognises spoken words and assesses each one by comparing it to a target word set by the therapist. Finally, OLP assists in controlling phonation by display-

ing the loudness and pitch of the client's voice in visual form.

Speech therapists can maintain a client record and create an exercise schedule for each client. They can choose and design the practice exercises that are most appropriate for the client as well as the therapist. Therapists can then monitor client progress and identify weaknesses. In this way, more clients can be served without compromising the effectiveness of the therapy.

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

Collaboration sought: further research or development support.

Offer ID: 3575

Ubiquitous access to entertainment and information

Under the auspices of the Broadway project, suitable infrastructure for robust, mobile broadband communications was developed.

The ever-increasing demands for video or data services in modern telecommunications have imposed a need for robust infrastructure for wireless high data rate systems. Broadband is a signalling technique over a wide range of frequencies; in data communications, multiple pieces of data are sent simultaneously to increase the effective rate of transmission. The term refers to high-speed connectivity communications where telephone, Internet and television are combined to offer communication, entertainment and information to users.

Orthogonal frequency division multiplex (OFDM) communication is considered to be the most popular scheme of all the modern high data rate systems. These include terrestrial or digital audio broadcast or broadband radio access networks (Hiperlan/2 and IEEE802.11a). Yet, at high Doppler spreads that normally occur when the user is moving fast, for instance while travelling, OFDM modulation may become low performing. Motivated by this, the Broadway project focused on building a system for broadband communications that is designed for all, anytime and anyplace.

Part of the project work involved the development of new pseudo-random postfix OFDM multi-carrier modulation schemes to accommodate effective transmission at high carrier frequencies. At such frequencies (60 GHz), the Doppler phenomena are frequent and channel variations occur, but the new modulation schemes have been tested and proved powerful in mobile connections. Moreover, the pseudo-random postfix OFDM modulation can be effectively applied at all frequencies and is also suitable for lower bands under various indoor and outdoor operations. For further information, please visit: <http://www.ist-broadway.org>

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

Collaboration sought: further research or development support.

Offer ID: 3619

ShapeShifted narratives: truly new media for the new millennium

Media has changed and proliferated beyond all recognition in the past 10 years, but the message, the storytelling, has stayed the same. The 'New millennium, new media' (NM2) project developed tools for a new kind of storytelling whose interactive, non-linear approach is to old millennium storytelling as theatre is to television.

The changes wrought by the Internet, by broadband and by Internet protocol television (IPTV) on media distribution are immense. User experience, too, is undergoing a sea change: high-definition, flat-panel displays with surround sound are becoming the norm, and the industry is struggling to adapt its business models to the new world.

Yet, peculiarly, storytelling remains quite the same. The standard, linear narratives free of interaction or personalisation from the user remain, well, standard. Story arcs and plot points are pretty unchanged since Shakespeare's time, or Beowulf's in the 12th century for that matter, though the effects are prettier. Stories are mainly fixed; one size fits all.

But not, perhaps, for much longer. NM2 set out with the extremely grand vision to create new tools for storytelling in the new media landscape. Stories that are non-linear, interactive, multimedia, and personalised to the taste and interests of the viewer.

NM2 calls them ShapeShifted narratives, a term created by NM2 to describe media made to adapt to user choices on the fly.

It is a huge challenge, particularly on the creative side. Imagine a story that evolves to satisfy the curiosity of millions of viewers, each with their own interests. 'Imagine someone with 10 spare minutes plugging into the news for the first time in three weeks: they want all the relevant

updates quickly,' says Doug Williams, Technical Director of NM2.

One pilot programme for NM2, *Accidental Lovers*, told the love story of a man in his 30s and a woman in her 60s. It is a challenging topic and, most challenging of all, the viewer decided how the story developed. That means writers must develop multiple plotlines.

This is a simple example, but it already presents a major task to develop useful production tools, for editing and storyboarding. Ultimately, though, the NM2 vision calls for simple tools so storytellers can create narratives that users can change on a whim. The story elements must be capable of being mixed and matched, and by a machine. And that's where the scope of NM2's vision shines through.

NM2 has developed a toolbox: a range of tools that producers can use to create ShapeShifted media productions. 'The tools are derived from a close understanding of the workflow in developing interactive narrative. They are designed to augment current production practice, so work with existing media asset management systems and non-linear editors,' Mr Williams emphasises.

So NM2's script logging tool annotates scripts and rushes — the raw film — with relevant, structured descriptions. An authoring tool, easily used by people with little or no technical background, describes the narrative structure of ShapeShifted programmes. A description tool tags media objects, while a preview tool can test the effects of user input, to make sure everything works.

Central to the new tools is the ability to describe narratives. NM2 developed a way to describe story elements and media objects. 'We've developed a narrative structure language with its own syntax and rules. It enables people to describe a story in which users can shape the narrative,' Mr Williams explains.

The tools support the concept stage, before any recordings are made, with placeholder narrative objects defining and representing storyboard elements. Story creation and editing uses NM2 tools working alongside

non-linear editors (NLEs) — film editing software importing metadata and media.

'Plot frameworks are created on a narrative canvas; on playback these frameworks are populated with media using narrative rules that respond to choices made by the viewer, but also on chance operations that could, for example, show any three of nine possible clips illustrating a particular point in the narrative. It ensures constructed narratives make sense and are visually appealing but also that they can remain surprising and non-declarative,' Mr Williams notes. The workflow is rounded out with a test function that allows creators to test viewer choices and preview the emerging story.

So far, it sounds like standard software development, but the practical approach taken by NM2 belies the wealth of creativity and ingenuity of the project. Conceiving a new way of storytelling is almost like locating a position on a blank map, without gridlines, landmarks or physical features. There is no frame of reference for conceiving the unimaginable.

So NM2 created one. And then developed the tools to execute it.

It was a major effort. The project regrouped 13 partners, 6 technical, 5 in media production and 1 apiece in consumer research and project management. At EUR 7.5 million, it is one of the largest concerted efforts to develop a new way of storytelling.

But does it work? Well, yes, perhaps better than could be expected. Feedback indicates the tools need more refinement, particularly the user interface. In some areas, it is already very strong, like an interactive, truly multimedia encyclopaedia. In other areas, it could be very important. But, vitally, NM2 has created a suite of tools and a workflow that makes new ways of storytelling possible.

And as the history of storytelling shows, that is just the beginning — it is a tale of evolution. From the early oral tales of Homer through to the frenetic editing of *The Bourne Supremacy* or the layered scriptwriting of *Toy Story*, storytelling always evolves to push the capacities of its medium — the human voice, the written word, the moving image — to the furthest of its capabilities.

Digital storytelling faces a long evolution before its limits are fully conceived, never mind explored, but NM2 has already taken new media storytelling a giant step forward.

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<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89371>



Empowering wireless personal communications

The importance of wireless communication networks is increasing as wireless and embedded computing technologies continue to advance. Within the Pacwoman project, a middleware entity was designed to enhance location sensitivity and achieve efficient energy management for adaptive embedded sensors.

One of the main impacts of wireless personal networks (WPNs) comes from the evolution of intelligent spaces populated by sensors. Wireless embedded sensors combine high-performance sensing, computation and communication capabilities in a single, tiny, resource-constrained device. Up to now, these have been used for very specific applications, but they are likely to play a fundamental role in near-future personal communication environments.

Their future usage scenarios range from monitoring environmental conditions to ubiquitous computing environments, allowing people to interact with various companions and embedded computers in their close vicinity. Focused on proposing a workable architecture to cope with heterogeneity issues, the Pacwoman project designed a generic platform to leverage information

sharing between different layers and communication protocol entities.

Within the WPN, basic and more advanced devices belonging to a single person and cooperating for a certain period of time constitute this individual's personal area network (PAN). A higher topological level arises if communications are established between terminals belonging to different PANs. If the establishment of a direct connection between them is impossible, other nodes could relay the information from the source to the destination, resulting in a multi-hop network.

Optimisation could be carried out at the lower levels of the open system interconnection (OSI) model implemented for PANs. In particular, special attention was devoted to the improvement and balance of both phys-

ical and media access control (MAC) layers in terms of energy consumption and low latency mechanisms. On the other hand, in community area networks (CANs), routing plays a key function that has to be carefully analysed.

For ad hoc routing enhancements and transmission control protocol/Internet protocol (TCP/IP) stack boosting, pieces of information must be made available to the upper layers to proceed with cross-layer optimisation. The PAN and CAN optimisation layer (PCOL) can be embedded just below the TCP/IP stack as an add-on functionality to control information traversing all the protocol stack layers.

The approach adopted within the Pacwoman project is only a starting point, since optimally, there should be more standardised application programming interfaces to access wireless interfaces that enable WPN building.

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

Collaboration sought: further research or development support.

