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Special feature

The internet, the future: Where to from here?

Other highlights

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The internet of just about everything?

The future without the internet seems hard to imagine. This hints at the undeniable importance of the so-called 'future internet' as a function of what we do and how we live in modern society.

The major driving forces of the 'future internet' are better broadband and the move to-wards an 'internet of things' — where machines understand each other better — and the 'internet of services' which underpin changing digital life-styles and the mobile internet revolution.

Technology commentators also talk about '3D internet' which basically means greater interaction and connectivity geared towards addressing real-world challenges and opportunities.

Perhaps we will also need to revisit our thinking of what is 'tradable' in the virtual world, from online auction platforms to exchanges for carbon credits. Related to this is the 'platforms of things' as the basis of interconnected objects, from volcano sensors and actuators to new voice-activated interfaces and displays.

If you hadn't already guessed it, this month's 'special' dossier looks at ***'The internet, the future: Where to from here?'***

Elsewhere in issue 24, our biology and medicine section leads with research by the 'Mito target' project providing online resources to help sufferers of rare degenerative diseases.

The top story in our energy and transport section builds on the future internet theme with the latest European research giving a boost to vehicle networking and communications.

Our environment theme is headlined by peer-reviewed research analysing biodiversity in so-called oxygen minimum zones (OMZs) of the Arabian Sea, eastern Pacific and Bay of Bengal. The study was supported by the 'Hotspot ecosystem research and man's impact on European seas' (Hermione) project.

New research by the Triumph project on 'see-through networks' — all-optical data transport systems — adds another dimension to our 'future internet' dossier and kicks off our IT and telecommunications section.

Our industrial technologies section leads with innovative light-based sensor technology helping European scientists build more autonomous robots that can accurately detect or localise both moving and static objects.

The events section offers a selection of upcoming conferences and gatherings in the field of research.

We look forward to receiving your feedback on this issue and on the research*eu *publications in general. Send questions or suggestions to: research-eu-supplements@publications.europa.eu*

The editorial team

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New online resource to help sufferers of rare degenerative disease

A new multilingual website will provide extensive information for people suffering from a devastating type of motor neurone disease called amyotrophic lateral sclerosis (ALS), which kills most sufferers within three to five years of diagnosis.

The new online resource is part of the EU-funded project 'Mitochondrial dysfunction in neurodegenerative diseases: towards new therapeutics' (Mitotarget), which is investigating the underlying causes of ALS. The team hopes that the website will be the first port of call for anyone wishing to learn or share information about ALS, including doctors, nurses, patients and members of the public. Mitotarget received EUR 6 million under the health theme of the EU's Seventh Framework Programme (FP7).

ALS, also known as Lou Gehrig's, disease after the American baseball star who was diagnosed with it in 1939, is a fatal neurodegenerative disease that causes progressive atrophy of the motor neurones (nerve cells) in the central nervous system that control muscle movement and coordination. ALS is not a very well-known condition, although more people die from it each year than from multiple sclerosis. There is currently just one approved drug to treat ALS, and it can only extend a patient's life by about three months.

Mitotarget is a 3-year project and consists of 17 partners from 5 EU countries, namely Belgium, Germany, France, the Netherlands and the UK, and its aim is to study in depth the links between mitochondrial dysfunction and the development of ALS.

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Mitochondria are organelles that provide energy to cells. Mitochondrial dysfunction plays an important role in the development of neurodegenerative diseases, but the exact process involved is not yet fully clarified.

The creation of the new web resource was coordinated by pharmaceutical company Trophos, leader of the Mitotarget consortium. 'The Mitotarget consortium wish[es] to develop treatments as quickly as possible for ALS, a rare but terrible and fatal disease,' explains Trophos chief executive officer, Damian Marron.

'We want to make it as easy as possible for sufferers of the disease and for other people, including specialists, physicians, nurses, patients and members of the public, to find out and share information. We hope this will speed up the process of finding cures as well as help all those whose lives have been touched by this devastating disease.'

British scientist Stephen Hawking, who is an ALS sufferer and patron of the Motor Neurone Disease Association (MNDA), welcomed the new website: 'It is essential that as much support as possible is given to those who are diagnosed with ALS. Their needs are to live as long as possible in as fulfilling a way as possible,' he noted. 'It is encouraging that the Mitotarget consortium is providing practical online support for all those affected as well as developing treatments for ALS with EU backing.'

The average for diagnosis of ALS is about 55 years, although Stephen Hawking was only 23 when he was diagnosed with an extremely rare variant of the disease in 1965. Initial symptoms include slurred speech and muscle weakness as the body's ability to do everyday things such as walk, carry objects, eat and drink is gradually impaired.

ALS rarely affects patients' mental abilities, and so sufferers have to deal with the frustrations of a body that cannot do what they want it to do, while their mind is still active. Eventually even breathing becomes impossible without a ventilator. Most sufferers of ALS die within 3 to 5 years of diagnosis, usually from respiratory failure, although about 10 % survive some 10 years after diagnosis.

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 15713

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

Gene jumping success for DNA transfer

Genome mapping is accelerating beyond the point where it can be used to understand gene function. Researchers involved in the EU project JUMPY(1) have studied the frog model vertebrate Xenopus tropicalis to bridge this growing gap.

In the study of functional genomics, there are many techniques based on the measurement of molecular activity at both gene and protein level. One very powerful method used by scientists in the Jumpy consortium involves mobile genetic elements, transposons.

The beauty of transposons is that they can move around to different positions in the genetic material of a cell. This way, they can cause mutations and changes in gene function which can then be linked together to give an idea of what protein a specific gene produces.

One JUMPY project team used the sleeping beauty (SB) transposon system where a non-viral carrier takes in the foreign genes to slot into the chromosomes. In this case, the carrier used was a circular piece of DNA known as a plasmid. The scientists chose to use a vertebrate model, the western clawed frog, *Xenopus tropicalis*, to maximise its value in biomedical research.

A number of different transposons were tested which were injected into the embryos. Ingeniously, a fluorescent marker was included with the transposon to indicate whether the genes in the insert were being expressed.

Using a gene that is not translated into a protein on one side of the fluorescent marker and a chicken promoter gene for muscle protein, half transgenic animals were produced. These were fully fluorescent on only one side of the body.

A major problem in gene therapy is the determination of the rate at which the gene transfer has occurred. The study of the SB transposon system also shed light on exactly how the genetic elements or cartridges are cut or excised from the plasmid for incorporation into the frog DNA.

Data from this study infers that the SB transposon system has significant potential for gene delivery in *Xenopus*. The means of achieving this is simple as it only involves injection of genetic material into fertilised eggs.

Transferring different combinations of genes in transposon cartridges can therefore help to unravel gene function in vertebrates. Using this research as a basis stands to have a great impact on gene therapy for human diseases like cancer.

(1) 'Transposon-based strategies for functional genomic analyses in *xenopus tropicalis*, a vertebrate model system for developmental and biomedical research.'

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
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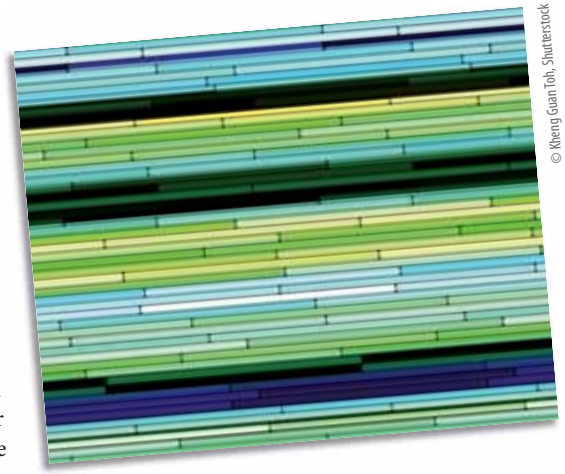

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Awakening the 'sleeping beauty' transposon system

Gene therapy, inserting genes into the cells and tissues of a patient to treat disease, is a technology in its infancy. The EU-funded project JUMPY(1) has explored a rapid non-viral means of inserting the genes into their alien environment.

Sequences of DNA, transposons, as their name suggests can jump around the chromosomes of a nucleus causing mutations. Their importance in genomics and proteomics is undeniable as a sequence alteration can mean a visible change in function.

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The sleeping beauty (SB) transposon system specifically uses a non-viral vector to transfer the genetic material from donor to new owner. Considered to be a safe option due to the lack of virus, the gene is cut out of a plasmid, a circular piece of DNA, by a special enzyme, a transposase. The gene can then be pasted in or incorporates itself into the cell.

At the Max Delbrück Centre for Molecular Medicine, a hyperactive version of the SB transposase was discovered. After searching through many mutants of the transposase gene, most were found to be less efficient than the original. One however, the D260K mutation, speeded up the cut and splice mechanism. Its efficiency was increased to around eight-fold the wild type due to synergistic liaisons with other mutations.

Scope for the new hyperactive SB system does not end there however. Tinkering with the concentrations of the transposase and the amount of transposon plasmid promises to increase the rate of mutation occurring because of the jumping gene uptake.

Gene therapy is a rapidly expanding technology but safety of viral vectors is a major concern. Use of plasmid vectors for gene transfer can be seen as a bit hit and miss but this research has improved the success rate significantly.

(1) 'Transposon-based strategies for functional genomic analyses in *xenopus tropicalis*, a vertebrate model system for developmental and biomedical research.'

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
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Effects of ageing on immune status

Healthy elderly Europeans were part of a study which uncovered important findings on factors affecting the immunological status of this age group.


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The overall aim of the EU-funded 'European cell cycle consortium' (Zenith) was set up to examine the health status of elderly Europeans. One of the main focal points of the project involved the physiological trends so often associated with ageing. Project partners at the University of Ulster examined the susceptibility to disease among healthy individuals in the 55-70 age range.

To evaluate immune status, blood samples were taken and the white cell blood count measured. The levels of both leucocytes and lymphocytes — both key figures in the immune system — were measured.

The samples of blood were taken using venipuncture — puncturing of a vein. The scientists therefore made sure that the 93 volunteers included were suitable for the procedure. Specific inclusion criteria were considered based on health and lifestyle and a psychosocial questionnaire was used.

Significant age effects were found on various groups of white blood cells and their ability to function. The data also suggested that the immune function alterations are largely sex specific.

In the wake of an ageing European population, studies of this kind can form the basis of a comprehensive health strategy for governments and medical care agencies.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: Further research or development support
http://cordis.europa.eu/marketplace > search > offers > 5400

Zinc and taste sensitivity in the elderly

Key findings from the 'European cell cycle consortium' (Zenith) have led to an understanding of the important role zinc plays in the diet of the elderly. The effects of this micronutrient even extend to taste sensitivity.

Zinc is an essential micronutrient which aids the immune system as well as eye, skin and bone health. It is readily found in red meat and unrefined cereals. As people age they are likely to be at a higher risk of zinc deficiency. The causes for this are many, including changes in metabolism, poor appetite, interactions with medication and even difficulty in chewing.


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Zinc deficiency can even cause subtle changes in sensory perception. One of these, researchers believe, is that there may be a loss of sharpness of taste — acuity. The Zenith project therefore examined the decrease in taste acuity in older Europeans for the four basic tastes detectable by the tongue — salt, bitter, sweet and sour.

For the analysis of the data, a signal detection theory (SDT) approach was applied in that it was assumed that all decisions recorded have an element of uncertainty. A three-alternative forced-choice procedure was used.

The correlation of serum zinc, erythrocyte (red blood cell) zinc and taste acuity were explored in healthy volunteers in the 55-90 age range from France, Italy and the United Kingdom.

An analysis of variance was then performed to determine whether there was any regional differences.

One of the key findings was that sensitivity for salt taste may be linked to zinc depletion. Individuals with higher red blood cell zinc levels showed increased sensitivity to salt.

The vast amount of data collected in this study will be useful in determining what constitutes adequate intake of dietary zinc for elderly populations in Europe.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5388

Electronic stimulation device for incontinence

Scientists working with an EU-funded project have developed and improved neurostimulation signals to be used during therapy for patients with neurogenic bladder incontinence.

Bladder dysfunction, either urinary incontinence or urinary retention, is a serious problem and at present affects more than 5 % of the European population. Not only is quality of life severely impaired for the patient but the cost to the health system is significant.

Neuromodulation techniques were developed to stimulate and modulate nerve fibres within the groups of nerves involved, for example, the sacral nerve bundle. Scientists with the EU-funded project 'Restoration of bladder function by neuroprosthetics (REBEC) aimed to develop an implantable neuromodulation device in conjunction with advanced related techniques and surgical procedures.

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In order to test the novel neurostimulators, reliable animal models were developed to represent the same unstable bladder conditions as found in human patients. Researchers at the University Hospital Schleswig-Holstein in Germany were able to induce the same inflammatory and pathophysiological conditions of an overactive bladder allowing investigations under normal life conditions. The same team of scientists went on to test the newly developed signalling devices.

Other applications may include using the signals in deep brain stimulation required in some treatments, Parkinson's disease being a prime example. However, further research is needed as a specialised implantable system is required for the novel electronics and electrodes.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5372

Top up for tomato anti-oxidants

European scientists have researched into side-stepping the biochemistry of the tomato plant to enhance its natural levels of anti-oxidant flavonoids.

Eating flavonoids in fruit and vegetables is a pleasant, healthy way to decrease the risk of cardiovascular disease, cancer and other age-related diseases. However, levels of these anti-oxidants are kept under close control within the plant. The project 'Improved antioxidant content for food applications' (Profood) studied what can be done to modify cell biochemistry to increase its nutrient value.

The researchers' first line of attack was to increase the levels of precursor molecules, components of pathways leading to the final product. The scientists chose two molecules, phosphoenolpyruvate (PEP) and erythrose-4-phosphate (E4P), both important for flavonoid production.

The new transgenic tomato plants showed over-expression of PEP in leaf plastids. As for E4P, the scientists harnessed the help of coding regions from other life forms ranging from *Escherichia coli* (*E.coli*), a moss species and spinach. Two important enzymes in the E4P molecular cascade showed accelerated activity, one in *E.coli* and the other in transgenic tomato plants.