Offer ID: 3618

Towards wireless personal networks

Future generations of mobile and wireless communications will be user-centric, enabling access to personalised services anywhere, anytime. Research within the Pacwoman project targeted technological breakthroughs necessary to realise personal area networks.

Along with the advance of wireless communication technology, the personally centred communication paradigm has evolved to meet the concept of a wireless personal area network (WPAN). Tethered to an individual, the personal operating system (POS) introduced by WPAN enables personal devices to communicate in an ad hoc manner, as well as with other devices within its communication range.

To fully exploit the available spectrum for wireless communication systems, the orthogonal frequency division multiplexing (OFDM) scheme was introduced within the Pacwoman project. Chosen for the outgoing communication through the WPAN gateway, OFDM will enable terminals to handle a wide range of different applications, from voice communication to high-speed data transfer.

The strength of the OFDM resides in its spectrum efficiency (bps/Hz) and, just as importantly, its ability to cover multipath channels which appear in wireless environments. Computationally demanding and therefore power consuming, it was not until

recently that technological advancements made it possible to build mobile OFDM devices with an adequate operation time.

Researchers at the University of Lund sought to design a flexible application-specific integrated circuit (ASIC) that would enable OFDM transmitters to be configured to function with different standards. A signal mapper and a signal-reordering unit that can insert a cyclic prefix and reorder data flow through a fast Fourier transform (FFT) processor were included in the OFDM chip.

When focus was turned from transmitter to transceiver, a higher level of performance optimisation achieved hardware savings. More than half of the memory needed to insert a cyclic prefix could be removed if a bidirectional FFT processor and cyclic suffix was

used. In addition to lower latency and less hardware, the number of memory accesses, and thus power consumption, were also reduced.

The proposed scheme has sacrificed backwards compatibility to existing standards for flexibility; however, it could be a promising candidate for future OFDM systems. This line of research work will be continued to investigate whether the flexibility in the OFDM transmitter can be matched in the receiver.

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

Collaboration sought: further research or development support.

Offer ID: 3595



Capturing facial characteristics in 3D

A three-dimensional (3D) model has been designed which can capture the behaviour of salient points on the face and head for use in animation.

The Custodiev project has designed artistic shaping technology through the process of creative pull which focuses on innovative ways of creating animation. One of its results is a 3D dynamic capture system which has tackled the challenging application of non-contact real-time 3D capture.

The system captures video from as many as 24 cameras in real time and post-processes

the combined video streams. It then creates a 3D model that matches the subject's behaviour and appearance. The goal is to capture the characteristics of prominent points on the face and head to be used for MPEG-4 facial animation parameters (FAPs). In turn, these drive an animated face and head model. The FAPs are also able to include points which are difficult to capture in other motion capture means, such as the iris of the eye.

Realistic augmented reality

Within the context of the Benogo project, a new image-based rendering (IBR) technology was employed to bring a new insight into presence.

The Benogo project focused on developing new tools that would offer people the experience of presence of real and possibly unknown places without actually going there. In order to achieve this, innovative camera technologies were further developed to allow realistic three-dimensional visualisation of real and possibly known places for a moving observer.

On the basis of advanced image-based rendering (IBR) technology, the developed techniques allow generation of new images from other images instead of graphics. The

employed IBR techniques imitate the illumination conditions of the real scene when rendering the augmented virtual objects. Thereby, the virtual objects that are not provided with illumination will not be as distinguishable as the augmented ones.

Emulation of the illumination environment for a static scene, relighting images of real scenes and estimation of the changing illumination of outdoor scenes were three key areas that were addressed. All developed subtechniques are applicable in interactive, real-time augmented reality systems that may be used

The main reason the dynamic capture system was developed was to facilitate the portrayal of historical figures in animation. Although faces are easy to animate, retaining a specific character of facial behaviour is quite difficult. Following some additional streamlining, dynamic capture can possibly result in new styles of facial animation in the future.

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

Collaboration sought: further research or development support.

Offer ID: 3617

for entertainment, education, even design prototyping and interactive apparatus repair.

A prototype augmented reality system was built that allows exploration of a real scene through panning and tilting a flat panel screen that is pole mounted. The screen displays a video stream of the real world along with arbitrary augmentations, such as historic buildings or events. In all augmentations, the emulating illumination conditions are those of the real scene, rendering them almost photo-realistic.

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

Collaboration sought: further research or development support.

Offer ID: 3655

Marrying biological with computer vision

Researchers have studied the neural selectivity of the visual pathway of primates for pictorial three-dimensional (3D) shape and material properties for implementation in computer processing.

The Insight2+ project consortium was a research team covering a broad range of fields including neuroscience, perceptual studies, psychology, mathematics, computer and information sciences. Drawing expertise from this multitude of disciplines focused the project's research on investigating the neural selectivity in visual pathways of the ventral visual pathway of primates.

Key regions studied were TE and V4. The neural coding of pictorial 3D shape cues and material properties was compared against the corresponding features of human perception. This mapping forms the theoretical basis for processing of pictorial cues and material properties in computers.

The human vision system uses two-dimensional retinal images to reconstruct the 3D structure of an object. Research prior to the project had proved that the inferior temporal neurons of the macaque employ binocular disparity gradients to code for depth. The inferior temporal neurons belong to the ventral visual stream. The project work showed that the same neurons may also code for depth using a monocular depth cue, the texture gradients.



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The individual neurons were not found selective in terms of the tilt preferences of the defined surfaces. That is, this was independent of the means of definition, whether by texture or disparity cues. However, single inferior temporal neurons showed selectivity for the tilt of texture-defined surfaces. Moreover, the tilt preference appeared invariant for several different textures and slants, indicating an abstract representation of the surface tilt in the ventral visual cortex.

These interesting findings provided a better understanding of the neuronal vision perception that may be applied in further developments for more intelligent and flexible artefacts and robots. Furthermore, detailed knowledge of the visual perception of humans or non-human primates may also contribute to the design of more effective interfaces between artificial vision systems and people, for instance people with disabilities.

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

Collaboration sought: information exchange/training.

Offer ID: 3567

Understanding the craft of 2D animation

A new book explores the understanding of two-dimensional (2D) animation in the form of 2++ D animation, a technology developed by the Custodiev project, and its future.

Animation technology is often developed without the artist's needs in mind. The EU-funded Custodiev project has created artist projects and artists shaping technology through a process known as creative pull. The focus was on new methods of designing animation, narrative drawing and performance-driven art.

As an outcome of this effort, a book entitled *The Art and Science of Drawn Animation* was written. It covers 2D animation in the form of 2++ D animation with examples taken from the many production strands within the project. A highlight of the book is the connection between the artwork, the

styles, and the story theme, as well as the relationship among them. In essence, the book is not about methodologies so much as it is about stylistic techniques and support for these techniques.

The book hopes to unite the research efforts of the partners and co-authors. Its contents include the traditional approach to animation, the use of computers in non-3D animation, and the extension of digital animation technology to live action.



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Two Bobs in a wireless world

The 'Wireless world initiative' (WWI) has developed prototype user-centred systems that will potentially enable millions of people to make the most of third-generation (3G) and beyond mobile technology to work, relax and play anytime, anywhere. ICT Results reports back from the WWI's crowning event.

It is Monday morning in the not-too-distant future and two neighbours, Bob the builder and Bob the businessman, are getting ready for work. The builder has to drive to a job in a nearby town, and the businessman needs to take the train to the office. They switch on their televisions and request information on road and rail conditions.

Outside their front doors, the two Bobs wish each other a good morning and head their separate ways. On the train, the businessman watches the financial news on his palm pilot, while the builder tunes in his phone to his favourite digital radio channel and relaxes in the morning traffic to some classical music.

Meanwhile, the businessman phones his secretary and tells him through his earpiece that he forgot his PowerPoint presentation and speech. Bob the businessman's palm pilot bleeps as he enters the state-of-the-art conference centre where he is to give a speech and presentation. It informs him that he has entered a high data rate zone and asks him whether he would like to switch to 'superbroadband'.

He sits in the conference building's lounge area and notices a message from his secretary in his inbox. He begins to download the documents he requested and surfs the web to do some last-minute research.

In the evening, both Bobs decide to go out. The builder checks the opera programme on his phone while the businessman checks the

cinema schedule, and they buy their tickets online. Their phones' e-signatures authenticate who they are. As they enter the opera house and cinema, their phones automatically switch to mute.

The EU-backed WWI has developed the prototype user-centred systems that have brought these future Bobs a lot closer to the present. The integrated architecture the initiative's five projects — MobiLife, SPICE, Winner, Ambient Networks, E2R — have developed will potentially enable millions of people to make the most of 3G and beyond mobile technology to work, relax and play anytime, anywhere. And, to top it all off, their experience will not just be wireless but also seamless.