Alternatively, to cheat the normal physiological controls of the plant, other transgenic tomato plants were engineered. These also produced enzymes involved in flavonoid synthesis, only this time in places in the plant not usually involved — so-called ectopic expression.

The tomato is an ingredient in a huge variety of gourmet dishes and convenience foods. Further research could mean that pizza toppings will be giving an unexpected boost to dietary flavonoid content.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
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Feeding vegetable oils to farmed fish

European aquaculture provides consumers with a healthy yet economical option for meals and therefore plays an important role in the economy of the EU. One obstacle to expansion, however, is the sector's dependence on fish oils (FOs), which are used as a source of essential fatty acids in feed.

The goal of the project 'Researching alternatives to fish oil for aquaculture' (RAFOA) was to help fish farmers by developing a vegetable alternative to fish oils in feed. This was achieved through a better understanding of fatty acid nutrition and metabolism in farmed fish. Researchers from the Canary Institute of Marine Science carried out a study on the effects of a vegetable oil diet on the gilthead sea bream (*Sparus aurata*). The scientists examined a range of vegetable oils, including linseed and rapeseed oil. Sea bream were given a diet comprising different mixtures of fish oils and vegetable oils from the time they first began feeding until they reached market size. The fish were then fed a fish oil finishing diet to remove polyunsaturated fatty acids resulting from a vegetable oil diet and restore required levels of omega-3 essential fatty acids.

The sea bream's health and metabolism were monitored by measuring changes in growth rate and lipid content of the fish. Results showed that replacing fish oils with high levels of linseed oil led to a decrease in growth rates. But this was not the case in fish larger than a quarter of a kilogram, which appeared to need less fatty acid in their feed than smaller fish. Lipid content of fish flesh was not found to be affected by diet. However, lipid content in the liver was greater in sea bream fed high levels of linseed oil and a blend of vegetable oils.

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Findings showed that most of the fish oils used in the production of sea bream can be replaced with a blend of vegetable oils. Changes in fatty acid composition can be reversed using a finishing diet of fish oil. Therefore, fish oil was being used unnecessarily to feed sea bream at the early stages of their life cycle, which could be replaced with vegetable oils.

The work by the RAFOA project has contributed to the ongoing success of the European aquaculture sector by promoting the use of sustainable fish feed. New feeds with the right balance of vegetable oils can be produced that safeguard the wellbeing, growth performance and flavour of the fish.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support; information exchange/training; available for consultancy.
http://cordis.europa.eu/marketplace > search > offers > 5399

Regulating cell division in plants

Understanding cell division can help unlock the secrets behind plant growth. European researchers have investigated the regulation of proteins involved in the cell division's control mechanism, the cell cycle.

Any major advance in plant science provides significant benefits for the human population. Currently, one of the most exciting areas of research is in cell division and growth. This field promises to have many important applications, including the boosting of crop yields.

Cell division is controlled through a complicated series of steps known as the cell cycle, which involves over 100 proteins. The 'European cell cycle consortium' (ECCO) was set up to isolate and study the genes responsible for this process. The project's goal was to improve understanding of how these control genes influence the development, growth and workings of a plant.

Molecular biologists from Cambridge University's Institute of Biotechnology used the small weed *Arabidopsis thaliana* as a genetic model to study plant cell cycle regulators at the protein level. They examined the protein CYCD3:1, which belongs to a family of proteins known as cyclins that help manage the cell cycle.

Analysis of CYCD3:1 showed that it was highly unstable and that its breakdown was controlled by large protein complexes known as proteasomes. The proteasome removes proteins that have fulfilled their role and are ready for recycling.

The Cambridge University research shows that the plant cell cycle is an extremely sophisticated process showing a high degree of regulation of some of its proteins. This knowledge can enable scientists to develop research tools that can be directly applied to improving agriculture.

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Funded under the FP5 programme Growth (Competitive and sustainable growth).
Collaboration sought: information exchange/training.
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Microbes excel at vitamin B production in yoghurt

The scope for the production of naturally nutritionally enriched foods using microbial nutraceuticals is enormous. A European-funded project has concentrated on increasing B group vitamins in fermented foods.

Naturally fermented foods such as sausages, pickles and yogurt are the perfect place to produce nutrients from their resident microbes. Scientists in the 'Nutra cells'(1) project used genomics techniques on *Lactococcus lactis* and other lactic acid bacteria to increase the riboflavin (vitamin B2) and folic acid content in dairy foods.

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For an increase in riboflavin, the scientists used a variety of methods. They generated a new *Lactococcus lactis* strain with an extremely high production level of vitamin B2. The researchers also investigated and outlined the mechanism whereby the bacterium can keep the riboflavin in its cell, unwittingly acting against the consumer.

A new method of producing mutant strains — by exposing lactic acid bacteria to roseoflavin — was devised. Roseoflavin can regulate gene expression by binding to a small target molecule, on this occasion producing new strains that produce lots of riboflavin.

Some of the strains were genetically engineered. One *L. lactis* strain was constructed to produce folic acid and riboflavin. Yoghurt is normally a poor source of folic acid. Some of the new strains have been further developed by another partner to produce commercially exploitable strains.

Out of the test tube and into the dairy herd, some lactic acid bacteria were incorporated into animals. This way, the fortified milk can be produced in vivo without the need for a boost during processing.

Engineering microbes in milk and milk products has great potential. Dairy products can be turned into the truly complete food reducing the need for dietary supplements.

(1) 'Increase in nutritional value of food raw materials by addition, activity, or *in situ* production of microbial nutraceuticals.'

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
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On the hunt for food poisoning bacteria

An EU-funded project, 'Bacillus cereus'(1), has harnessed genomics to identify the food spoilage bacterium with the same name. Rapid and yet accurate, the new process has closed loopholes in previous methods.

Food storage in fridges and freezers has opened up the possibilities for more interesting food, both at home and in the restaurant. Unfortunately, this is accompanied by more opportunities for bacteria and fungi to cause food spoilage and poisoning.

Tracking down the source of a food poisoning outbreak is often a daunting task. In the laboratory, it involves isolation of the offending microbe from food and then matching it with the samples from the patient.

Behind the attempts to keep the public safe from food spoilage are the researchers that provide government departments with information about diseases. Researchers with the European project 'Bacillus cereus', a bacterium notorious for causing food poisoning, investigated the genetics of toxin production that causes diarrhoea and vomiting.

Altogether, seven of the bacterium's genes were found to be responsible for the release of enterotoxins, poisons released within the gut that cause diarrhoea. The scientists devised a test for the genes based on multiplication of the relevant gene sequences. Primers, DNA regions that start the process of DNA replication and a related polymerase chain reaction method, were developed to detect the genes.

Similar tests developed previously had given false negative results, a significant problem when aiming to identify potentially dangerous bacteria. The new tests are able to detect these mistakes in identity. As the primers are more universal, they can detect more than one gene in a sequence where genes operate together.

Rapid, accurate identification of food poisoning strains translates into less likelihood of a serious food poisoning outbreak. This can only be good news for the restaurant and food industry as well as the digestive health of Europe.

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(1) 'Preventing *bacillus cereus* food-borne poisoning in Europe — detecting hazardous strains, tracing contamination routes and proposing criteria for foods.'

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources).
Collaboration sought: further research or development support.
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The internet of cars


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An internet of cars promises a road system designed around cooperative technology enabling each element of the traffic system – cars, drivers, traffic lights, signs – to cooperate proactively to create a safer, more efficient driving experience. No road rage required.

Your cooperative dashboard flashes a warning: 'Emergency vehicle crossing at the next intersection!' You start slowing down. On cue, the lights on your route turn red, simultaneously turning green for a fire engine crossing at the intersection. That fire engine will surf a 'wave' of green lights all the way to the blaze further downtown.

As the lights turn green, your display suggests a diversion that will skirt the scene of the accident, avoiding any risk of congestion. You take the suggested turn and your car advises you of a new speed limit.

You slow down and gain some extra 'green miles', bonus points awarded to careful drivers, redeemable against a range of privileges, such as driving in the city centre without charge, or using bus lanes outside rush hour.

The day started more or less as any other. Your mobile phone woke you a little earlier than usual because heavy rain meant traffic was less fluid than usual: the Saferoute service you subscribe to estimated a 10-minute delay in your normal commute and so sent your mobile an earlier alarm.

As you make the final turn on the way to work, your cooperative co-pilot reads a message from the car behind you. It's your colleague, asking if you have time for coffee. Thanks to all the 'Cooperative vehicle-infrastructure systems' (CVIS), you are early for work so you catch a quick coffee with your friend.

This is a future without road rage, a future of cooperative drivers using cooperative vehicle infrastructure systems. It is the vision of the CVIS project, which is itself part of a broader trend internationally with a focus on Intelligent Transport Systems (ITS).

The USA, Japan and Europe are all thinking of cooperative systems like this, according to Paul Kompfner, head of sector, cooperative mobility at ERTICO-ITS Europe and coordinator of the CVIS project. ERTICO is the network of intelligent transport systems (ITS) and services stakeholders in Europe

'On every continent, part of the spectrum has been reserved for cooperative systems, 5.9 GHz in the States and Europe, and 5.8 GHz in Japan, so this subset of ITS is certainly coming. Right now, I'd say Europe has something of a lead in technology development and validation across a wide range of test sites,' suggests Mr Kompfner.

Europe also leads on vision, with the development by the CVIS team of an open, state-of-the-art ITS platform which can function on a variety of levels, from in-vehicle and roadside systems to portable devices. It can also evolve over time to take advantage of new technologies and business models.

The CVIS project is huge, literally and figuratively. The budget is over EUR 40 million with EUR 20 million coming from the EU, and there are 62 partners, developing several core technologies to create a totally integrated, open-source 'internet of cars'.

There have been many piecemeal attempts to create a compelling mobile platform for infrastructure-to-car communications, and other efforts for car-to-car, and still other initiatives for mobile ITS and mapping, but except for GPS none have really broken through.

The cooperative vehicle infrastructure system tackles all these issues and many others, and incorporates highly ambitious technical goals, compelling applications and extensive demonstration, validation and exploitation plans — the latter being a particular weakness in many earlier efforts of this kind.

First off, CVIS has developed a complete communications infrastructure, running from hardware, through protocols, standards, middleware, application programming interfaces (APIs) and cross-platform integration.

In communications hardware alone, the CVIS team has developed a platform that can essentially use any known communication infrastructure, including WiFi, WiMAX, broadcast radio, satellite communication, dedicated short-range communications (DSRC), radio frequency identification (RFID), microwave, 3G and even infra-red.

Bolted on to a scalable hardware chain is a massively scalable, open (and partly open-source) software chain. It handles all the different elements of the CVIS framework: traffic management, vehicle-to-vehicle (V2V) communications, floating vehicle data collection, appropriate integration of city traffic networks with public communication networks, and so on.

But it also creates a series of APIs and an open application development suite that will allow third-party software developers and service providers to create applications which run across the CVIS platform — a kind of 'ITS app store'.

Finally, the project tested the combined technologies in many large-scale trials in seven countries and the team has developed a progressive and detailed exploitation plan that should see these technologies adopted and deployed in the short- to medium term.

The project coordinator is ERTICO, a European public-private partnership representing all the stakeholders, including car and traffic system manufacturers, governments, road operators, telecom operators, users and service providers. Every aspect of road use will be impacted by the new internet of cars, and it is set to become the model for how other Intelligent Transport Systems will be developed in the future.

The CVIS project demonstrated to the public its main applications at the 'Cooperative mobility showcase 2010', Amsterdam, 23-26 March 2010.

The CVIS project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&id=91314

Better transport in cities hosting major sporting events

Partners in the EU-funded Stadium project will look for ways to improve transport services for large events in big cities, including the South Africa World Cup, the India Commonwealth Games and the London Olympics.

The European project 'Smart transport applications designed for large events with impacts on urban mobility' (Stadium) is one of the first three 'Specific international cooperation actions' (SICA) to be launched under the transport theme of the European Commission's Seventh Research Framework Programme.

SICA projects provide a unique mechanism for specific bilateral or bi-regional cooperation, according to the Commission. They address specific needs of mutual interest to targeted regions or countries, and they require compulsory participation of research entities from different selected 'International cooperation partner countries' (ICPC) or regions.

'The global challenges we face cannot be addressed if we simply confine our action to Europe,' says Patrick Mercier-Handisyde, the EU project officer in charge of Stadium. 'This is why we are opening our research funding to emerging economies. Supporting interesting and innovative research projects in the field of transport is a great way to start. And, at the same time, promoting development in countries outside Europe will have positive knock-on effects that will benefit the world economy.'

The Stadium project kicked off in 2009 and is being coordinated by Italy's Institute of Studies for the Integration of Systems (ISIS).

The overall aim is to improve the performance of transport systems for a wide range of users during big events in big cities.

'The idea of "performance" covers several dimensions,' says Mr Mercier-Handisyde. 'It includes efficiency, in terms of frequency, punctuality and reliability. It also refers to comfort, affordability, ease of use, safety and security, and impact on the broader community in terms of congestion, air quality, and accident risk to both users and non-users.'

Project partners will demonstrate the performance of intelligent transport system (ITS) applications at three world-class sporting events, based on procedures worked out under the EU 'ITS frame architecture' initiative.

- South Africa World Cup — First, at the 2010 World Cup in South Africa, a new ITS telematics tool and an innovative technological control centre will be used in support of a 'demand-responsive' transport service, providing key information that will help to improve the efficiency of public transport. The proposed system will manage a fleet of minivan taxis in Cape Town, integrating taxis with other local public transport services, including buses. The application will compatible with multi modal ticketing, terminal management and other systems.
- India Commonwealth Games — A second demonstration will take place during the 2010 Commonwealth Games in Delhi. Here, public transport services, in particular bus transport and feeder services consisting of auto rickshaws, will be monitored in real time via interfaces with GPS positioning systems. The aim will be more efficient planning of overall transport services.
- London Olympics — The final demonstration will take place during the London Olympic Games in 2012. A system based on visual scene analysis will be used to monitor localised passenger and vehicle congestion and the propagation of congestion across and within multimodal transport networks. The demonstration will include elements deployed at a number of locations across the London transport system.

The FP7 Stadium project gathers a multidisciplinary team that includes transport companies, transport policy experts and information and communication technology (ICT) experts. Its geographical scope is wide, encompassing players in Europe, Africa and Asia. Partners include academic institutions, research and consultancy firms, ITS manufacturers, small and medium-sized enterprises (SMEs) and companies from Europe, India and South Africa.

Stadium will produce a handbook for cities hosting large events, including guidelines and solutions for selecting, designing and implementing ITS applications. In addition, project partner POLIS, the European network of cities and regions, has established a user group of cities that are interested in cooperation with Stadium, with a view towards the preparation of future events. These include: Glasgow (Commonwealth Games 2014); Warsaw, Krakow, Poznan, Kiev and Kharkov (Euro 2012); Milan (World Expo 2015); and Madrid. Contacts have also been established with Brazilian cities involved in the 2014 football World Cup.

'For the Commission, international cooperation in specific sectors and technologies, such as in the field of ITS, can boost competitiveness on world markets,' says Mr Mercier-Handisyde. 'And the development of improved international standards will mean easier and better travel for individuals, and better access to world markets for European industry.'

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Cycling as a form of sustainable urban mobility

The bike is a cultural icon in cities like Amsterdam and Copenhagen. But for city planners, cycling also represents an important contribution towards the EU policy on clean urban transport. The benefits are obvious — healthy exercise, reduced congestion, no carbon emission, and no noise pollution.

Every day, millions of Europeans commute to work by bike. The car, however, remains the dominate vehicle of transport — even at short distances. Over 70 % of passenger kilometres in 2007 were made by car journeys, according to a study conducted by the European Environment Agency in 2009.

So getting more people to cycle requires careful city planning that integrates land-use and transport objectives into an overall comprehensive strategy. It also requires a change in mind-set.

But each city has to respond to a unique set of challenges. So how does an urban city planner create and implement a cycling strategy that addresses a number of inter-related policies? And how do you get people to leave their cars in the garage?

Pascal JW van den Noort, executive director of Velo Mondial, may have found a response. He launched the EU-funded research programme Velo.info which provides urban planners with an online tool to plan and implement cycling policy. The site has been live for almost ten years and has amassed an enormous repository of data on cycling policy and implementation.

'We started in 2000 and got city officials interested in our project. Our goal was to turn this project into something tangible and accessible with real ambition and real objectives. We want to make cycling glamorous,' says Mr van den Noort.

Available in Spanish, German, English, French and Dutch, Velo.info has the unique advantage of combining local knowledge with international expertise. Planners are therefore more easily predisposed to tailor strategies for their cities. A searchable database provides them with the latest in cycling expertise and updates on plans already initiated elsewhere.

But Velo.info is much more than just a knowledge base. The site also has a set of interactive tools.

The 'Cycling planning' tool, for instance, enables planners to develop a strategy that takes into account the entire life cycle of the policy. The tool identifies 19 components and benchmarks necessary to obtain a successful cycling policy.

These components are grouped into four phases; preparing the policy, planning the policy, implementation of the policy, and monitoring and evaluation of the policy. Each component provides a detailed definition and performance criteria using a five point scale. Policy-makers rate their own performance by comparing their results with other strategies.

To ensure quality, Velo.info has developed a rating system that ranges from none to platinum. Those with the highest ratings are then invited to discuss results and best practices at seminars and meetings.

This means local authorities can compare their own policies, using Velo.info's 'Spicycles benchmark' tool, with other cities and identify areas on which performance improvement is needed. Spicycles is an interactive map, much like Google Earth, and provides constantly updated information on cycling related projects, partnerships, and policy throughout participating cities in Europe.

In Catalonia's capital city, Barcelona, almost 14 million bike rides were registered within two years after using Velo.info's 'Cycling planning' tool. By 2008, the city had constructed over 20,000 parking areas specifically for bicycles. Barcelona also launched a biannual bike week that celebrates sustainable mobility. Twenty-five thousand leaflets are distributed to promote cycling during bike week. The drop in emissions and less traffic congestion is motivating authorities to get even more people on the bike.

Berlin is another example. They, too, used Velo.info's planning tool and the past several years have seen an exponential increase of bike use in Berlin. This is largely due to an integrated approach to policy planning that combines an effective communication campaign, ease of use, and appropriate infrastructure; all prerequisites to a successful policy according to Velo.info guidelines.

Sustainable mobility is more than just cycling. It also involves using alternative fuels for vehicles, in redefining public transportation services, and developing or enhancing existing infrastructure. Velo.info is a project in constant evolution and is now researching a whole range of sustainable mobility related issues. Last year, it built further on the Civitas Mimosa initiative.

'We want to promote sustainable mobility. We need to expand our project and not just stick with cycling otherwise we'd be in the same position as we were ten years ago. There is a huge interest in Civitas,' adds Mr van den Noort.

The initiative takes on a more scientific- and empirical-driven research methodology to explore the issue of sustainable mobility. The European cities Gdansk, Talinn, Funchal, Bologna and Utrecht are participating and conducting studies that range from using canals, to electric cars, to improving cycling lanes.

Each city has a dedicated team of researchers who will implement and then study 69 different projects on sustainable mobility. Bologna, for instance, expects to reduce its CO_2 emissions by 50 %. Talinn hopes to see a 25 % decrease in car accidents. And Utrecht will add another 1500 public bicycles.

The bike has been the vehicle for change in sustainable mobility. And Velo.info was instrumental. Cities in Europe are becoming better and more enjoyable places to live because of it.

Created with the Transport Research Knowledge Centre and Velo.info consortium.
Velo.info was funded under the FP5 EESD (Energy, environment and sustainable development).
http://www.transport-research.info > projects & analysis > search > velo.info

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Major scientific publication for Desider project

The results of the EU-funded project 'Detached eddy simulation for industrial aerodynamics' (Desider) have been published in a 454-page volume edited by Werner Haase, Marianna Braza and Alistair Revell. The book includes a comprehensive introduction to the project and full details of methods and approaches.

Computational fluid dynamics (CFD) uses numerical methods and algorithms to solve and analyse problems that involve fluid flows. In their preface to '*DESider — A European effort on hybrid RANS-LES modelling*', published by Springer-Verlag, the authors quote a previous publication on the earlier project 'Flow-physics modelling — an integrated approach' (Flomania), which states, 'In aircraft design, efficiency is determined by the ability to accurately and reliably predict the occurrence of, and to model the development of, turbulent flows. Hence, the main objective in industrial CFD is to… improve predictive accuracy for both complex flows and complex geometries.'

While this statement remains valid, they continue, CFD is now under growing pressure to increase predictive accuracy while retaining 'affordable' computation times. 'With an ever-increasing demand for faster, more reliable and cleaner aircraft,' say the authors, 'flight envelopes are necessarily shifted into areas of the flow regimes exhibiting highly unsteady and, for military aircraft, unstable flow behaviour. This undoubtedly poses major new challenges in CFD.'

Reynolds-averaged Navier-Stokes (RANS) equations are the oldest approach to turbulence modelling. Together with highly resolved grids or 'meshes' employing millions of nodes, numerical methods such as RANS must have the inherent capability to predict unsteady flows. Statistically unsteady (or non-stationary) flows can be treated using URANS methods, currently the CFD workhorses in the industry.

The Desider project focused on the development and combination of these approaches with much more expensive but more accurate 'large eddy simulation' (LES) methods. LES is a technique in which smaller eddies are filtered and are modelled using a sub-grid scale model, while larger energy carrying eddies are simulated.

Under the FP6 Desider project, 17 partners from the European Union, representing industry, research institutions and universities, and one partner from Russia worked to improve existing CFD methods.

The primary objective of the Desider project was to demonstrate the capabilities of these so-called hybrid RANS-LES approaches in the application to industrially relevant test cases with a focus on aerodynamic flows characterised by separation, wakes, vortex interaction and buffeting, i.e. flow features with the central common theme of inherent unsteadiness. An additional goal was to demonstrate the extent to which hybrid RANS-LES methods can be applied to multidisciplinary topics such as aeroacoustics (noise reduction) and aero-elastics (reduced A/C weight, unsteady loads, fatigue issues, improved A/C safety), thus providing further tools towards more accurate and cost-effective design.

The authors also say, 'All the goals achieved during the Desider project and described in this book have resulted from what has been a highly successful cooperation between European industries, research establishments and universities, leading to much improved knowledge dissemination and achieving cross-fertilisation between the various represented engineering industries; airframe, helicopter, power generation, car and train industries.

'This close collaboration, stimulated by the financial support from the European Union, can quite genuinely claim to have promoted and accelerated the enhancement of CFD approaches of each Desider partner to a far greater extent than would have otherwise been possible with the partners functioning individually in isolation.'

The authors say they hope the chapter on hybrid RANS-LES methods, the newly developed turbulence models and the assessment and validation of methods based on a variety of test cases in particular will help seed and motivate further and extended future investigations and validation work.

The new book is part of the Springer-Verlag series *'Notes on numerical fluid mechanics and multidisciplinary design'*, in which the results of many EU-funded projects have been published since 1993.

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Facilitated workshops on nuclear accidents

Facilitated workshops were identified as an ideal vehicle for nourishing an effective multi-party dialogue on the subject of nuclear accident response.

While considerable attention is rightfully focused on developing and implementing measures to avoid nuclear accidents, accident response plans must also be rigorously assessed. Funding from the 'European atomic energy community' (Euratom) programme was allocated to address this issue through a research project coordinated by the Radiation and Nuclear Safety Authority (STUK) in Finland.

The project, entitled Evatech([1]), sought to provide the tools necessary for evaluating the suitability of different countermeasures in the case of an accident. It was imperative that the full range of stakeholders, including industry, government, as well as the local communities, were involved in the decision-making process.

Further to a review of relevant research on this subject, it was decided to proceed with facilitated workshops. The concept of this particular type of workshop, also known as decision conferencing, is

based on decision theory and the psychology of groups. The goal is to integrate the various points of view and eventually achieve a common level of understanding between all participants. Treating all concerns as equal also helps encourage a shared commitment to action.

During the course of the three-year year project, facilitated workshops were organised in each of the seven EU Member States from which the Evatech partners hailed. These workshops provided the context for extensive discussion and analysis of possible countermeasures prior to the formal decision-making process.

(1) 'Information requirements and countermeasure evaluation techniques in nuclear emergency management'.

Funded under the FP5 programme EAECTP C (Euratom research and training programme in the field of nuclear energy).
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Radical and novel ideas for 'personal air transport system'

The EU-funded 'Personal plane' (Pplane) project is poised to revolutionise travel, ease congestion with its personal air transport system (PATS), a new paradigm in air transport. Like a private car, the Pplane personal air vehicle will deliver the benefits of speed and routing efficiency only possible through direct-to-destination flight.

The project emphasises environmentally responsible design, including noise and gas emission reduction, green propulsion, and energy efficiency, and is expected to increase savings and sustainability on one hand, and decrease overall traffic environmental impact on the other, resulting from a more efficient travel.

European Commission project officer José M Martin Hernandez says Pplane is part of the Seventh Framework Programme's (FP7) strategy of 'pioneering' and 'revolutionary' aeronautics projects that will pave the way for future European air transport systems.

Comprising 13 partners, Pplane is partially based on the findings of previous European R & D projects, including Out-of-the-box, EPATS, SATS and Equipt, and also on the SESAR, Nextgen and INOUI initiatives. It will last for 30 months and has a total budget of EUR 4.4 million.

Ambitious targets have been set to deliver drastic reductions of noise and emissions, substantial increases in fuel efficiency, a safety level comparable to that of conventional airliners, and low cost. The Pplane consortium is led by France's ONERA and includes organisations from 11 European countries, representing industry, research and academia.

Project partners will identify those concepts found to yield the greatest social, environmental and economic benefit for future European research funding.

Additional contributions will be made by external regulatory experts who will assist the consortium with strategic decisions and dissemination of findings.

The successful introduction of personal air transport systems in Europe will ensure mobility of people and goods, stimulating safe and secure commuting, while reducing the unwanted effects of traffic congestion, including environmental damage, social exclusion and unnecessary costs.

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Building energy-efficient cities


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More the half of the world's population live in cities. This trend will continue to increase, making energy efficiency in cities a global and crucial theme for the future. Ursula Eicker of the Stuttgart University of Applied Sciences, and Zerrin Yilmaz of the Istanbul Technical University are collaborating on a European research project, Citynet, to help realise their shared vision for energy-efficient cities.

Buildings contribute to almost half of the energy consumption for any one country, thus an appropriate starting point for tackling energy efficiency on a large scale. One focus of the research done by the project is high rise glass-fronted buildings. These buildings have complicated automation systems that consume a lot of energy. Yet, there is also a lot of potential to reduce energy consumption with the help of various passive strategies.

Passive systems can be used to regulate building climates. At the university in Stuttgart strong lamps are used to simulate the sun heating office windows. According to Ms Eicker, it is much more difficult to cool a room, compared to keeping a room warm. Good insulation and good windows are enough to keep an office complex warm, especially with all the computers, lighting and people generating heat inside. But keeping a building cool in the summer, and doing that efficiently, is still a problem. In this simulation set-up, researchers test different shading systems. Their investigations are not just limited to thermal features, but include optical features and airflow, so the amount of fresh air coming into the office.

Elsewhere, a German PhD student Tobias Schulze is working with Turkish colleagues at the Istanbul Technical University. A model of the Kanyon centre — a new development in Istanbul including offices, apartments and a shopping centre — is placed within the university's wind tunnel. Smoke is introduced to help visualise the airflow around the building and how it is affected by its surroundings. For example, other buildings can affect the air turbulences. Wind direction also plays a role, so the model must be turned around in the wind tunnel and viewed from all possible directions. Air pressure is measured by small sensors in the model. The pressure difference between two sides of a building forces air to flow through the buildings, which could be used for ventilation or cooling within the building.