Funded under the previous framework programme (FP6), the WWI has worked over the past few years to develop ambient networks which will enable the seamless transition and interaction between services across a range of currently distinct and disjointed technology domains.

'In the future, Bob and millions like him will be able to benefit from and enjoy lots of wireless services,' describes France Télécom's Marion Duprez, who heads WWI's Cross-issue Validation Team. 'The technology underpinning all this is very complex and sophisticated, but this does not matter to Bob.'

Although they do not concern Bob, these platforms and how they relate to one another

matter greatly to WWI. Each of the initiative's projects focused on a particular technical challenge that needs to be overcome in order to enable mobile technology to come of age. At the same time, the projects worked closely together to ensure that their platforms and systems fit together seamlessly. This is what the WWI calls 'transparent seamless mobility through distributed architecture'.

'Our team was in charge of creating the scenarios to show that the ... projects could work together to provide integrated services,' Ms Duprez explained in the demonstration area of WWI's final conference, which took place in Brussels on 13 November 2007. 'Creating this end-to-end system was a real challenge. It required a lot of brainstorming, coordination and experimentation.'

But, as the Brussels demonstrations amply illustrated, they pulled it off. 'It has been very valuable to have this cooperation between telecom operators, manufacturers and universities. [European] Commission support was also invaluable in ensuring that the projects were well led and coordinated,' Ms Duprez noted.

Both industry and operators are already showing signs of interest. 'At France Télécom, we have invested a lot of effort into these systems as part of our commitment to offer new services to our customers,' Ms Duprez stressed.

A new batch of WWI projects, which aim to continue the good work, will be funded under FP7.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89335>

Sandwich technique eases 3D optical chip fabrication

Complex three-dimensional (3D) integrated circuits involving both optical and electronic elements are now easier to make, thanks to a wafer bonding technique developed by a European research consortium. With the right commercial backing, the new technology will help Europe to stay competitive in communications and sensor technology.

Photonics is the science of controlling photons — the particles that make up light. Photonic devices are essential in telephone and computer networks, where they manage the flow of information along optical fibres. Pollution monitors, laser rangefinders, surgical lasers and DVD players are other examples of photonics in action.

Photonic devices are made on chips, in a similar way to electronic circuits, by combining elements such as laser diodes, waveguides and detectors. Some of these circuits use purely optical technology, but most are hybrids that include both photonic and electronic components.

The problem, as Helmut Heidrich of the Fraunhofer Institute for Telecommunications in Berlin explains, is that the growing complexity of these devices is pushing the limits of current manufacturing technology. In particular, photonic components are based on special semiconductors such as gallium arsenide (GaAs) or indium phosphide (InP), while most electronic components use silicon. Working with two fundamentally different materials on the same chip is difficult and expensive.

Instead of using two types of semiconductor in the same process, an alternative might be to fabricate separate slices, each made from one basic material, and then stick the slices together. In June 2004, a team of European scientists set out to show that this 'wafer bonding' technique could be an effective way to make complex multi-layer photonic devices.

The EU-supported Wapiti project was coordinated by the Fraunhofer Institute for Telecommunications and had four other academic partners: Romania's National Institute for R & D in Microtechnologies, the Max Planck Institute of Microstructure Physics in Germany, the University of Athens, and the University of Cambridge in the United Kingdom. A fifth partner, the EV Group in Austria, contributed its expertise in processing and machinery for full wafer bonding. Wapiti began in June 2004 and finished in September 2007.

To show the potential of wafer bonding, the project partners set out to build optical elements known as active microring resonators. Microrings, which act as power storage devices, are a key part of the lasers which allow high-bandwidth communications signals to be spread across a wide range of laser frequencies. They also have great potential as wavelength converters for telecommunications and in monitoring applications, such as the detection of biological or chemical substances.

Using InP and GaAs wafer substrates, the Wapiti team created various kinds of microrings with radii down to 10 μm . The two-layer technique allowed them to create microrings with vertical connections to the transparent waveguides that carry light in and out of the microrings. Compared to the standard technique of horizontal coupling on a single layer, vertical coupling allows the production of smaller microrings, which in turn means higher data rates. The researchers tested their microring lasers with several channels of wavelength division multiplexing, at data rates up to 7 Gbit/s.

Accurate alignment is one of the biggest challenges in wafer bonding. Each wafer is a slice of semiconductor material large enough to hold thousands of chips; only towards the end of the process are the individual chips separated and packaged. With the width of the smallest electronic circuit elements now down to 45 nm or less, accurate alignment across the whole wafer is crucial.



Maintaining alignment is hard enough over a single wafer, but even trickier when two wafers are made separately and then bonded. Different wafer materials have different rates of thermal expansion, so temperature changes during processing can distort the alignment of the tiny multilayer circuit elements.

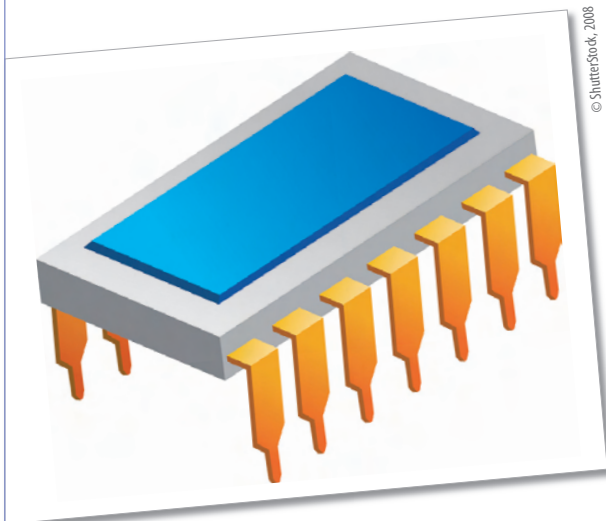
Using electron beam lithography, the Wapiti partners achieved good results in aligning wafers of InP and GaAs 50 mm in diameter — currently the standard wafer size for these materials. Future development will bring the need to bond 50 mm InP and GaAs wafers to full-size (300 mm) silicon wafers. For this more difficult task, 'step-and-repeat' masking techniques may replace the current system of fabricating each layer as a single unit, Mr Heidrich believes.

Although the project did not include an end-user, Mr Heidrich is confident that the technology developed during Wapiti is very marketable. The partners are now looking for a commercial company with an interest in taking their devices to the next level.

He is particularly upbeat about potential applications in environmental monitoring. Because of their small size, the microring lasers developed by the project have output powers of less than 1 mW, so they are not suitable for long-distance communications, which requires powers of 6–30 mW. Their high-quality resonators are, however, extremely sensitive to surface modifications, so they should have many applications as novel detectors for biological or chemical substances, Mr Heidrich believes.

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<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89356>



Inexpensive polymer-based optics

Within the context of the 'Development of technologies for SMEs aiming at applying thermal infrared devices for detection and imaging' (TECH-TIR) project, low-cost, complex-shaped and multifaceted polymer optics were used in thermal infrared device applications intended for detection and imaging.

The TECH-TIR project introduced several innovations in the fields of optics, optomechanics, actuation and sensor technologies to develop two new products. One of these innovations involved the development of low-cost, high-density polyethylene (HDPE) lenses.

Until this development, the HDPE material had not been used as an optical material in high-end imaging applications, despite its extensive use in low-end non-imaging applications. This limitation was mainly due to its poor transmittance properties compared to semiconductor crystals or chalcogenide glasses. A key prerequisite for the production of HDPE lenses as thin Fresnel elements of less than 1 mm was to bring the radiation throughput to its maximum potential.

Two manufacturing techniques can be employed for fabrication of HDPE Fresnel lenses: hot pressing and injection moulding. The first one is suitable for flat lenses and offers a good moulding accuracy, while the second is more appropriate for curved lenses with limited accuracy. The limited accuracy of the second technique comes from shrinkage of the material that results in rounding of the microreliefs and deformation of the substrate.

Answering this need, hot-pressed chalcogenide glasses were utilised; more particularly, a doublet of chalcogenide material was used for a lower cost product. Lenses based on chalcogenide material cost less than those based on crystalline semiconductors because of the inexpensive raw materials used and the cost-effective manufacturability (through moulding).

The outcome was the design, testing and manufacture of low-cost HDPE solutions. The huge cost reduction in the production of optics using plastic-based micro-optical parts opens new avenues in imaging and detection capabilities. These can find numerous applications ranging from medical imaging to surveillance.

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

Collaboration sought: further research or development support, manufacturing agreement, venture capital/spin-off funding.

Offer ID: 3557



Design improvements for optoelectronics devices

Advances in polymer-based optoelectronics materials offer solutions to today's increasing demand for light-emitting diode (LED) products with greater light output, efficiency and reliability than ever before.