Modelling carried out by Ms Yilmaz and her team has already helped the building managers at Kanyon to improve the efficiency of their lighting. Further research studies are now considering how energy can be saved through natural ventilation, photovoltaic applications and better shading systems for cooling. They have also done studies looking at the relation between energy use and comfort.

An artificial sky at the Stuttgart University of Applied Sciences can be employed to simulate the light and shade dynamics for particular models. A high-power lamp acts as the sun, while the surrounding dome, acting as the sky, can be adjusted to give a realistic luminescence, including details like brighter regions around the sun and near the horizon. Scharnhauser Park, a site near Stuttgart, was studied with the use of this artificial sky. The level of sun falling on the buildings was analysed by adjusting the distances between the buildings.

There are, however, not just scientific and technical challenges in achieving a high standard for energy efficiency, but also social challenges. Regardless of whether the optimal building systems or cooling systems are installed, it is still necessary that they are operated properly (for example, being switched on and off at appropriate times) and that the user within the building is aware of how energy can be saved.

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Modelling carried out by Ms Yilmaz and her team has already helped the building managers at Kanyon to improve the efficiency of their lighting.

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Life in minimum oxygen ocean zones at risk


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Even areas of the deep ocean with very low oxygen concentrations can be awash with life. However, these habitats are threatened by global climate change, which has the potential to cause further oxygen depletion. New research, published in the journal Marine Ecology, analysed biodiversity in oxygen minimum zones (OMZs) in the Arabian Sea, eastern Pacific and Bay of Bengal.

The study was supported by the EU-funded 'Hotspot ecosystem research and man's impact on European seas' (Hermione) project, part of the environment theme of the Seventh Framework Programme (FP7). Hermione has received EUR 8 million in financial support.

OMZs are mid-water areas in the ocean where oxygen saturation is at its lowest. They are created by the degradation of organic matter from the upper water levels, which are rich in oxygen. Tiny marine algae (phytoplankton) populate these levels. As they die and slowly sink to the ocean floor, aerobic bacteria feed on them and degrade the matter, using up oxygen.

Due to lack of mixing of the water column (a conceptual column of water from surface to bottom sediments), these low-oxygen areas are not replenished with oxygen, leading to the creation of OMZs at depths between 100 and 1000 metres. The core regions of OMZs tend to be rather stable, although seasonal or longer-term climatic changes may cause shifts in their upper boundaries and hence community composition.

Sediments in these zones will still contain large amounts of organic matter. As a result, they are the ideal habitats for certain microorganisms and species of animals that can tolerate low levels of oxygen.

'Oxygen seems to be the overriding factor controlling biological diversity and seabed community composition within OMZ core regions,' says the lead author of the study, Professor Andrew Gooday of the National Oceanographic Centre (NOC) in Southampton, UK. 'Where oxygen levels increase, the strong seafloor gradients create variety that exerts an increasingly important influence, with different habitat types supporting different kinds of organisms. In particular, the lower boundaries of OMZs, where oxygen levels begin to rise and food is plentiful, often teem with large organisms, among them brittle stars and spider crabs.'

NOC's Dr Brian Bett adds: 'The skeletons and carcasses of marine animals provide discrete habitats where other creatures can thrive. For example, scavengers such as shrimp-like crustaceans exploit accumulations of dead jellyfish, fish and crabs, while other species live off whale bones.'

The extreme conditions in OMZs increase environmental variety of species, as low oxygen concentration will promote adaptations including smaller body sizes and larger body surface, which enhance oxygen intake. Professor Gooday explains: 'OMZs may be a cradle of biological diversity, promoting speciation by creating strong gradients in the environmental conditions that are important for species as well as barriers to population exchange.'

However, global warming is a considerable threat to these habitats: as ocean temperature rises, vertical water mixing is expected to decrease just as oxygen solubility in seawater. When oxygen depletion grows too severe, animals and organisms start disappearing. 'If this [global warming] results in larger, more intense OMZs, the impact on biodiversity is likely to be negative,' Dr Brett reiterates.

Hermione is dedicated to furthering our understanding of deep-sea ecosystems and their contribution to the production of goods and services. The large-scale project brings together 38 partners from 13 European countries and 1 African nation.

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Nitrate-bearing groundwater enters the sea

Scientists from a European project have studied the impact of groundwater containing nitrates entering the coastal marine environment. This little understood process can have a negative effect on the quality of coastal waters.


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Nitrates used in intensive agriculture can be carried to the sea by streams and rivers. However, an unknown amount can seep into underlying groundwater and enter the marine environment through the shoreface or seabed. This may cause algal blooms, an explosion of algal growth which can lead to poorer water quality, a drop in species numbers and falling seafood production.

The project 'Nitrate from aquifers and influences on carbon cycling in marine ecosystems' (NAME) used thermal infrared aerial photography together with geophysical measurements to study the entry of groundwater into the sea. Detailed chemical analyses of the aquifer and the seabed were also carried out. The information collected was used to build and calibrate computer models for determining the flow of nitrates from groundwater into the marine environment.

Researchers from the Danish company DHI Water and Environment carried out integrated 3D modelling of groundwater transport and marine ecosystems. The study site was at Ho Bay, in the Graadyb Estuary, in western Denmark. The groundwater in this area is affected by nitrate leaching and seeps directly into the sea. The model used was based on MIKE 3 FM software, which was previously developed by the company as a water resource management system.

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By comparing computer simulations with and without input of groundwater, researchers found that the effect of the nitrate was relatively small. This was due to the low level of the pollutant entering the estuary, which was then removed by the flushing effect of the tides.

The project successfully brought together experts in the groundwater and marine environment who gained a greater insight into the phenomena of nitrate cycling and groundwater movement. The end result promises to provide more sustainable coastal management.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).
Collaboration sought: information exchange/training.
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Researchers warn of how methane leaks affect planet

***An international team of researchers has discovered some alarming news: a section of the Arctic Ocean seabed holding extensive stores of frozen methane is displaying signs of instability and widespread greenhouse gas leaks. The study's findings were recently published in the journal* Science.**

The researchers from Russia, Sweden and the US observed perforations in the permafrost under the East Siberian Arctic that are allowing substantial amounts of methane to escape into the atmosphere. The release of even just a small amount of the methane stored in the shelf could result in further climate warming.

'The amount of methane currently coming out of the East Siberian Arctic Shelf is comparable to the amount coming out of the entire world's oceans,' explains lead author Dr Natalia Shakhova of the International Arctic Research Centre (IARC) at the University of Alaska Fairbanks in the US. 'Sub-sea permafrost is losing its ability to be an impermeable cap,' she warns.

So what's worse, carbon dioxide (CO_2) or methane? Experts say methane wins hands down because it is 30 times more potent than CO_2. According to the researchers, the carbon-containing organic material starts to decompose and slowly releases methane when it begins to thaw in the permafrost. Not only can these releases be larger than those triggered from decomposition, but they can also be a lot more sudden and unexpected.

An area that encompasses over 2 million square kilometres of the Arctic Ocean seabed, the East Siberian Arctic Shelf is rich in methane, making it one of the world's greatest sources of this chemical compound. A breakdown of the FP5 study's findings shows that the East Siberian Arctic Shelf emits 7 teragrams (1 teragram equals 1.1 million tonnes) of methane each year. This amount is similar to what is emitted from the rest of the planet's oceans combined.

'Our concern is that the sub-sea permafrost has been showing signs of destabilisation already,' says Dr Shakhova. 'If it further destabilises, the methane emissions may not be teragrams, it would be significantly larger.'

According to the scientist, the Earth's geological record shows variances in atmospheric methane concentrations: around 0.3 to 0.4 parts per million during cold periods to 0.6 to 0.7 parts per million during warm periods. Average methane concentrations in the Arctic currently stand at around 1.85 parts per million, which is a record for the last 400,000 years. Even more disconcerting is the fact that the East Siberian Arctic Shelf is reporting concentrations that are even higher than that.

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The researchers say the shelf is only up to 50 metres in depth, and does not release methane during the planet's coldest periods; it remains a frozen arctic coastal plain. But the warmer the Earth becomes, the higher the sea levels rise, which leads to the shelf being flooded with seawater. Experts say seawater is 12 to 15°C warmer than the average air temperature.

'It was thought that seawater kept the East Siberian Arctic Shelf permafrost frozen,' Dr Shakhova notes. 'Nobody considered this huge area.'

Past studies in Siberia spotlighted methane venting from thawing terrestrial permafrost. But thanks to earlier work carried out by co-author Dr Igor Semiletov, who joined IARC as the visiting scientist from the Pacific Oceanological Institute, Far Eastern Branch, Russian Academy of Sciences, researchers in the 1990s became aware that the amount of methane being emitted from terrestrial sources decreased at higher latitudes. However, those studies went no further from the coast.

Drs Shakhova and Semiletov, along with their colleagues, decided to take their research offshore from 2003 to 2008. Their investigation has helped them determine that methane levels were elevated overall and that the seascape was home to over 100 hotspots. They also found that methane gas trapped under and in the sea ice was not only being dissolved in the water, but was also escaping into the atmosphere.

'The release to the atmosphere of only 1 % of the methane assumed to be stored in shallow Hydrate deposits might alter the current atmospheric burden of methane up to 3 to 4 times,' Dr Shakhova warns. 'The climatic consequences of this are hard to predict.'

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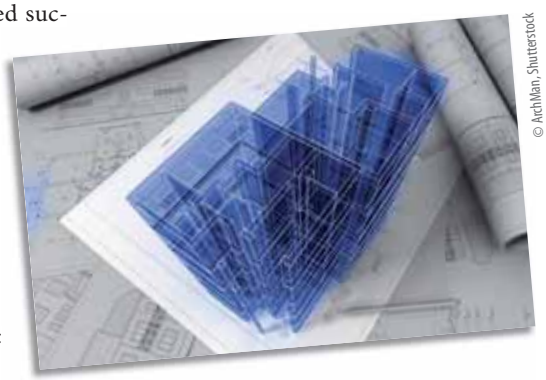
Building better tools for sustainable urban development

Evaluation tools used for urban sustainability were analysed through case studies. The aim was to identify consistency, applicability and areas of improvement for cities of the future.

Projects across the EU need to make our cities healthier places to live while reducing their environmental impact — implementing urban sustainability. To make this a reality, decision-makers must look at a whole range of situations from ongoing programmes to the tried and tested successful city project.

Aided by EU funding, the project 'Practical evaluation tools for urban sustainability' (PETUS) developed and tested evaluation tools used to promote sustainable development. Areas covered span all sectors including water and sewage, waste, transport, energy networks, green areas and holistic urban studies. The tools include any procedure, guidelines, evaluation or assessment that can be used by both the public and private sector. This is useful when organisations are considering any socio-economic impact as part of decision-making processes and when there is public participation.



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PETUS partners evaluated 60 case studies of various projects and policies. Interviews and site visits were used to collect the information. The results produced a number of significant findings. The content of the tools is flexible but there is still room for improvement in terms of accessibility of tools for decision-makers. Although some problems were pinpointed about defining sustainability in practice, there are also several prime examples of how tools can assist sustainable infrastructure development.

All the findings led to continued investigations for developing a framework of practical tools which can be used to support continuing urban sustainability.

Funded under the FP5 programme EESD (Energy, environment and sustainable development).
Collaboration sought: further research or development support.
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The city and the sky

Matthias Beekmann of the CNRS, France's largest scientific research group, believes that traffic exhaust fumes are the greatest man-made influence polluting the air within Paris.

With a population of more than 10 million, Paris belongs to a group of 20 so-called 'megacities'. The city is now at the centre of a European FP7 research project called Megapoli(1), that is investigating the effect street pollution is having on the climate and atmosphere. However, the aim is not just to trace the pollution and its impacts on the urban scale, but rather to see how one city can have an impact on a continental or even global scale.

Frank Drewnick, from the Max Planck Institute for Chemistry, and his team can use their mobile lab to take measurements for air composition, particles and gases while driving about. By an isolated field on Paris's north-eastern edge the team can take untainted readings of background air pollution arriving from other regions of Europe. They can identify the Benelux countries as being a close-by source of emissions, while a large part of the pollution appears to be sulphur dioxide from the coal-fired power plants of eastern Europe.

Mr Beekmann and the project coordinator Alexander Baklanov collect pollution data during the winter. To compare with similar data collected in the last summer. Their instruments, situated on a roof in central Paris, run around the clock gathering data concerning organic aerosols that can pose a health risk — organic aerosols being very fine particles, or dust, composed of elements like carbon, oxygen and hydrogen.

An Irish team from the University College Cork is also involved in the field work, using a spectrometer to detect particles from cars, wood fires and heating systems. With a strong westerly wind they also find particles of sea salt from the Atlantic Ocean. This time the scale of the measurements is more local. The air quality is at its best between 3-4 a.m., while the pollution will jump dramatically at 7 a.m. and 5 p.m. or 6 p.m., reflecting the traffic rush.

Having been emitted by a car or factory, a particle or gas might remain in the air for several days, or perhaps hundreds of years. Mr Beekmann remarks that a particle could be carried up into the atmosphere, from where it can travel hundreds or even thousands of kilometres.

Research by Bill Collins, a climate expert from UK's Met Office in south-west England, is dealing with air quality and climate on a global scale. Plots of the pollutant called ozone from the US cities of New York, Boston and Washington show how the strong westerly winds over the north Atlantic carry the pollutant across into the UK and western Europe.

Another point of interest for Mr Collins is the effect that sulphur dioxide can have on climate. This compound reacts quickly in the atmosphere to create sulphate aerosols, which reflects sunlight back into space and ultimately has a cooling effect on the atmosphere. Mr Collins wants to find out to what extend this short-term effect counteracts the long-lived greenhouse effect caused by carbon dioxide.

Urban pollution has been studied before in the past. Now this research project is broadening the scale from the street to the megacity, the regional scale and on to the global scale.