Polymer light-emitting diodes (PLEDs) have been introduced as promising candidates for next-generation displays, particularly for portable electronic devices. A number of inherent qualities, including full-spectrum colour displays and high brightness at low drive voltages, render PLEDs ideally suited for mobile phones, digital cameras and MP3 players.

However, one of the major concerns for their large-scale commercial exploitation remains their power efficiencies, since these are directly dependent on battery usage. High-quality devices are continuously emerging through the use of new polymer-

based optoelectronics materials; and therefore an explicit description of the contact (metal/polymer) region has become necessary.

To accurately evaluate the current-voltage characteristics of organic material-based LEDs, a theoretical approach has been adopted within the 'Optical amplification in polymer-based materials and devices' (OPAMD) project for the analysis of the contact phenomena. Researchers at the Technion Israel Institute of Technology considered the contact region as an intrinsic part of the device and provided numerical simulations of the charge distribution for the entire device.

On the basis on their results, LEDs that can operate at a voltage as low as 3 V and demonstrate fast switching times of a few nanoseconds were designed and manufactured. Technion researchers, moving one step further, explored the possibility of using a new generation of polymers exhibiting high mobility.

At extremely high modulation frequencies of at least 500 MHz, doped PLEDs manufactured at Technion offered high photoluminescence efficiency combined with a long operating lifetime. In the next phase of research, demonstrators of visible PLEDs will be benchmarked for future commercial exploitation.

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

Collaboration sought: further research or development support.

Offer ID: 3622

Optoelectronics devices on gallium nitride

The growth of free-standing gallium nitride (GaN) substrates for light-emitting devices can be facilitated with the production line established in the laboratories of Linköping University, Sweden.

GaN and its related alloys have opened up the road to efficient solid-state lighting with white light-emitting diodes (LEDs) replacing conventional fluorescent tubes. GaN-based high-frequency electronic devices for wireless applications have already been launched

on the open market. Currently, they are beginning to revolutionise the field of high-capacity data storage with blue laser diodes.

Nevertheless, the hetero-epitaxial growth on foreign substrates, such as sapphire

or silicon carbide (SiC), results in high defect density, limiting the luminous efficacy of GaN-based devices. On account of the recognised potential of GaN-based devices, the 'Development of low dislocation density gallium nitride substrates' (DENIS) project, funded through FP5, aimed to develop a technique suitable for large-scale production of GaN thin wafers.

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Facing the challenge of market fluctuations in shipping

Modelling techniques for evaluating a ship's dynamic response to waves are neither in their infancy, nor are they perfectly formulated. It is therefore essential that these are applied with expertise case by case.

The passenger ship sector is of significant importance for European shipyards and is also showing signs of growth, even though the bulk of shipbuilding is moving to Asia. Modern tanker industry trends are putting pressure on shipbuilders' competitiveness, design and construction methods, as well as on efficient use of human resources.

Design- and engineering-cycle times have been significantly reduced due to shorter delivery times dictated by heavy market competition. At the same time, project size has grown and technical demands are becoming more challenging. As one of Finland's largest shipyards, Aker Finnyards has been active within FP5 in several R & D projects. The

Finnish shipyard is renowned for its ability to carry out demanding shipbuilding projects.

Within the Effort project, research targeted the refinement of the Finflo-ship code used for solving viscous flows around ships' hulls and propellers. The team primarily aimed to speed up execution times and improve the user-friendliness of the Finflo software package, which allows fast modelling and easy checking.



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The development of this Navier-Stokes flow equations solver dates back to 1987, when a research project in computational fluid dynamics (CFD) modelling techniques started at the Helsinki University of Technology, Finland. The validity of up-to-date versions of the code was tested thoroughly by evaluating the viscous flow around the hull of a modern research vessel at full-scale Reynolds numbers. The main validity issues addressed were the wake, resistance and thrust, in addition to the elevation of the free surface.

Equipped with a strong bulbous bow, stern and transom, the selected vessel was a challenging case characterised by strongly curved lines and therefore high demands on the grid generation. Results demonstrated the need for attention to be paid to the influence of the grid resolution in order to obtain grid-independent solutions. Future efforts will be focused on speeding up computations by means of effectively parallelising the Finflo-ship code and using large parallel computers.

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

Collaboration sought: further research or development support.

Offer ID: 3614

Making sea travel more comfortable

A modelling system incorporating onboard integrated passenger comfort tools has been designed to improve overall passenger services in ship operations.

Motion sickness is a common problem in sea transportation. While ships can operate during severe weather conditions, they are obliged to stop operating for many months or operate well under their capabilities in order to ensure passenger safety and comfort.

The Compass project has designed a new motion sickness prediction model along with realistic standards for motion sickness and passenger comfort in sea transportation. The highest technological goal was to improve passenger and crew safety as well

as the reliability, operational efficiency and competitiveness of passenger and cruise vessels in Europe's shipping industry.

Under these auspices, a combined software and hardware tool can integrate motion sickness assessment software with onboard measurement systems. This enables onboard continuous measurement of the motions, vibrations, temperature and air quality of the ship. It can also provide the observation and prediction of motion sickness and passenger comfort in different sections of the

ship. Furthermore, a decision support system was designed which assists the captain in executing the proper actions to lessen discomfort.

This tool is suitable for the activities of consultants, designers and shipyards. New motion sickness and passenger comfort standards specifically cater to passengers and crew of sea transportation and can be used in a broad array of vessels including cruise ships.

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

Collaboration sought: information exchange/training.

Offer ID: 3559

continued from page 37 'Optoelectronics devices on gallium nitride'

The use of substrates with closely matching thermal expansion coefficients and lattice constants would provide the optimal solution to improving the performance and lifetime of GaN-based devices. The DENIS project has come to an end, having produced a range of positive contributions to the establishment of GaN technology in Europe.

A technique and a reactor suitable for the growth of GaN boules from which thin

wafers can be produced has been developed at Linköping University. More specifically, the hydride vapour phase deposition technique was successfully used for the growth of GaN substrates of up to 2 inches in diameter and a thickness of 2 mm. Growth of bulk GaN material was performed in a vertical hot-walled reactor at atmospheric pressure.

When combined with the laser-induced lift-off for substrate delamination, the antici-

pated improved performance of light-emitting devices compared to the use of sapphire substrates was demonstrated. However, critical questions remain to be solved as well as the need to clarify the effect that the use of such substrates has on devices' properties.

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

Collaboration sought: further research or development support.

Offer ID: 3642

Numerical investigations of modern vessel designs

Already firmly embedded in the design process of modern vessels, computational fluid dynamics (CFD) software tools have enabled the modelling of turbulent flows for handling complex vessel geometries.

Among the remaining challenges in modern vessel design are the long computing times needed for numerical simulations of flows around the vessel's hull at full scale. Only recently have predictions of viscous flows at model-scale Reynolds numbers been made possible by means of increased parallel computing capacities.

The Effort project made significant contributions to the refinement and validation of CFD tools for simulating the flow around real ships. Focusing on the applicability of Reynolds-averaged Navier-Stokes (RANS) methods to viscous flow computations, project partners from Poland provided measurements of different flow parameters and collected existing data.

Scale effects and differences in the accuracy of available CFD codes were estimated in order to increase confidence in their prediction capabilities. For this purpose,

model tests conducted at the Ship Design and Research Centre, Poland, were supplemented with full-scale flow measurements around existing vessels.

For velocity measurements needed to investigate the hull wake, a 3D particle image velocimetry technique that does not interfere with the field structure was deployed, in addition to laser Doppler velocimetry. Furthermore, resistance and powering performance, dominant criteria for the hull design, were evaluated by means of traditional self-propulsion and nominal wake tests.

Experimental data from several vessels accumulated at the Hamburg Ship Model Basin, Germany,

along with flow measurements of the corresponding models, were added to the database delivered to all project partners. Comparisons between measured and simulated results for all these case studies will provide, for the first time, a real indication of the prediction capabilities of RANS methods used for practical simulations.

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

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

Offer ID: 3592



Structural health monitoring for natural gas vehicles

A technique based on fibre optics that may potentially provide an indication of developing hazardous conditions in composite fuel tanks has been developed within the 'Zero-hazard gas storage by multisensing optical monitoring system' (ZEM) project.

With the potential added benefit of reducing hazardous emissions into the environment, the promotion of alternative fuels in the transportation industry can reduce Europe's dependence on oil. However, different factors

inhibit the market growth of vehicles running on compressed natural gas, although they are considered to be the cleanest internal combustion vehicles available today.

Full composite tanks used to store compressed natural gas onboard feature high manufacturing costs. Furthermore, despite their extended lifespan, safety and maintenance issues remain a challenge for their widespread use in vehicles. The ZEM project aimed to develop a monitoring system, based on fibre-optic sensors, to simplify periodical control and to facilitate detailed evaluation of the structural integrity of tanks.

To offer online interrogation during refuelling, the system has been designed to be permanently installed on natural gas tanks. In particular, advanced fibre-optic sensors were developed for embedding in the composite fuel tank material. Research work at the University of Strathclyde, United Kingdom, focused on changes in fibre attenuation, which are a significant source of inaccuracy

and mainly result from microbending of the fibres during tank pressurisation.

In order to overcome this problem, a well-established technique based on subcarrier phase measurements of radio frequency modulated light was selected and introduced for strain measurements of gas tanks. Using both in-phase and quadrature mixing and taking the ratio of the outputs, the method is independent of optical power levels over a wide range of values.

Since power levels can change because of components ageing and a wide range of external environmental factors, the improved fibre-optic strain sensors can be applied for different strain measurements. Moreover, they can be used in either transmissive or reflective mode to remotely interrogate units sequentially in a multiplexed fibre-optic sensor network. Sensors offering precision and stability in the microstrain range and suitable for mass production at an economical cost are envisaged by the ZEM project partners for the future.

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

Collaboration sought: further research or development support, financial support — available for consultancy.

Offer ID: 3556

See also pages 20 (offers 3644 and 3585), 21 (offer 3589) and 40 (offers 3621, 3579 and 3546)



Revolutionising public transport in Denmark

A plan has been created to implement bus priority and real-time passenger information (RTPI) in order to advance public transportation in Denmark.

The 'City vitality sustainability' (Civitas) project has provided innovative ways to improve public transportation in the areas of clean vehicles, access management, pricing strategies and telematics solutions, amongst others. Under these auspices, drivers of public transportation can have an improved working environment, and operators can have options for planning and monitoring.

An example of telematics solutions is the employment of real-time information for bus

priority at signalised junctions. This allows for improved service, provides less stressful driving and is more economically efficient for the operator. Until now, there have been no large-scale implementations of bus priority and RTPI in Denmark. Part of this effort also included a new public transport plan with a new local train service. This should significantly alter the image of public transport in Aalborg.

Given this, a new group of users is hoped for. These are people who do not currently

use public transportation because they consider it too slow and out of date. Providing new IT solutions and an improved travel rate thanks to bus priority, it is quite likely that this will change in the future.

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

Collaboration sought: information exchange/training.

Offer ID: 3621

Advanced filters for fewer emissions

New filter materials and an improved filter design particularly suited for catalytic coated units have been developed for reducing particulate mass emissions from heavy-duty engines.

In line with European directives for further reductions in emissions levels, the 'Coated sintered metal trap' (COMET) project focused on a new technological filter concept. The new improved particulate filter system has been specifically designed to cover the needs of heavy-duty applications. It may also be employed in combination with exhaust gas recirculation (EGR), a nitrogen oxide (NO_x) reduction technique employed in the majority of gasoline and diesel engines.

Project partner PUREM provided a wide range of new material variants to be tested for the new design concept. These materials feature appropriate filtration capabilities

meeting requirements of mechanical properties including weight, size, coating ability and thermal resistance to soot combustion. At the second stage, another set of new material variants was further developed aiming at better porosity, pore diameter and permeability according to the catalytic coating requirements. In combination with a favourable permeability characteristic, ferrierite coatings with higher wash-coat loading levels were found to be a very promising solution.

A new filter design technology, highly suitable for catalytic coated filter units, was also developed. This new design displays size advantages in respect to con-

struction volume and has undergone extensive testing including bench tests and ash cleaning investigations. PUREM will release such filter systems into the market for various applications meeting future emission levels, such as those set by the Environmental Protection Agency (EPA) in its 2010 requirements for heavy-duty engines.

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

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

Offer ID: 3579

Improving air quality in vehicles

A new catalytic formulation offering ozone removal and toluene conversion in vehicles is expected to find applications in a wide range of mobile cabins.

Aiming to provide a healthy, comfortable and safe environment for the driver and the passengers, the Cleanrcab project generated a novel, cost-efficient and modular air quality management system in vehicles. The system is based on an innovative plasma-based catalytic process for destruction of gaseous pollutants and an advanced electrostatic technology for removal of fine aerosol particles. Moreover, the system involves air monitoring and enhanced driver/vehicle interfaces for air quality awareness as well as preventive maintenance information.

Research work involved the formulation of suitable catalysts for purifying the cabin environment from harmful gaseous pollutants, such as ozone and the volatile organic com-

pound (VOC) toluene. Four different catalysts were developed and located downstream to the plasma reactor. These were porous alumina (Al_2O_3), manganese oxide supported over porous alumina ($\text{MnO}_2/\text{Al}_2\text{O}_3$), gold supported over zinc oxide (Au/ZnO) and an industrial catalyst (N150).

Extensive testing showed that the best ozone removal was achieved with the Au/ZnO catalyst, and for toluene removal, the $\text{MnO}_2/\text{Al}_2\text{O}_3$ was best suited. These findings showed that nanodispersed gold particles are suitable for CO_2 selectivity and ozone removal, while MnO_2 can lead to toluene conversion. The powerful combination of catalyst-plasma technology is highly suitable not only for automobiles, but also



for larger vehicles such as trucks, buses and trains. This is mainly due to the reduction of constraints imposed by the size and the energy consumption of the system.

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

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

Offer ID: 3546

See also pages 20 (offers 3644 and 3585), 21 (offers 3554 and 3589) and 39 (offer 3556)

Aiming for lead-free soldering

Within the context of the 'Environment-friendly soldering technology' (EFSOT) project, innovative solder paste for lead-free soldering was developed for use in many industrial applications.

Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive) bans the use of lead from solders and finishes. Motivated by this, the EFSOT project focused on a next-generation, environment-friendly soldering technology. For an easy transition to lead-free soldering technologies, current industrial processes need to adapt and possibly adopt new methodologies.

To improve the competitiveness within the technology, the EFSOT project promoted reliable, efficient and sustainable lead-free soldering techniques. One of the key results was an innovative solder paste for lead-free soldering that was further optimised for a robust performance and a reliable solder joint. It was developed on the basis of SnAgCu alloys for fine pitch soldering. This innovation is suitable for numerous applications, ranging from the consumer to critical automotive electronics.

The new solder paste displays excellent performance properties similar to the common SnPb solder paste. These include printability, wettability under air and reliability of the chemical behaviour of residues after reflow joints. The trademarked product is widely available not only in Europe, but also overseas. For further information, please visit: <http://www.efsot-europe.info/servlet/is/1>

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

Collaboration sought: further research or development support, marketing agreement.

Offer ID: 3615

Improving the performance of machinery

The 'Nanostructured coatings for engineering tribological applications' (TRIBO) project extensively studied the micro-properties of advanced coatings deposited by different technologies along with their tribological behaviour.

The performance of machinery in terms of quality and reliability is strongly associated with the tribological behaviour of the materials used. Tribological problems are quite common in various industrial sectors, such as aerospace, paper, machinery, building and in the automotive industry, to name only a few.

The developed high-performance SLCs have been extensively studied in terms of their tribological behaviour. The wear and friction tests covered a broad range of conditions including typical working conditions of components, such as choice of counterface materials, contact pressure, speed and temperature.

Motivated by this, the TRIBO project focused on improving the performance of friction joints under harsh environments including high-contact loads and temperature. Thereby, new advanced solid lubricant coating (SLC) materials were developed with the aid of suitable energy sources and deposition strategy.

The conducted experiments involved tests of friction behaviour and erosion resistance. The assessment of the friction behaviour of the coatings was based on two tribometers allowing testing under different loads and working temperatures. For testing erosion under different impingement angles, a specially adapted test-bench was employed.

The experimental data obtained for the micro-properties of the materials, which were deposited with the aid of various technologies, were found to be satisfactory for further exploitation of the coatings. Moreover, they constitute a valuable repository for future research on SLCs' potentialities that may lead to further optimisation of materials and real parts.

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

Collaboration sought: information exchange/training — available for consultancy.

Offer ID: 3582

Automatic assessment of industrial plant components

The newly developed XpectionTool is an automatically operating software for evaluation and assessment of a material's real structure from data involving two-dimensional x-ray diffraction patterns.

Under the auspices of the 'Innovate residual service time assessment of industrial plant components using real structure analysis by onsite x-ray diffraction' (Xpection) project, an innovative material ageing characterisation method that employs onsite x-ray diffraction was generated. The novel inspection methodology can be easily integrated into the infrastructure of inspection and maintenance of industrial plants. The method includes hardware and software for obtaining data, evaluation of residual life-time and process simulation.

two-dimensional x-ray diffraction data to monitoring materials properties. The tool is very flexible and may be easily adapted to any infrastructure. Using raw data format as an input, its use does not require any specialisation skills in crystallography.