(1) 'Megacities: emissions, urban, regional and global atmospheric pollution and climate effects, and integrated tools for assessment and mitigation.'

Promoted through the Research Information Centre.
http://ec.europa.eu/research/infocentre > search > 16034

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Mapping out the future of Alpine glaciers

The Alps, known as 'Europe's water tower', is home to glaciers that supply Europe with 40 % of its fresh water. It is the pristine alpine streams that supply rivers like the Rhine, Danube, Po, and Rhone with the water that makes transportation and irrigation in many parts of Europe possible. However, studies have shown that the rate at which alpine temperatures are increasing is more than twice the global average.

How climate change will affect water resources in mountainous regions is the subject of a major European Union research project, called 'Assessing climate impacts on the quantity and quality of water' (ACQWA), involving three dozen scientific partners from within and outside of Europe.

At an altitude of 3100 metres in the Aosta Valley in north-western Italy, a meteorological station is gathering data regarding snow and glacier dynamics. The network of automated weather stations that gather this data is run by the ARPA, the regional environmental protection agency. The data is sent in real time via mobile phone networks — GPRS and GSM — to local research and meteorological bureaus. It includes parameters like snow thickness, air temperature, solar radiation, wind conditions and surface temperature. These can be used to find what is known as the snow-water equivalent, which measures the supply of frozen water before it melts.

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Recent research shows that, over the next few decades, the snow will begin melting earlier, bringing a higher risk of floods and avalanches in winter and spring. Using information from satellites and the data from ARPA, scientists at the regional 'Functional centre' of the Aosta Valley are creating a hydrological model in order to make early predictions of natural disasters.

The Secure Mountain Foundation is another participant of the FP7 ACQWA project. It has created a three-dimensional computer model of an unstable hanging glacier, from which large falling blocks of ice threaten the safety of locals and tourists. Since climbing the glacier would be far too dangerous, the researchers used close-range photogrammetry to create the model of the hanging glacier, whereby they took photos from different angles using a helicopter, which were reconstructed on a computer.

Aside from safety issues, climate change is also raising concerns in the economic, agricultural and energy sectors. Local economies will suffer greatly should the famous alpine ski resorts become too warm.

Switzerland receives 60 % of its energy from hydropower stations. It is a clean and renewable energy source, but obviously one that relies on a stable water flow. The expected rise in water during spring and drop in water levels in July and August will lead to a need to rethink production at hydropower plants. Exactly how the running water in the mountains relates to the flow of electric current in domestic homes is under scientific examination.

According to Martin Beniston, ACQWA project coordinator, the best-case scenario by the end of the century will be a loss of 50 % of the alpine glaciers, while the worst-case sees a loss of 90 %. This will lead to a strain on all sectors, as water goes into shorter supply. The results of the international project are due for presentation by 2013. It is hoped that with sufficient knowledge, it will be easier to adapt in preparation for the future.

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http://ec.europa.eu/research/infocentre > search > 16035

The effects of war on water quality in the Una River

A European research project has helped focus much needed attention on the issue of water quality in Bosnia and Herzegovina.

Following the break-up of the former Republic of Yugoslavia in the early 1990s, the region was plunged into a period of armed conflict. In addition to the human tragedy, the war also took its toll on the environment.

A unique collaboration between European research institutes sought to evaluate the impact on water quality in the Bihar Valley in Bosnia and Herzegovina as well as the Politico Lakes National Park region in Croatia. Scientists with the University of Bihac in Bosnia and Herzegovina specifically investigated the Una River watershed in which the city of Bihac is located.

Researchers working under the Anthropol. prot([1]) project collected samples from potable water supplies as well as natural springs, karst aquifers and the river itself and subjected to a range of chemical and biological analyses. Levels of ammonia, nitrites and phosphates were mostly below the accepted thresholds.

On the other hand, evidence of elevated concentrations of faecal matter pointed to a lack of proper sewage treatment facilities in the area. This was particularly noticeable downstream of the city of Bihac. Therefore, the primary recommendation following from the project calls for the implementation of wastewater treatment.

The team at the University of Bihac also studied residence times in karst aquifers using multiple tracer species. Residence times provide important feedback regarding water storage and pollutant accumulation.

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Furthermore, although no clear conclusions could be drawn, it was suspected that leaks from toxic material stored in former military facilities could also be contributing to the pollution load.

(1) 'Study of anthropogenic pollution after the war and establishing of measures for protection of Plitvice national park and Bihac region at the border area of Croatia and Bosnia-Herzegovina.'

Funded under the FP5 programme INCO 2
(Confirming the international role of Community research).
Collaboration sought: information exchange/training.
http://cordis.europa.eu/marketplace > search > offers > 5393

See page 35 **'Complying with European wastewater guidelines'**

Turning brewery waste into animal feed with hydrolysis

Researchers with the University of Novi Sad in Serbia have discovered how to optimise the hydrolysis of waste sourced from the production of beer.

The EU's 'Confirming the international role of Community research'(INCO 2) programme has supported a number of initiatives aimed at accelerating technology transfer beyond Europe's borders. One such project, Agroiwatech(1), targeted waste and wastewater treatment in the Balkans. One of its objectives was to transform brewery waste into usable animal feed.

Various spent organic materials used in the beer-making process, including grain, hops, yeast and kieselguhr, were combined in known ratios. This mixture was then broken down through hydrolysis.

Given the high cellulose and low nitrogen content of the brewery waste, specific types of both biological and chemical hydrolysis were selected and applied. The group at the University of Novi Sad performed a number of different experiments in an attempt to obtain the best results in the shortest amount of time.

For example, by limiting the addition of rumen to just 5 %, it was possible to significantly decrease the processing time without contaminating the sample. Further time savings were achieved by incorporating a secondary biological hydrolysis step involving yeast thermolysates.

With regard to chemical hydrolysis, the addition of hydrogen peroxide (H_2O_2) helped reduce both the timing and magnitude of the maximum chemical oxygen demand (COD). Finally, it was determined that pretreatment with sodium hydroxide (NaOH) produced the fastest results as well as the best carbon to nitrogen ratio.

(1) 'Cost-effective technologies for wastewater treatment and waste biodegradation in agro-industries with reclamation of resources.'

Funded under the FP5 programme INCO 2 (Confirming the international role of Community research). Collaboration sought: information exchange/training. http://cordis.europa.eu/marketplace > search > offers > 5394

See page 34 **'Deriving value from the treatment of agro-industry waste'**

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New ways to manage old rubbish

A Europe-wide project helped local municipalities from rapidly growing cities to improve their waste management systems. Researchers collected data from selected urban areas and used it to develop new waste strategies that would help municipalities comply with EU standards.

People want their rubbish collected regularly and efficiently because a badly run waste management service can seriously affect their quality of life, particularly in large built-up areas. In southern European countries and new EU Member States rapid economic development has led to an increase in the amount of waste produced by cities in these regions.

This new challenge has meant that waste management systems need to be upgraded and their recycling levels increased before they can match the standard expected by the EU. The EU-funded LCA-IWM(1) project was therefore set up to help the local government departments which run the cities to improve their waste service.

Project partner Wroclaw University of Technology, Poland gathered information about the municipalities of a number of cities chosen from different parts of Europe. This information gave researchers a more detailed picture of the climate, infrastructure and population mix for the urban areas identified.

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The Polish team also gathered data from individual urban areas concerning their collection, transport, storage and treatment of waste. This was then used to produce new waste management strategies based on local conditions.

The amount and content of waste produced varies between cities, but needs to be quantified for it to be properly managed. This task was tackled by the municipalities who carried out an analysis of their waste using a range of different techniques. A number of managers in urban areas also conducted social surveys, using questionnaires to gauge the public's opinion of waste treatment plants.

The work of the LCA-IWM project can help in the development of support tools for the planning and monitoring of waste management. Although the strategies were developed for southern European countries and Member States that joined after 2004 they can be successfully applied to cities throughout the Union. The study also supported good practice for waste management across Europe by promoting waste recovery and recycling.

(1) 'The use of life cycle assessment tools for the development of integrated waste management strategies for cities and regions with rapid growing economies.'

Funded under the FP5 programme EESD (Energy, environment and sustainable development). Collaboration sought: further research or development support. http://cordis.europa.eu/marketplace > search > offers > 5377

Open shop for environmental data

A new way to access and reuse environmental data from diverse sources has been devised by European researchers. They foresee a future where environmental data and services are offered on the open market.

Every day numerous sensors on earth and in space observe the condition of land, atmosphere and oceans for multiple purposes ranging from weather forecasting to monitoring of nuclear incidents. Important political decisions, such as how to adapt better to climate change, depend ultimately on scientific insights gained from these observations. But at present there is no simple way to access and use that data.

'We are investing lots of resources to make measurements for a particular reason, but the information obtained may never be used again,' says Denis Havlik of the Austrian Institute of Technology. 'Perhaps people don't know that certain information exists or they cannot access it; sometimes they can access it but they don't know how to use it, or it is too complicated to get in touch with the data owner.'

Mr Havlik coordinates an EU-funded project called 'Sensors anywhere' (SANY) which has created the technical means to allow the free exchange and use of environmental monitoring data regardless of its source.

SANY uses a 'service-oriented' architecture, where applications can be built out of modular services accessed over the internet. One service might obtain some data, another might plot a map, graph or chart, and another might process the data in some way.

'The SANY sensor service architecture (SensorSA) allows everybody who makes environmental observations to advertise them over standardised service interfaces,' Mr Havlik explains. 'Anybody who needs environmental data can go and search for it — or look in a catalogue — and retrieve it using standardised methods.'

It doesn't matter where the data comes from, how it was obtained or what form it is in. The SANY system transforms all data to a standard format set out by the Open Geospatial Consortium (OGC) and can handle all kinds of sensor data, both raw and processed.

The SANY proposal has significant business consequences. 'If you are a small company and you believe, for example, that you can predict episodes of air pollution much better than anybody else, then it's easy for you to put your service on the market,' Mr Havlik says.

This is not just about allowing small companies to access markets that have traditionally been dominated by big public bodies. 'Today, many companies still try to do everything on their own. The new market paradigm envisaged by SANY will allow all involved parties to concentrate on their own strengths, and purchase the missing data and services on an open marketplace.'

To demonstrate the potential of the SANY approach, the project has been running pilots in the monitoring of air, water and land.

One air quality pilot spans the border between France and Belgium to demonstrate the feasibility of seamless presentation of data from independent monitoring networks. A second air quality pilot demonstrates automatic generation of air quality reports, data-fusion-aided quality assurance, and real-time environmental impact modelling for major industrial sites in Linz, Austria.

The SANY air quality pilots also demonstrate the use of SANY and SensorSA as a possible technical basis for the 'Infrastructure for spatial information in the European Community' (Inspire) Directive.

Meanwhile, a pilot in Gdansk, Poland demonstrates the feasibility of automatic monitoring and forecasting of the bathing water quality at local beaches. At the moment, water quality is checked by taking infrequent samples which need 24 hours to be analysed. That means bathing can only be restricted long after a pollution incident has taken place and some incidents may be missed altogether. The SANY 'bathing water' pilot proposes a different approach: SANY data fusion services can use simple measurements, taken in real time with automatic equipment, to generate indicators for things which are quite difficult to measure, like the bacteriological quality of the water. 'The system delivers 24-hour predictions and continuously improves by comparing a posteriori the indicators with laboratory measurements,' says Mr Havlik.

A similar pilot is being run in Cornwall, UK where SANY is being used to forecast incidents of microbial contamination of shellfish beds.

The third area being piloted is geo-hazards associated with the security of underground construction sites. A pilot in Barcelona — and two smaller scale pilots in Budapest, Hungary and Toulon, France — are using a combination of existing stationary sensors and SANY wireless ad hoc sensor networks for the real-time monitoring of ground movements in the vicinity of a new metro tunnel. The SANY infrastructure allows instantaneous visualisation of data from all sensors, and the data fusion services predict the soil settlements and warn the site manager when needed.

SME partners in Belgium, France and the United Kingdom, who have taken part in the pilots, are already using SANY to develop applications of their own.

SANY builds on work by the EU-funded Orchestra project and received funding from the Sixth Framework Programme (FP6) for research. Its outcome is directly relevant to two big international initiatives. 'Global monitoring for environment and security' (GMES) is a joint effort of the European Commission and the European Space Agency to assure the long-term interoperability, availability and reliability of Earth observation data. At the same time, the EU's Inspire directive requires public bodies to exchange geospatial data via a common infrastructure. Both these ventures require information from diverse sources to be handled in a uniform way.

'Parallel developments with proprietary interfaces and undocumented data models are the main obstacle to interoperability,' says Mr Havlik. As a consequence, SANY builds on open standards and the key project results will be available to all interested parties. The list of public project results includes the user and technical requirements, architecture and service specifications, pilot specifications, public training events, an introductory book on sensor service architectures, as well as the reference implementations of the key SensorSA services.

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See-through networks

Promising faster, more efficient and cheaper computer networking, transparent networks are the paradigm of the future. But thanks to European researchers, they are on their way already.


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Transparent networks are all-optical systems data transport systems. Touted as the solution to future networking needs, they nonetheless present a difficult technical challenge.

To make the network truly transparent, it must be optical throughout the transmission, from end to end. That raises many tricky conversion issues as the network changes speed and wavelength, to mention just two of the variables. This requires new photonic technology, primarily optical switches, capable of tying heterogonous network elements together.

The envisaged future scenario of the project 'Transparent ring interconnection using multi-wavelength photonic switches' (Triumph) posits transparent connectivity between core/regional-metro rings supporting data rates up to 160 gigabytes per second (Gbit/s) and metro-access rings supporting up to 40 Gbit/s per second. Considered until recently to be a future networking technology, their feasibility has already been shown thanks to the work of the Triumph project.

Just in time, too. Network demands are overtaking the capacity of traditional metro systems to cope. Internet traffic growth is unpredictable; users are deploying new, high-bandwidth applications, and content delivery needs are exploding as the internet begins to take over from television.