The XpectionTool experimental prototype covers all operations from evaluation of

Although the main application area is inspection and maintenance, it may be also used for quality control in production and material research using two-dimensional x-ray diffraction. The XpectionTool is highly suitable for fossil-related electric power generation and petrochemical industries. Other potential applications include all

types of electric power generation, aircraft manufacturing and maintenance, pulp and paper, chemical, food, foundries, cement and concrete.

The XpectionTool is unique in its development since the user is able to complete all the evaluation steps involved using only one tool in the simplest way possible. There are no requirements for data formatting, which is both time and resource consuming. Its adoption may significantly benefit industries performing inspection, manufacturers of x-ray diffraction components and research organisations. For further information on the project, please visit: <http://projects.tecnatom.es/xpection/index.html>

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

Offer ID: 3641

Wearing technology on your sleeve

You think the switch from typewriter to computer was a revolution? The next stage could see many of us interacting with computers inserted into our very clothes. A new project is exploring a range of applications where wearable technology could significantly improve productivity and even help save lives.

'Assimilate, assimilate!' You trekkies out there will recognise the Borg mantra for the bloodcurdling 'assimilation' of humans by machines. On the other side of the sci-fi divide, many may recall Star Wars' recently revived Darth Vader, the half-man, half-machine dark lord of intergalactic evil.

From science fiction to science fact, the pairing of man and machine has always been at the forefront of our fears of what the technological future might have in store. But it has also been the basis of many of our conceptions for dealing with the challenges of the future: efficient multimedial communications, improved ecologically friendly transport and revolutionary medical applications. After all, for every space villain, there is a light sabre ready to be used to chop his head off.

Today's instances of the association between man and technology are perhaps not as impressive to the jaded cinema-goer, but just as ambitious for the impact they could have on our daily lives. The focus, though, is perhaps not so much on assimilation as it is on integration and usability. European researchers have been carrying out wide-ranging testing of new wearable technology with applications in a variety of fields and with the potential of protecting and even saving lives. The vital innovation is that the technology facilitates a new form of human-computer interaction comprising small, easily accessible body-worn computers that are always on and always responsive.

'If you have a desktop application, then there is always a screen, a keyboard and a computer unit, but if you have a wearable computing solution, then it can be completely different,' says Michael Lawo, technical manager of the WearIT@work project. 'You can have speech control in one instance,

gesture control in another, though the application should always be the same,' he says. The open wearable computing framework being developed essentially comprises a central, easily wearable and hardware-independent computing unit which gives access to an ICT environment. Some of the basic components include wireless communication, positioning systems, speech recognition, interface devices, and low-level software platforms or toolboxes allowing these features to work together.

The pattern of this EU-funded project is woven as much out of applications as it is technology. It uses a number of commercial, off-the-shelf components and brings them together to create a new tool with the potential to revolutionise the way we work.

'Wearable computing is a completely new working paradigm,' Mr Lawo says. 'It is a technology which can support you in a particular environment. Instead of working at the computer, you are directly supported by the technology, a bit like when you are driving a car and you get information from the navigation system supporting you in your primary tasks.'

WearIT@work, the largest civilian wearable computing effort worldwide, is currently being tested in four different fields. These include aircraft maintenance, emergency response, car production and health care. Pilot projects in the areas of bush-fire prevention, e-inclusion and cultural heritage have also been launched recently.

In most cases, the technology is being applied to people who are not accustomed to using computers at the workplace, such as blue-collar workers. 'The basic idea was



to make the technology available to the workers and directly improve productivity,' Mr Lawo says.

'We address fields where there are no similar applications today. Take the example of an aircraft technician. There is a person doing paperwork who has to find the relevant documentation on a computer. He has to find the aircraft maintenance manual and the parts manual, and produce a printout. These documents are handed over to the technician who then goes to the aircraft to do his work. He then has to write a report on a sheet of paper. And that is the way things work today. What we are doing is giving the worker support and direct access to the ICT system from the workplace. We get rid of the paper.'

With a considerable number of applications potentially possible, perhaps the most challenging test case for the project is the one involving emergency response teams, in collaboration with the Paris fire brigade. The technology helps to support the communication, collaboration and information processes of rescue forces.

The efficiency and safety of firemen can be considerably improved by a number of light, easy-to-use and resistant devices, such as biosensors monitoring their physiological condition and improved localisation of hazards, personnel and retreat paths.

The technology has largely been well received by workers. 'They recognise that this is a new technology where you can monitor working activities, but they do not hesitate to use it, and they see the advantage of it,' Mr Lawo says. Difficulties might nonetheless emerge in the future. 'As soon as you come to the actual introduction of



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Novel non-linear polymers

Within the context of the 'Polymer molecular modelling at integrated length/time scales' (PMILS) project, a new methodology produced branched polymeric structures from non-linear molecular architectures.

Aiming to reduce costly experimental trials and errors in the polymer industry, PMILS addressed the issue of effectively predicting the macroscopic properties of polymer materials. Based on knowledge of molecular constitution and processing history, researchers have developed suitable methodologies and tools for polymer molecular modelling.

One of the project results involved a state-of-the-art Monte Carlo algorithm for the simulation of long-chained polyethylene melts with a linear and a non-linear molecular architecture. The algorithm is based on an advanced set of chain-connectivity altering moves and may be used for both mono- and poly-disperse systems.

H-shaped polyethylene systems that include polyethylene chains with a main backbone trapped between two branch points, each of

which is linked to two dangling arms, were used for testing purposes. The test results offered numerous uncorrelated and fully equilibrated configurations at all length scales for subsequent molecular dynamics studies.

Apart from the rigorous estimates of the thermodynamic and conformational properties of H-polymers, the algorithm was also found capable of accurately predicting several key properties. These included branch point friction, diffusivity of chain centre-of-mass, spectrum of relaxation times and zero shear rate viscosity.

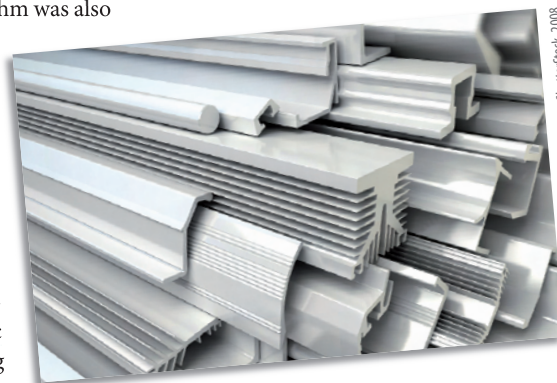
The key innovative aspect with the new code rests in its ability to simulate the viscoelastic properties of polymers bearing

long/short branches along their backbone. The algorithm would be very useful in non-equilibrium molecular dynamics simulations when interpreting the strain-hardening properties of branched polyethylene melts. In addition, it may be able to prove the better performance of branched polymers in fluid-flow processing operations in comparison to linear ones.

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

Collaboration sought: further research or development support.

Offer ID: 3620



New techniques cut cost of producing woven textile-reinforced thermoplastics

Two new technologies have been developed to improve textile processing techniques, thereby making the production of woven textile-reinforced thermoplastics both more economical and better for the environment.

The previously used production process of heating resin and textile in a metal mould and then quickly cooling it used a huge amount of energy to produce large thermoplastic composite parts. This was both very expensive and harmful to the environment.

The partners in the Amiterm project improved the energy balance in the production of the thermoplastic parts by heating the resin and textile but not the mould, leading to a faster production cycle. They achieved this with two new technologies, the JETex process and the HTex process. With the JETex process, a low-viscous prepolymer is injected into a non-metallic

mould and heated by microwave energy and then polymerised. The HTex process uses pre-impregnated 2D or 3D textile inserts which are put in a specific mould. The yarn is heated with the inserts, compressed and the thermoplastic resin forms the solid thermoplastic composite.

The aims of the project were lower production costs, an improvement in production flexibility and a reduction in negative environmental impact. These have been achieved and, as a consequence, the project partners are now in a position to improve their competitiveness in the market. The new production process is available in several European

countries and will therefore be supporting Europe in the global economy.

Benefits to the European economy will comprise more SME inclusion in the industry as their competitiveness potentially increases. This is due to the new techniques that mean less harmful effects for the environment, significant energy savings and safer working conditions for staff as they are less exposed to fumes and fibre dust, as well as easier transportation due to lighter parts. Another very positive result was that technical staff in the partner companies gained a lot of new experience and training, which could have a very positive effect on the moulding and manufacturing industry in Europe.

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

Collaboration sought: information exchange/training.