With all this unpredictability, networks need to handle very large capacities and be able to adapt very quickly. Agility is the key requirement to respond to fluctuating needs, but current metro network technology imposes heavy limitations.

Transparent, all-optical networks offer a solution. Up to now, transparent networks were limited to traffic at the same speed. Now the Triumph project has proven that it is possible to create all-optical networks across widely varying bandwidth, wavelength and communication protocols.

It sounds simple, but it is anything but. It requires a high degree of innovation in network architectures and needs state-of-the-art photonic switches capable of tying together the access, metro access, and core metro networks together. This tie-up is particularly difficult because they all run using different speeds, wavelengths and protocols.

The Triumph team worked on all aspects of the problem, starting with network architecture. They specified the requirements and then studied the technology options, applying value analysis and benchmarking to each system. Triumph sought commercially viable solutions at each stage.

Once the architecture was defined, the team worked on optical switching nodes for coarse wavelength division multiplexing (CWDM) at rates between 10Gbit/s and 130Gbit/s. CWDM is a way of adding capacity to a network by using different 'colours', or frequencies, along a single optical fibre.

The team also developed a 're-amplifying and reshaping' (2R) multi-wavelength regeneration device for cleaning up distorted signals. It is an important device providing signal integrity in the core network.

Signals also had to be mapped from lower bit-rate wavelength division multiplexing networks, typically used on access networks, to high-speed Optical Time Domain Multiplexing networks such as may be used on core networks. For this the team developed non-linear optical modules.

These modules delivered a compact, energy efficient optical switch of enormous technical ingenuity, capable of optical grooming and aggregation as well as signal regeneration.

Grooming is the name given to a family of optical network design and resource allocation algorithms that can enable cost-efficient use of both network bandwidth and electronic switching. Combined, this functionality makes for an incredibly sophisticated switch.

Finally, the team developed a testbed and demo to validate their technology, as well as a manufacturing plan for the commercialisation of the platform.

This was a key aspect of the project, which featured a European who's who of optical network experts. Triumph's technology responds to real problems that exist now and that call for new solutions.

The upshot is a flexible, powerful and economic system capable of coping with the emerging demands of modern networks.

'The switches developed by Triumph are compact and very low power compared to the non-optical switches currently in use, and this is an added attraction for network operators,' explains Juerg Leuthold, coordinator of the project and a professor at the Karlsruhe Institute of Technology (KIT).

It all means better networks in the future, and world-class expertise for network component manufacturers in Europe.

The Triumph project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

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Getting families and friends together again, virtually

A fireside chat, sharing photos with granddad, a family get-together to play Monopoly on a Sunday afternoon… Digital media designed for the individual has hastened the demise of collective social events, but it could also enable their revival.

By marrying state-of-the-art video and audio communications technology with digital media, interactive devices and ambient intelligence, a team of European researchers hope to give people of all ages the opportunity to get together, play games, share experiences and generally communicate, interact and have fun even if they are thousands of kilometres apart. Their goal is to bring down the barriers between people — technological and social.

'E-mail, the internet, cellphones, internet video calls… they are all designed for one person using one machine. They are not designed to support families or groups of people communicating,' suggests Nikolaus Färber, a researcher at the Fraunhofer Institute for Integrated Circuits IIS in Germany. 'People have become isolated by technology,' he adds.

Coupled with people moving and travelling more frequently for work and study, it is a situation that has led to families and friends spending less time together. Even in the same home many people now tend to entertain and educate themselves alone, whether it is the teenager playing computer games in her room, the father listening to music on his MP3 player in the lounge or the mother studying on her laptop in the kitchen. Technology has encouraged this isolation, but advances in that same technology could now reverse it.

Working in the EU-funded 'Together anywhere, together anytime' (TA2) project, Mr Färber and a team of researchers from seven European countries are aiming to turn the tables on technology by simply and affordably bringing telepresence into normal households. Their vision is of groups of friends and family members seeing each other on their TVs, hearing each other through their stereo systems, sharing photos and videos and playing games almost as naturally as if they were in the same room.

'My brother lives in Switzerland and we have kids about the same age but they only get to see each other twice a year. With the system we are developing they would be able to play together whenever they wanted to without having to leave their homes,' Mr Färber notes.

To make that possible, the TA2 researchers are developing the components necessary to build an affordable and easy to install in-home telepresence system. The components can then be used to build complete telepresence systems without the need for special rooms or big screens to bring people together virtually. A television set, sound system, cameras and microphones placed in a living room suffice to create a sufficiently interactive and immersive experience, while state-of-the-art software which is transparent to the end user manages the communications backbone.

'Audio and video quality is of essence… it needs to be sharp and responsive,' Mr Färber says. 'At the same time, TA2 is aware that high audiovisual quality is not the only thing that matters. Applications like games, photo sharing, or virtual pin boards are necessary to frame and trigger the communication.'

Fraunhofer IIS has developed an Audio Communication Engine to provide low-delay, hi-fi quality sound that vastly improves upon current shaky and echo-prone internet calls. Other project partners, among them Philips, British Telecom and Alcatel-Lucent, are working on enhancing video communications, linking together interactive devices and implementing ambient intelligence.

Two or more families playing a board game, for example, would be able to see and hear each other over their TV sets, with artificial intelligence used to focus in-home cameras on the person speaking or whose turn it is. A touch screen embedded in a table might serve as a board game interface, while ambient intelligence from in-home sensors will let the system and other players know where participants are and what they are doing.

'Ambient intelligence could also improve communications by letting friends and family know when someone is available for a call or if they are busy, depending of course on how much information the person wants to disclose,' Mr Färber says.

Children and the elderly, who often find themselves more isolated than other social groups in the modern world, stand to benefit particularly from the technology. One scenario, due to be used as a demonstrator to highlight the project results, envisages a grandparent and grandchild playing a picture-matching game called pairs in which old photos could be used to trigger conversations and pass stories down through the generations.

'At IFA in Berlin (the world's largest consumer electronics fair) we set up a demonstrator consisting of two rooms, two TV screens and two tables with integrated touch screens on which people could play games. People were playing with each other as if they were really together in the same room… Many people were interested in the system, particularly those with families and friends in different parts of the world,' notes Matthias Rose, the head of marketing communications for audio and multimedia at Fraunhofer IIS.

Fraunhofer is already working on integrating its audio technology into commercial products, and commercial applications are also likely to stem from other areas of research in the TA2 project, which is being funded by the EU's Seventh Framework Programme.

'Obviously, once the project ends, it would be interesting to find investors and partners to create a commercial product out of the whole system that would allow everyone to incorporate telepresence into their homes and bring families and friends closer together,' Mr Färber says.

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Online collaboration with built-in clarity

Software packages that interoperate while providing online users with an overview of their colleagues' work may finally threaten the dominance of email as the world's premier collaboration tool.


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One of the biggest barriers to effective online group working has been the need for everyone to work on the same software package. Often many in the group have to acquire and learn new software. That complicates the creation of online work groups and slows collaboration.

Emailing large attachments to a distribution list is a pretty crude form of collaboration when compared to the application features on offer from major software vendors. But email has two great strengths. It is standardised and it is universal. The adoption of Ecospace standards might finally threaten the dominance of email in online collaborations.

Researchers on Ecospace ('eProfessional collaboration space'), a Europe-wide project with funding from the EU, sought a solution to the standardisation problem. They analysed collaboration applications from companies such as SAP and Microsoft to establish what is common and what is essential in the software.

Next, they used their findings to develop a standardised architecture with software building blocks — or basic collaboration services — that would allow the collaboration applications to interoperate. The architecture draws on a semantic ontology — rigorous organisation of information based on semantics, or its meaning — that has to define and correlate the concepts and terms used by the applications.

Working prototypes enable users of Microsoft Sharepoint, Business Collaborator (BC), BSCW and SAP's Netweaver collaboration tools, to work simultaneously on documents and projects.

Ecospace also developed a series of tools to break down another major barrier to remote collaboration — understanding who is available for collaboration, what their role is, and how well they are progressing.

There are a number of Ecospace tools that use visuals to show who is online and how accessible they are for collaborations.

One of Ecospace's most innovative developments is its 'expectation awareness' tool. 'Very often you have an expectation from a collaboration,' explains Wolfgang Prinz of the Fraunhofer Institute FhG, in Germany, and coordinator of Ecospace. '[For example] that you will be telephoned at a certain time or that 10 people will deliver responses to a report from you.'

The expectation awareness tool automatically tracks your expectations. It prompts you before deadlines expire and informs you when they have been missed. The tool helps make goals and expectations explicit right upfront, and eliminates a lot of time-consuming progress monitoring.

Mr Prinz suggests collaborative working tends to focus too much on the past. But with Ecospace's expectation awareness tool, the future becomes more the focus. 'We say what should happen and then look to see what did happen,' he says.

A second new tool oversees the project's progression. The 'collaboration mining' tool keeps track of who is making changes or involved in an online project. 'Normally, this is not visible,' says Mr Prinz. 'It means that if you want to propose a change, you can address it directly to the people who are working on that part of the project.'

All Ecospace developments are tested in real-life environments. Three working groups act as 'living labs' and use the collaboration tools in their daily work. More than 50 public administrators, together with smaller groups in Italy and Switzerland, are networking, forming groups and professional virtual communities, and attempting to undertake creative work in more productive ways. They provide feedback on their efforts to the Ecospace researchers.

The Ecospace tools and services are also winning fans in wider communities. The basic collaboration services are also grouped in 'composite collaboration services' to make it easier for developers to use them when creating new applications. 'A lot of students are using these services to develop their own applications,' says Mr Prinz. Little applications using Ecospace services have been created for iPhone users, for instance.

Commercial companies have already implemented Ecospace services in their latest versions. The UK-based manufacturer of Business Collaborator has done so, as has a toolbar developer in the Netherlands. The BSCW international public cooperation platform has incorporated a lot of features that were developed in Ecospace. They are made available to the more than 100,000 users of BSCW on its public server.

The Ecospace project received funding from the ICT strand of the Sixth Framework Programme for research.

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... collaborative working tends to focus too much on the past. But with Ecospace's expectation awareness tool, the future becomes more the focus.

Cloud to tackle trillion-euro money laundering problem

Money laundering is estimated at €1 trillion worldwide — a huge problem. Now European researchers are using cloud computing services to boost anti-money laundering efforts by tracking suspicious transactions.

Experts estimate that money laundering spirits away €1 trillion worth worldwide every year, providing a huge resource for criminal activity.

Seizing the profits of crime is one of the most effective methods for tackling criminals, but gangs have become extremely sophisticated at hiding their ill-gotten gains. Billons of transactions fly through the world's banks every week, making detection an exercise involving needles and haystacks.

But money laundering does leave tracks through the ledgers of banks. Particular transaction patterns, how money is routed from one account to another and in what timeframe provide investigators with red flags that merit further study.

The trouble is separating the suspicious activity from the honest business of the everyday economy. The size of the data and complexity of the modern banking business offers a shield for crime lords to hide behind. New regulations place a greater onus on banks to tackle the problem.

It is a big problem for the banks, which are liable for huge fines if the institution fails to take robust anti-money laundering (AML) measures to tackle the problem, but it can be a very expensive business for banks, because the quantity of data to be analysed requires costly computing power.

Help is on the way, in the form of new cloud services developed within the 'Business Experiments in Grid' (Beingrid) project. Beingrid created a series of Business Experiments to develop the technology required to provide real-world grid and cloud computing services to SMEs.

The 'Anti-money laundering on grid' (AMONG) Business Experiment developed detection services using grid technology.

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Grids are a computing infrastructure that take advantage of unused processing and storage resources on computers scattered around the world. It makes a supercomputer out of standard PC.

This performance also powers cloud computing services. The cloud is a new computing paradigm which makes it much easier for organisations and people to tap into the power of the web to carry out particular tasks. The cloud can guarantee service levels and security while supplying all the resources – however large – required by the user at reasonable costs.

'Through Grid SW (the GRIA service-oriented infrastructure), AMONG allows banks to cooperate in a cost-efficient, secure and controlled way,' explains Damian Hubaux, Business Experiments leader in the Beingrid project and R & D department manager for the firm CETIC.

'The solution allows banks to more efficiently spot money laundering than with the data available in a single institution. And more importantly banks control the information given to competitors.' Confidential banking data is not shared.

This solution helps banks to meet the EU's third AML directive, while also working with established AML solutions.

By working with the AMONG platform, banks can perform scans of extremely large datasets, a scale of number crunching that would normally be very expensive.

Bankers are excited by the platform's potential: 'AMONG takes the next step in providing a holistic view of money laundering activity, and most surprisingly at low cost, securely and regardless of the AML application installed in the bank,' comments Giorgos Panousopoulos, R & D project manager at Exodus SA in Greece.

Another interesting Beingrid Business Experiment was the financial portfolio management one provided by a grid services company set up by the University of Calabria and Innova, two Beingrid partners. The company is a grid-based application service provider (ASP).

The financial sector, unlike many others, already uses grid computing — most financial institutions use some kind of grid for number crunching on a massive scale for calculating growth, balancing risk and modelling scenarios for small banks.

However, grids are high maintenance and present several serious challenges, such as capacity and demand management, return on investment and ensuring scalability.

The ASP service developed within Beingrid, on the other hand, employs ground-breaking grid technologies to offer the desired and customised application through a portal, hiding the complexity of the system and placing access to the vast computation resources in the hands of those who need to use them.

Bankers use the service to perform very complex calculations for portfolio management. They get all the processing power they need at lower costs. It has been a very successful experiment.

'Financial asset allocation models entail extremely complex simulations,' explains Alberto Alfiero, Head Director for Finance and Markets at Banca Finnat. 'Thanks to participation in Beingrid, Banca Finnat has been able to run new models and update them extraordinarily faster, going even above expectations. At the same time, the outsourcing solution leads to significant cost savings.'

Beingrid also performed similar experiments on real-world business problems for financial risk management and data recovery.

These finance services represent the mere tip of the iceberg. Beingrid developed over two dozen Business Experiments in nine key sectors. It had over 95 partners and a budget of almost EUR 24 million, with EUR 15.7 million provided by the EU. As such, it is probably the biggest and best-funded attempt worldwide to mainstream grid technologies and cloud services.

Beingrid developed projects in advanced manufacturing, media, tourism, retail, healthcare, agriculture and telecommunications, among others.

It also developed the many software components required to commercialise grid computing, set up graphical user interfaces, service level agreements, quality of service guarantees and all the other essential elements for industrial-strength grid and cloud services.

It fast-tracked the widespread adoption of grid technologies and cloud services among Europe's SMEs, mainly by providing best practices, case studies and essential components.

That work is set to continue even now, with the project officially completed. Several Beingrid partners are collaborating to provide an online resource for SMEs and other organisations that wish to deploy grids.

'Early in the project we developed the Gridipedia, an online guide to grid technology, cloud computing and best practices for implementation and development,' explains Mr Hubaux. 'That resource will continue and expand as IT-Tude.com.'

In the meantime, several new services in architecture, manufacturing, healthcare, tourism and finance are set to take off as real-world applications, and other Business Experiments in the project hope to take their work further too.

Ultimately, it means that Europe now enjoys an unparalleled set of resources and experiences for the development, implementation, deployment and maintenance of grid computing and the cloud services they enable.

The Beingrid project received funding from ICT strand of the Sixth Framework Programme for research.

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As the refrigerator said to the hi-fi…

Networked sensors and devices have huge potential but how can we ensure that they can all talk to each other? The answer, according to a European consortium, is to link them seamlessly through a common 'middleware'.

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In these energy conscious times, the old idea of home automation is being revived to give the householder finer control over the many devices in the home. Most proposals envisage devices (embedded systems) — such as the heating, lighting and ventilation systems — being able to communicate with each other in a wireless network.

How can different devices, using different technologies and made by different manufacturers at different times, communicate with one another? One way would be to insist that all devices conform to some agreed standard, but that would be complex and time-consuming to negotiate and would not apply to existing devices. It could also stifle innovation by putting constraints on future technologies not yet imagined.

A much better way has been adopted by the EU-funded project 'Networked embedded system middleware for heterogeneous physical devices in a distributed architecture' (HYDRA).

'HYDRA aims to reduce the complexity by developing a service-oriented middleware,' explains Markus Eisenhauer, the project coordinator, who works at the Fraunhofer Institute for Applied Information Technology.

'It will help manufacturers, software developers and systems integrators to build devices that can be networked easily and flexibly via web services to create cost-effective, high-performance solutions.'

With HYDRA, all manner of devices such as electricity meters, TV sets, refrigerators, stereos as well as heating and lighting systems, can be networked without having to know what goes on inside them.

'We have some prototypes and demonstrators running where we have used an ordinary Playstation 3® as a home control centre,' says Mr Eisenhauer.

The middleware provides access to all sensors and embedded devices so a software developer does not have to think about what kinds of sensors are in the house.

'If you want to get a temperature value, you can just address the middleware semantically — "I want to get the temperature from this room" — and HYDRA will resolve it and provide access to the corresponding sensors,' he explains.

In principle, any HYDRA device can connect to any other, bringing the fabled 'internet of things' a step nearer.

Existing devices can be adapted to work with HYDRA. 'We are delivering a device development kit where you could integrate the middleware into the devices,' Mr Eisenhauer says, 'but you can make use of it with existing devices and HYDRA-enable them as long as they have a certain computing power.'

Manufacturers could even put HYDRA-enabled sensors within products such as washing machines so that problems could be diagnosed remotely, without a site visit.

But home automation is only one example of what HYDRA can do.

Another major application is expected to be in healthcare, especially the monitoring of patients in their own homes. The partners have set up a demo using networked sensors measuring body weight, blood pressure, blood sugar and oxygen saturation. A muscle sensor gives warning of an epileptic fit.

'So we have different kinds of technologies — ZigBee, Bluetooth and others — all covered by our network manager within HYDRA,' says Mr Eisenhauer. 'And then just to show that we can also use off-the-shelf devices we have used a Wii balance board as a weight scale and have connected it to our Playstation 3®.'

The Playstation 3® games console can be found in many homes but can easily run the HYDRA middleware while providing complete privacy for the patient's data. 'It's not a fully fledged telemedicine system but it has all the necessary ingredients of such a system and is running with diverse and heterogeneous hardware at the moment.'

Agriculture can also benefit from HYDRA. In one trial, pigs were fitted with RFID tags so their movements around their enclosure could be tracked. 'We can locate each pig in the shed or outside and we can use this to control the heating and ventilation system. If the shed gets too crowded the temperature rises and then the heating system responds to that.'

In another trial, wireless ZigBee sensors measured soil humidity in the field, to help farmers decide the best time to sow their crops.

The HYDRA automated home demonstrator was runner up in the best demonstrator award at the ICT Mobile Summit in Stockholm in June 2008. And the project was

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voted one of the top 10 best projects at the ICT2008 fair in Lyon.

Mr Eisenhauer detects a lot of interest from the networking community. 'We have a lot of requests from other projects who want to take HYDRA as their basic technology and to build upon that. We are developing the core components as open source and they will be published on Source Forge by the end of 2009.'

The partners are also discussing whether to market a commercial version of HYDRA with more features.

For Mr Eisenhauer, HYDRA brings closer a world of ambient intelligence, or ubiquitous computing, where artificial intelligence becomes part of our everyday surroundings. 'It is an enabler of the vision that Mark Weiser, the founder of ubiquitous computing, had of the "disappearing computer". HYDRA is an enabling technology that would make this dream come true.'

HYDRA received funding from the ICT strand of the EU's Sixth Framework Programme for research.

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Semantic research sets world standards

European researchers have created new tools for semantic technology development which are helping to set the next generation of official standards. The tools also unblock some key bottlenecks in semantic technology.

The next generation of the World Wide Web will be a cyberspace full of meaning, thanks to the semantic technologies currently rolling out. Semantic technology creates labels for web-page elements that machines can read and 'understand' on their own.

This will have a huge impact on the quality and range of accessible information. Right now, if you type in the search term 'fruit', you will get a list of pages where this term appears. But in the semantic web, you would get lists of pages with apples, oranges, pineapple and everything else relevant. You don't need to type every single relevant term when the computer 'knows' the meaning of the word 'fruit'.

Better, you would also receive listings of pictures, videos and audio which are relevant to 'fruit', even if that word never appears directly in the title. This is the power of semantics, machine-readable data accessible from your browser. This overcomes the problem of implicit information, which is usually hidden from the machine.

The semantic web is the primary focus of a large portion of web development over the past five years. But as the range and ambition of semantic research expands, the technology and tools used to develop it are finding it hard to keep up, because the ontologies at the heart of the semantic web are becoming more complex, larger, and more demanding.

Ontologies are large dictionaries of machine-readable labels defining every aspect of a specific domain, such as medicine or engineering. These domains can be populated with further sub-ontologies, such as neurology or mechanical engineering.

'The increased demand for multiple, large-scale and complex ontologies poses novel challenges on all ontology tasks, such as their design, maintenance, merging, and integration,' explains Diego Calvanese, Free University of Bozen-Bolzano, coordinator of the European 'Thinking ontologies' (TONES) project.

The TONES project set out to develop a series of tools to make the development, management, integration and operation of large ontologies much simpler.

'The starting point of TONES was to develop a logical formalisation of ontologies. And using this logical formalisation, we can allow machines to understand and reason with the knowledge that is represented [ontologically],' he notes.

Using a formal logic means that a machine can understand how two or more different terms relate to each other in a given ontology, and this can provide enormous benefits in ontology management.

For example, very often ontologies are merged when the work of one group is integrated with the work of another, or when two ontologies are combined for a new task. This exercise is fraught with risk, however, because often terms can conflict or lead to redundancies in the system.

By using logical formalisation, however, a computer can semi-automatically detect potential conflicts or repetitions, and in fact TONES developed a 'debugging' tool that performs this function. It makes the management and integration of ontologies much simpler, much faster and more reliable.

Merging ontologies, particularly large ontologies, is another common and very difficult task, but new tools developed by the EU-funded TONES make it much easier. The group also developed a modularisation tool to break a large ontology into distinct parts.

Standards, or the lack of them, have been a big stumbling block in semantic development, so TONES worked extensively on this problem. That work set the foundations for the new official standard language, called OWL 2. Like html, OWL 2 is ultimately governed by the World Wide Web Consortium (W3C).

'What the TONES project has done is not aimed at the user sitting at home [with] an internet browser,' Mr Calvanese states. 'It is more directed to the design of complex applications. So what TONES has been doing is developing technologies that can be taken up and used to make end-user tools.'

This is not the first time these types of tools have been developed. But Mr Calvanese suggests earlier attempts have struggled to cope with evolution.

'The earlier technology did not scale,' he reveals. 'It could not handle large ontologies and large amounts of data accessed through them. Ontologies are becoming more and more numerous and people are building larger and larger domains, with more definitions in them. TONES developed new algorithms and new techniques to deal with large ontologies.'

The team also tested its work on real-world ontologies and early results have performed well, though testing is ongoing. Nonetheless, technologies developed in TONES have already appeared in several commercial and open-source applications.

Currently, the team is looking at ways to extend the work of TONES. In the meantime, European research is setting the standard for ontology development and management.

The TONES project received funding from the FET-Open strand of the EU's Sixth Framework Programme for research.

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Software: running commentary for smarter surveillance?

Cutting-edge surveillance software that automatically detects human motion, behaviour and facial expressions, generates a running commentary of what's happening and re-enacts events virtually could soon be helping police and security services.

The system, developed by a team of researchers from five European countries, provides a comprehensive and innovative solution to the information overload facing police forces and public and private security services.

With millions of surveillance cameras across Europe capturing what happens on city streets and major meeting points like airports, malls and buildings, monitoring and analysing these video streams has become an epic task. Technology such as automated motion detection, object tracking and behaviour analysis has eased some of the burden, but a gap continues to exist between what surveillance cameras see and how it can be described and interpreted in terms a human operator or computer can understand. Bridging this semantic gap is important because meaningful descriptions of events can trigger meaningful automated or human responses that could spot a crime in progress, prevent injuries or save lives.

'The semantic gap in the analysis of human behaviour from digital video is huge,' explains Andrew Bagdanov, a senior researcher at the Computer Vision Centre of the Universitat Autonoma in Barcelona, Spain. 'Most surveillance software operates only at a very low level… in order to bridge the gap it is necessary to build an artificial cognitive solution that operates at a much higher level, which is able to analyse footage, describe the events taking place and reason about what is going on.'

Thanks to research carried out by a multidisciplinary team working in the project 'Human-expressive representations of motion and their evaluation in sequences' (Hermes), an EU-funded initiative named, fittingly, after the messenger of the gods in Greek mythology, such a solution now exists.

The state-of-the-art Hermes system consists of a scalable, flexible platform, integrating software components that not only detect events in real time as they are filmed by surveillance cameras but also describe them semantically and react to them intelligently. It operates at three levels: tracking the movement of people and objects; monitoring the behaviour of people; and, in the case of high-resolution footage taken at close quarters, detecting changes in facial expression.

Whereas most surveillance video tracking systems operate in a state of perpetual surprise, dumbly following a single target and struggling to reacquire it if lost, the Hermes tracking technology functions more like a human monitoring the same scene, making predictions about where a target is heading and also reacting to any other events in the scene that appear unusual.

'Say two people meet in the street and start to run. The system will detect the change in behaviour and start to follow them. It could alert a human operator if the pattern of behaviour seems suspicious… such as if it appears someone has had their bag stolen,' Mr Bagdanov, who oversaw the project's validation activities, says.

Using a combination of static cameras, which provide an overall view of an area, and pan-tilt-zoom (PTZ) cameras, so-called 'eyes in the sky' that zoom and move to follow a target, the system is able to automatically track a person as they walk down a street or even across an entire city.

This smarter tracking is made possible by the Hermes researchers' approach to solving the semantic gap. Instead of tracking objects in a scene directly — the current, low-level approach — the Hermes platform generates a running commentary in natural language text of what is going on: 'A pedestrian labelled "Actor 3" appears in the field of view,' 'He moves on the south-eastern sidewalk,' 'Actor 3 stands nearby another pedestrian', etc.

This semantic information, generated automatically in real time, is then used by the artificial cognitive system to reason about events and behaviours of interest. Human operators, in turn, receive a more accurate description of what is occurring, and can more easily and quickly retrieve specific scenes from a recording with a simple text-based search. The current version of the system can generate text in six different languages.

Generating semantic information from video in this way also enabled the Hermes researchers to develop another powerful tool as part of the system: a virtual 3D representation of the scene.

'The virtual graphical representation of the footage is generated in near real time and can be displayed alongside the actual video stream. Because it is virtual and 3D it allows operators to look at events from angles they would otherwise be unable to,' Mr Bagdanov notes.

The outdoor applications for the system — focused, primarily, on motion and behaviour detection — were tested extensively in Barcelona earlier this year, where cameras attached to the CVC building were used to monitor events in the street outside.

'The system held up better than we expected, though when there are more than 20 people in the scene it starts to break down. This, however, is a problem that can be solved with more cameras and more computer processing power, so the system should scale well,' Mr Bagdanov says.

Indoor applications of the system were developed and tested at ETH Zurich in Switzerland and Oxford University in the United Kingdom, both project partners. There, the facial expression recognition component showed the potential for the system to detect different emotions, especially powerful ones such as fear or anger.

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Though facial expression detection does have security applications, Mr Bagdanov notes that the technology could prove useful in research on human-computer interaction, for example, to make communication between humans and robots more natural.

'The Hermes project focused principally on developing technology for security and surveillance, but our research has uses in many other fields, not least human-computer interaction, natural language processing, multimedia communications and semantic annotation and search,' the project technical coordinator says.

He notes that several project partners are developing commercial applications based on the work carried out in Hermes, and that one or more spin-off companies are under consideration.