Offer ID: 3640

continued from page 42 'Wearing technology on your sleeve'

the technology and start negotiating with the unions, privacy will undoubtedly be an issue,' Mr Lawo says.

WearIT@work already has some 42 partners, including IT giants Microsoft, Hewlett-Packard and Siemens, but Mr Lawo says the project is always on the lookout for new ventures.

'Research will continue for components or for positioning systems. There is a lot of further research that can be carried out, but you can basically already do quite a lot with the application and with the technology that already exist,' he confirms.

Testing is due to continue until mid-2008 and will be followed by an initial 12-month

period where the focus will shift to exploitation. 'What we really want to do is introduce the system into everyday working methods,' Mr Lawo says.

Promoted through the ICT Results service.

<http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89322>

Optimising processes for hydrogen separation

Aiming to realise a membrane-based hydrogen (H) separation technique, the 'Cerhysep membranes for hydrogen separation' (Cerhysep) project developed suitable methods and tools for process optimisation.

Separations are widely used in the chemical industry for purification of the feedstock and removal of impurities from a mixture. Basically, separation is used to improve process efficiency, yet most separation processes display a poor thermodynamic efficiency, particularly distillation. As modern industry moves towards sustainable growth and development, a new, more efficient separation technology which is more environmentally friendly has to be realised. Furthermore, the development must be readily applicable and available.

Due to improved efficiencies and huge energy and cost savings, membranes constitute a good alternative to distillation. Membranes have the potential to be used in many processes, including pervaporation, dehydrogenation reactions, water-gas shift reaction and steam reforming. Urged

by this, the Cerhysep project focused on a membrane/membrane module toolbox for H separation from various process streams within the (petro)chemical industry.

H may be derived with the aid of the water-gas shift reaction in combination with catalytic partial oxidation or steam reforming. This innovative technology can be employed in numerous useful applications even under harsh environments. Most importantly, it may be exploited to promote the eco-friendly H-based economy, i.e. H-based fuel cells.

The assessment of the technical and economic potential of employing membranes and membrane reactors in processes requires time-consuming and costly experiments. In order to minimise these experiments, project researchers propose

to use process engineering and flow-sheeting calculations for a rapid and effective assessment. A wide range of tools has been developed, from an MS Excel spreadsheet to flow-sheeting package ASPEN+ with new codes implemented.

The new codes provide descriptions of the membrane and reactor performance as well as combined heat and mass transfer for dehydrogenation and water-gas shift reactions. The sophisticated toolbox has already been successfully tested in the evaluation process of several different processes. The models used are easily extendable to include other types of reactions, such as steam reforming and esterification reactions. For more information on the project, please visit: <http://www.sintef.no/cerhysep/partnerschs.htm>

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

Collaboration sought: further research or development support.

Offer ID: 3560

See also page 17 (offer 3628)

Predicting the durability of high-performance concrete

Within the context of the 'Life cycle management of concrete infrastructures for improved sustainability' (Lifecon) project, new degradation models for high-performance concrete (HPC) were developed and tested to offer reliable service life prediction.

Durability of building materials is a very important issue that depends heavily on exposure to different climatic conditions. Investigation of the damage behaviour of individual materials provides a basis to assess the lifetime of constructions such as roadways, bridges, tunnels and standard buildings.

In particular, the manufacture of HPC involves a combination of ultra-strength concrete with industrial by-products and admixtures, such as silica fume or fly ash.

This extends the limits of the HPC as a structural material, which makes prediction of its lifetime a very difficult task.

Motivated by this, the Lifecon project focused on systematic studies of the durability of different concrete design concepts, exposed to various climatic conditions in Europe. By correlating laboratory data against data coming from in-field tests, researchers were able to analyse deterioration mechanisms for development of degradation models.

More specifically, test results were coupled with data derived from observations of in-service structures in order to assess the behaviour of the different HPC mixtures in the field. The latter were correlated with laboratory studies offering an assessment of

the durability behaviour of HPC mixtures against different exposure classes.

On the basis of the deviations in the behaviour of the various HPC mixtures exposed to different climatic conditions, models were designed and analysed to describe the degradation processes. The deterioration models comprised several damage mechanisms in relation to the HPC mixtures and the exposure classes of the concrete standard EN 206.

Aided by these modelling tools, mixtures with an improved resistance to different climatic conditions can be evaluated. Such estimations can provide the basis for developing recommendations for HPC production with constituents falling within fixed limits and acceptance criteria according to EN 206 exposure classes.

Apart from contributing to lifetime prediction of HPC as far as durability is concerned, guidelines were also generated. These guidelines refer to service life evaluation, classification to EN 206 service class, and recommendations to industry for HPC applications. Potential partners for further use of the results include designers, material suppliers and other research organisations in the construction sector.

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

Collaboration sought: further research or development support.

Offer ID: 3566



Innovation steps in industrial machining processes

Widely used in the automotive, aeronautical and capital goods sectors to obtain the accuracy required, grinding processes are considered among the most polluting machining processes.

Innovative grind-hardening tools developed in the framework of the 'Development of low-energy and eco-efficient grinding technologies' (ENGY) project aim to improve the quality of steel hardened components and address efficiency issues for their entire manufacturing cycle.

In current manufacturing practice, workpieces after short machining need to be transported to the surface hardening bay, cleaned and subjected to heat treatment. They are then discharged, moved back and incorporated into the production line for a final precision surface finish. During grinding, undesirable changes of the mechanical properties generated by heat treatment can result from thermo-mechanical processes.

Experimental studies demonstrated that heat generated in the contact zone between conventional grinding wheels and the workpiece can be used to induce metallurgical transformations necessary to harden the material's surface. The workpiece surface is locally heated above the austenitisation temperature and is subsequently quenched to increase surface hardness.

The final hardening was substantially dependent on the material properties and the grinding wheel specifications, but could be controlled by the grinding parameters. Within the ENGY project, researchers at the University of Bremen, Germany, evaluated a wide range of suitable machining parameters in order to achieve a uniform hardness penetration depth of > 0.5 mm.

In addition to cutting speed, feed and infeed rate, different methods for the application of coolant lubricants were examined in order to determine the optimum machining strategy. Furthermore, test-tapered workpieces were developed by means of which the definition of the optimum machining parameters could be significantly shortened.

Past structural investigations and hardness measurements as well as residual stress and fatigue analyses have proved that grind-hardening can be a cost-effective alternative to conventional surface layer hardening processes. Besides high precision and life-long performance, grind-hardening tools developed by the ENGY project partners can provide for shorter process chains for the manufacture of steel hardened components.

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

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

Offer ID: 3555

Computer-assisted design of hip replacement prostheses

Longer life expectancy, an increasingly active population and scientific advances are fuelling a tremendous demand for new and improved biomedical devices.

As technology evolves, researchers and manufacturers cooperating within the Biograd project faced the enduring task of delivering biomaterials that combine high quality and lifelong performance.

The availability of natural and synthetic biomaterials has permitted the develop-

ment of the bone and joint replacement techniques which are now in current use. Such implanted prostheses provide restored mobility and relief from suffering for thousands of patients; they are, however, still generally based on materials selected from engineering practice. Combining the ability to be tolerated by the human body with mechanical properties sufficient to withstand anticipated physiological stress, they offer an effective immediate solution.

To improve long-term performance while reducing stress on hip joint replacements, the Biograd project demonstrated the use of functionally graded ceramics. With the variation of the composition from a tough zirconia-rich core to a hard, chemically and wear-resistant surface layer of alumina, a unique combination of properties could be offered.

The particular interest in these materials lies primarily in the high hardness and chemical resistance of alumina, which is too brittle for many structural applications. Zirconia, on the other hand, is one of the toughest ceramic materials, but it does not retain its excellent mechanical properties in the presence of water and high temperature.

To compensate for the tendency of ceramics to fail suddenly with local plastic deformation, project partners from Italy sought to identify the optimum conical coupling between stem and femoral head. Finite element methods were used to investigate the effects of changing parameters, such as material properties and contact geometry, on the evolution of surface shear stresses within the ceramic femoral head.

These numerical analyses incorporate the principles of Newtonian mechanics. They are applied to models and animate the realistic behaviour of the femoral head coupled with the prosthetic acetabular component in the patient's pelvis. Residual stresses developed in different parts of the fully graded ceramic structure were implemented into subsequent processes of the grinding and assembly to simulate the entire manufacturing cycle.

The results indicated the importance of fixation between the head and the stem to withstand torque likely to be transmitted through the prosthesis in use. Specific definitions of the functionally graded materials' operating conditions will contribute, in the future, to superior mechanical properties and better wear resistance for prosthesis components.

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

Collaboration sought: further research or development support.

Offer ID: 3590



Cooking up new MEMS: a taste of microscopic machines to come

Microelectromechanical systems (MEMS) are tiny components etched from silicon. Production is extremely complex, sometimes with hundreds of steps, each with dozens of parameters.

The EU-funded Promenade project has developed software that can test, simulate, track and share new manufacturing processes. It could slash development times and pave the way for innovative MEMS designs.

If you could shrink yourself smaller than a dust mite and explore the innards of a modern car, you would discover some amazing microscopic machines. Carefully etched out of silicon wafers are microscale accelerometers to trigger airbags, gyroscopes to detect and correct dangerous yaw, and pressure sensors to monitor tyre inflation.

The automotive industry is one of the biggest consumers of MEMS. These tiny components link the worlds of electronics and mechanics. Using the same manufacturing principles employed to produce microchips, it is possible to etch silicon into electrical devices with moving parts.

MEMS manufacturing is extremely complex, sometimes involving hundreds of different steps. Each step may be controlled by a dozen or more parameters, including temperatures, pressures and chemical compositions.

‘Trying to come up with a manufacturing recipe for a new MEMS component is so complicated it would be impossible without ICT support. You just couldn’t keep up with all the variables and their impact on the final outcome,’ explains Dirk Ortloff, co-originator of the Promenade project.

A difference of 5 °C may have little effect on the production of silicon chips, because they only depend on the electrical properties of

the material. MEMS, however, also have mechanical properties. A small variation in any manufacturing parameter at any step could alter the performance of the final product.

Promenade brought together some of the foremost experts in process development for MEMS devices. The project consisted of seven partners, including industry, research institutes, universities and software vendors from Belgium, Germany, the Netherlands, Austria and the United Kingdom. The aim of the project was to build software that could support the design of MEMS manufacturing sequences.

Working closely with Bosch and the Interuniversity Microelectronics Center (IMEC) in Belgium as potential end-users, the research partners focused on three modules. The design module lets manufacturers input and edit the sequence of manufacturing steps using a graphical interface. The module can really cut down development time by performing consistency checks on the assembled process flow. These checks help to avoid common errors like wrong or forgotten pre- or post-processing.

Each step and its related parameters and other data are stored in a database in a standardised format. Dr Ortloff says this is an important breakthrough for the MEMS industry. ‘Currently it is not possible to transfer complex MEMS recipes together with their support data electronically. By making this information available in a standard format, it will be much quicker for manufacturers to transfer the information and to set up fabrication in different units.’

The second module allows designers to simulate the manufacturing sequence. This module is based on a commercially available simulation package by Silvaco, one of the project partners. Development work within the project has adapted Silvaco’s software to account for the physical structure of MEMS. Reliable

simulations are essential for MEMS designs so that as many problems as possible can be ironed out prior to expensive experimental and prototype production.

The final module developed by the Promenade consortium is a tracking component that documents the entire manufacturing process — every parameter of every step, along with images and scans of the device.

‘Capturing experimental data is routine in the industry,’ Dr Ortloff says, ‘but there is no system that captures all of it, then organises the data in a way that finds the relations between the data. We help to turn all the data into knowledge and, again, speed up the development process because you don’t need to gather all the knowledge again every time you design a new MEMS.’

The project’s results have been welcomed by MEMS manufacturers and several commercial products will be made available. Silvaco will offer a tool for full 3D process flow simulation analysis, incorporating models for MEMS processing.

What’s more, Promenade team members at Cavendish Kinetics in the Netherlands and the University of Siegen in Germany have started a new spin-off company, called Process Relations GmbH. The start-up has already completed its first round of funding and is approaching a second round as it prepares the worldwide launch of Promenade’s commercial successor, named XperiDesk.

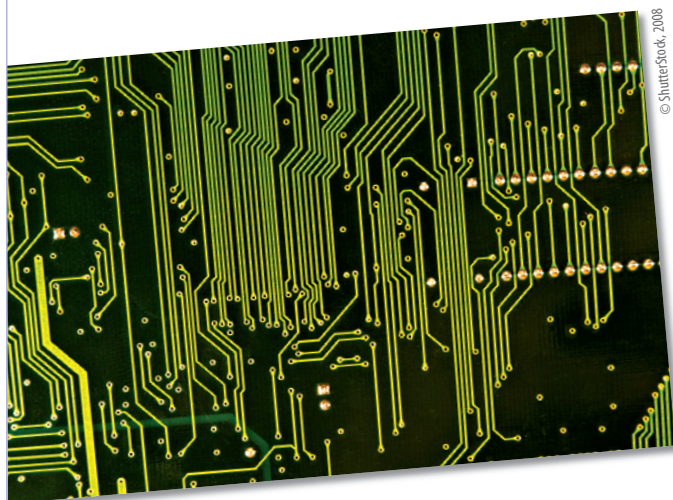
XperiDesk will provide the first-ever process development and execution system (PDES) in the area of microelectronics and MEMS, and later also for other high-tech industries like solar and biomedical equipment manufacturers. Dr Ortloff estimates the market for PDESs at EUR 100 million per year.

‘XperiDesk will really speed up process development and the transfer of the processes, perhaps by two or more weeks for any one transfer,’ Dr Ortloff says. ‘It will also allow novel devices and ideas to be tested and taken into development, whereas previously they would have been cancelled because no one could work out how to make them. For high-tech companies with their fast product life cycles, this can be a real competitive advantage.’

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Eco-friendly adhesive materials

Under the auspices of the 'Interconnection materials for environmentally compatible assembly technologies' (Imecat) project, new, advanced, environmentally friendly materials have been developed for flip-chip assembly technologies.

The Imecat project has developed interconnection materials, such as lead-free solders and adhesives for assembly technologies of electronic systems. The new, environmentally compatible technology concerns isotropic conductive adhesives (ICAs) and non-conductive adhesives (NCAs). These materials can be exploited in numerous fields including the automotive industry, liquid crystal display (LCD), telecom systems, smart card or smart label and portable telecommunication applications.

With the emphasis on advanced flip-chip technologies, innovative, very fast curing

NCA materials were generated. Having tested several epoxy materials such as resins and curing agents, a bisphenolic and a cycloaliphatic resin as well as a cationic curing agent were found to be most promising. These were further explored to assess their capabilities regarding their interaction with system components as well as their suitability for application.

The adhesive developed for the NCA system, namely the NCA4-020, displayed a very fast curing time at about 180 to 200 °C. The system allows a fast connection

of flip chips on different substrates, including chip-on-flexible (COF) chromium-on-glass (COG) substrates. Compared to anisotropic conductive adhesive technology, it is less expensive while it may be employed in similar applications. Work is under way to further decrease its cost in high-volume production applications of smart labels. Producers of smart cards, smart labels and LCDs are sought for further collaborations.

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

Collaboration sought: further research or development support, joint venture agreement, licence agreement, information exchange/training.

Offer ID: 3565

Critical challenges for MEMS

Promising predictions that the future of microelectromechanical systems (MEMS) is 'just around the corner' have proven to slowly come true. Within the 'Process for hydrophobisation of surfaces' (Hydrosurf) project, self-assembled monolayer (SAM) coatings have been developed for surfaces of contacting MEMS's micro-components to help them interact and function smoothly.

MEMS, although built using semiconductor technologies, are not integrated circuits and demonstrate a different set of failure mechanisms and reliability concerns. Reliability concerns for these very small devices combining mechanical components, micro-sensors, micro-actuators and electronics on a common silicon-based substrate focus on mechanical rather than on electrical failure modes.

The Hydrosurf project, which was partly financed by the EU, aimed to reduce or eliminate adhesion-related phenomena during fabrication of MEMS devices, responsible for their limited lifetime. Due to their high surface area-to-volume ratio and surface

smoothness of the micro-machined structures of most micro-mechanical devices, strong static friction and adhesion forces can be developed.

The magnitude of these interfacial forces is sufficient to deform and attract these structures to the substrate, causing the device's failure. Chemists, microsystems engineers and manufacturers collaborated with original equipment manufacturer customers to successfully hydrophobise the microstructures' surface by coating them with a SAM and abate deleterious effects of adhesion.

Since liquid-phase monolayer deposition is accompanied by the production of large

amounts of environmentally hazardous waste (including heptane), research efforts focused on the implementation of a vapour phase coating process. For the surface characterisation of the SAM, dedicated contact angle measurement tools were developed by engineers at the Technical University of Denmark.

Wafer-shaped substrates of different materials, such as silicon, sapphire, quartz and pyrex, were coated with dedicated test SAM layers to evaluate the accuracy of measuring contact angles, which reached 0.1 °. In combination with suitable surface treatment, contact angle measurements can lead to the optimum coating process recipes for the industrial application of SAMs, specifically designed for MEMS micro-components.

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

Collaboration sought: further research or development support.

Offer ID: 3598



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