The Hermes project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

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When culture meets science

How many times have you asked yourself what it would have been like to live in the ancient world, to walk among and live in buildings that only grace the pages of our history books? State-of-the-art digital technology developed by the Fraunhofer Institute for Computer Graphics Research (IGD) in Germany gives us the chance to imagine just what it was like.

New digital technology by European researchers enhances real images on a virtual tour through ancient buildings. The end result is a dramatic tour experience for museum visitors.

The Fraunhofer IGD team applied the digital technology at a recent exhibition in the Allard Pierson Museum in Amsterdam, the Netherlands. Visitors could stroll through sites that have found a niche in history.

A flat screen on a rotating column was positioned amongst many art works showing an extract of the image on the wall, a black and white photo of the Roman Forum ruins. When the column is rotated to the left, the viewer is given a completely different angle.

The researchers said the camera connected to the back of the movable display gives information about the new view that is shown on the monitor: the Temple of Saturn ruins. They added that a digital animation gives viewers an idea of what the temple might have looked like when intact. Further rotation of the column offers new information, photos and videos about other ancient buildings such as the Colosseum.

'We have taught the computer to recognise the image,' explains Michael Zöllner, a designer at Fraunhofer IGD. 'The program knows where the centre of the camera is pointing and can superimpose the relevant overlay — a text, video or animation.'

The team said visitors to the museum are always aware of where they are on the tour because the original image is clearly shown under the overlays at all times. Experts call this technology 'augmented reality': unlike virtual reality which creates computer-generated environments, this technology enhances what we feel, see, hear and smell.

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The software developed by Fraunhofer IGD and used in the museum operates on a mini-computer and is controlled via a touch screen. Experts believe this console is just the start of a trend towards mobile and virtual guidebooks. For example, tourists will use their consoles in front of a palace, and customised information regarding the palace will pop up on the screen.

> *'The smart phone means that augmented reality is at last suitable for the mass market.'*

The Fraunhofer IGD team has also tested this 'vision' in the EU-funded project 'Intelligent tourism and cultural information through ubiquitous services' (Itacitus), where Mr Zöllner and his team programmed a portable computer to act as an electronic tourist guide for the Royal Palace of Venaria in Italy.

The researchers said the new mobile phone technology could play a pivotal role in fuelling people's interest for this feature. 'The smart phone means that augmented reality is at last suitable for the mass market,' Mr Zöllner says.

Itacitus received EUR 1.35 million under the 'Information society technologies' (IST) thematic area of the EU's Sixth Framework Programme (FP6). Launched in 2006 and completed in 2009, Itacitus brought together researchers and industry actors from Germany, Greece, Italy and the UK.

The project partners investigated novel methods of representing cultural heritage virtually and facilitated the customisation of personalised walking and public transport tours in archaeological sites, museums and urban areas.

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Light-based localisation for robotic systems

Getting robotic systems to accurately detect both moving and static objects remains an obstacle to building more autonomous robots and more advanced surveillance systems. Innovative technology that uses light beams for localisation and mapping may offer a solution.

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The technology advances the current state of the art of light detection and ranging (LIDAR), the optical equivalent of radar in which reflected beams of scattered light are used to determine the location of an object. Whereas most LIDAR systems use a one-step process to detect objects by scanning an area and measuring the time delay between transmission of a pulse and detection of the reflected signal, researchers working in the EU-funded 'Intelligent robotic porter system' (IRPS) project added a prior step.

They use LIDAR to first build a 3D map of the area, enabling their system to pinpoint the location of not just static objects but also moving ones — be it a human, an open window or a leaking pipe — to within a few millimetres. The researchers, from four EU countries and Israel and Canada, have called the technology '3D LIDAR imaging and measurement system' (3D LIMS) and foresee a broad range of applications for it, from navigating autonomous vehicles around airports to monitoring industrial equipment and enhancing security surveillance.

'This two-step LIDAR process, involving first calibration and then real-time navigation, is the key innovation. It allows the system to accurately and rapidly detect changes in the environment,' explains Maurice Heitz, the manager of the IRPS project and a researcher at French technology firm CS Communication & Systèmes.

The technology not only detects objects with greater accuracy, but unlike camera-based robotic vision systems it is not affected by shadows, rain or fog, and provides angular and distance information for each pixel, making it suitable for use in virtually any environment.

To highlight the potential of 3D LIMS, the IRPS team built a prototype application in which the technology was used to navigate buggy-like autonomous vehicles that might one day transport passengers or luggage around an airport.

Showcased at Faro Airport in Portugal in December 2009, the robotic porter application involved first building up a 3D image of the airport environment so the system would know the location of static features such as walls, columns, doors and staircases. The buggies then use onboard LIDAR to accurately calculate their position and detect obstacles as they move around the airport.

'Our vision is that one day people, perhaps elderly or with a disability, will go to the airport and by speaking to a porter control centre on their mobile phone or through a web interface on their PDA would be able to order a vehicle to take them to their boarding gate. The vehicle would transport them autonomously, weaving its way between moving objects such as passengers and piles of luggage,' Mr Heitz says.

The IRPS project manager notes that there is real demand for such a system by airport operators, who are finding it increasingly hard to meet the transport needs of passengers and their luggage because of the large size of modern airports. However, he says it will probably be many years before robotic buggies start buzzing around airports autonomously due to a combination of safety concerns and the need for further technological advances.

'Running a 3D LIMS system requires a lot of computer processing power and a large investment,' he notes.

Other applications are closer to market. In the field of security surveillance, 3D LIMS could improve upon current techniques for detecting intruders or spotting changes inside a building.

'The system compares the current acquisition [of reflected light] to its reference acquisition, allowing it to detect any change in the environment,' Mr Heitz says.

In the case of industrial monitoring, for example, a 3D LIMS system operating in a power plant would be able to instantly and accurately detect something as small as a leaking pipe.

Though the project partners say commercial applications for their system are still a few years away, they are continuing to work on the technology and are seeking support for further research and development.

The IRPS project received funding from the ICT strand of the EU's Sixth Framework Programme for research.

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http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=91245

Robots: man's new best friend?

The 29-year-old Erica, living near Budapest, has been in a wheelchair since a road accident at the age of 2. Erica and her guide dog, Borka, are helping scientists from a European research project to understand how robotic assistants can best interact with humans.

Aside from being a companion and a means of social integration, Borka helps physically by carrying out tasks like retrieving objects, opening doors or using light switches. Observations are made in a special room fitted with cameras to study how dogs interact, communicate, follow orders and behave in certain situations. Scientists from the project 'Living with robots and interactive companions' (LIREC) want to use this behaviour as a model for robots, to make them more companion-like.

Researchers test their robot prototypes in real-life situations at a residential home in the university town of Hatfield, near London. One robot, called Pioneer, reacts when the refrigerator door is opened and, using patterns on the ceiling for navigations, approaches the user to help carry their drink. After the user returns to his desk, the activation of the computer screen signals Pioneer to bring the drink to the user. It does not require much imagination to see that a robot like Pioneer could also be useful in assisting a person with disabilities. Following other behavioural models, another robot prototype manages a comfortable distance from the user. Laser, infrared and optical detectors are used to measure this distance, respecting the personal space of the user.

Since there is not just a technical interest in the robots, many of the project's important scientists are biologists, who want to study and mimic natural cognitive and behavioural processes. Dogs react to changes in an environment, when a new object is placed in a room or when someone new enters, for example. They can sense trouble and react to people's emotions. There is no need or wish for robots to replace the role of dogs, but understanding how a dog attracts attention or how its personality plays a role during interaction could help scientists to develop robots that are easier to use and are more acceptable by users unfamiliar with technology.

An attempt to bring more personality to robotic technology is to be found at Heriot Watt University in Edinburgh. SARAH, meanwhile, is a virtual character embodied by a seeing, talking and mobile robot with a face on the monitor. SARAH is a 'Social agent robot to aid humans'. She can perform tasks in the lab like bringing someone the telephone when it rings. Similar to the robot Pioneer, SARAH uses patterns on the ceiling to navigate.

The developers of SARAH have implemented the concept of migration: transferring the 'mind' of SARAH, which after all is just software, to other electronic devices throughout the building. SARAH can be carried around by a user in the form of a handheld device. She can also be found on a big flats creen monitor, where she can recognise a person standing in front of her or answer questions sent by SMS.

This kind of transferral of social and cognitive attributes into robotic technologies is an important step towards bringing these prototypes into the home and workplace.

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Haptic solution for modelling industrial designs

Industrial design modelling, used to make prototypes of home appliances or mock-ups of car parts, could soon make the leap from the world of plaster, plastic and sticky tape into the digital domain thanks to an augmented reality design system developed in Europe.


© SATIN

The system, developed by a team of researchers from six EU countries, merges touch-sensitive haptic technology with 3D digital modelling and computer-aided design (CAD) to allow professional designers to feel and shape their creations physically and virtually. Implemented commercially, the system promises to save companies time and money, raise designers' productivity and improve the quality of new products.

'Though designers use computer programs to create mathematically precise models of products, they still need to be able to see and handle the model physically. Until now, the only way they have been able to do that is to turn to a model-maker to create a real, physical sample. It's a labour-intensive, time-consuming and costly process,' explains Monica Bordegoni, a professor at Politecnico di Milano university in Italy.

Haptic technology, which uses mechanics and/or special materials to transmit and receive information through the sense of touch, offers a practical solution, providing many of the benefits of physical models with none of the drawbacks. The team of researchers, coordinated by Ms Bordegoni and funded by the European Union in the project 'Sound and tangible interfaces for novel product shaping' (SATIN), therefore saw haptic technology as the logical next step in the evolution of industrial design.

'Haptics is far from a mature technology, and this project was one of the first to build a haptic system for industrial designers,' Ms Bordegoni notes.

The multimodal and multisensory SATIN system consists of two FCS-Hapticmaster

devices, in essence robotic arms more commonly used for remote welding or dental surgery, which position and rotate a robotic spline, an electronic version of the flexible strip of material, typically wood or metal, long used by designers to draw curves. Fitted with actuators and sensors, the spline automatically twists and bends to the shape of a digital representation of the product uploaded by the designer into the system.

Standing in front of a workstation and wearing 3D glasses, the designer views, through a set of mirrors, a virtual 3D model of the product superimposed where the spline actually is. By pressing the centre or pushing or pulling the ends of the robotic spline with their hands, the designers can reshape and reform the 3D model. Models can be saved and compared, and any changes made much more quickly and simply than using traditional modelling methods.

'It is a two-way system. The spline both responds to inputs made to the digital model on the computer and outputs changes made by the designer to the physical interface,' the project coordinator says.

Additional information about the model that cannot be perceived tactilely on the spline, such as discontinuities of a curve or inflection points, is transmitted through audio signals as the designer runs a finger along it.

'Haptic technology is still not advanced enough to provide all of the information about a surface. The SATIN system, for example, can only represent curves. However, we expect improvements in materials and mechanics over the coming years to lead to systems that will allow designers to feel, handle and reshape any kind of object surface,' Ms Bordegoni says.

The SATIN team is planning to continue its research in that direction, and some of the partners are considering setting up a spin-off company to commercialise the SATIN system. It is an endeavour for which they are actively seeking investors and partners.

Ms Bordegoni says a commercial version could be put to use by any company that currently makes use of industrial design processes, from car and home appliance manufacturers to furniture makers and producers of building materials.

'Trials we conducted with industrial partners and designers from companies outside of the project showed that there is a lot of interest in our solution. They can see the benefits in terms of cost and time savings as well as improved product quality,' Ms Bordegoni notes. 'In addition, designers said they like it because they feel they have more artistic control over their creation.'

SATIN received funding from the ICT research strand of the European Union's Sixth Framework Programme.

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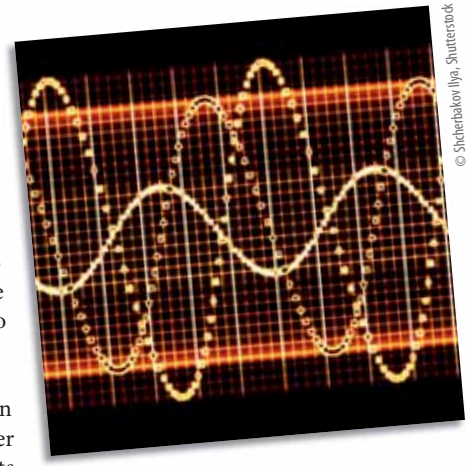
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=91241

When noise becomes the signal

European researchers have developed a new class of electronics that uses noise — normally a problem — as part of the signal. It means better, faster electronics.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'It is a tale, told by an idiot, full of sound and fury, signifying nothing,' according to Shakespeare's Macbeth. Of course Shakespeare was speaking about the brevity of life, but his words apply equally to noise in a signal.

A signal — any signal — inevitably has some noise, a degree of imprecision that carries no information, literally signifying nothing, and even confusing the underlying data. Most of the time engineers work very hard to ensure a high signal to noise ratio — lots of signal for very little noise.

'That is why in commonly used electronics, the signals are boosted well above noise margins,' explains Lukas Worschech, coordinator of the 'Sub-KT low energy transistors and sensors' (Subtle) project and a professor at the University of Wurzburg.

That is a fine and worthy goal in most applications, but as devices become smaller, and more complex, the noise becomes a greater and greater problem. It is a bit like dots of ink becoming less sharp as they get smaller, as with impressionist paintings.

'Electronics is based on switches, which can turn on and off signals. The smaller the switches are, the more complex circuits can be realised,' notes Mr Worschech.

'However, with increasing miniaturisation of electronic circuits, an increasing fraction of the applied power is converted into non-deterministic signals that add to the ambient noise. It is sometimes referred to as the thermal death of electronics.'

It is a problem, and it is setting limits on the miniaturisation, complexity and power of small circuits. Engineers and scientists love limits; it gives them a chance to employ some cunning insight to overcome them.

The scientists and engineers at the Subtle project have been very cunning, and their solution is subtle indeed. The project sought to use the noise — normally a problem — to boost the signal.

The idea relies on a concept called 'stochastic resonance' (SR), a phenomena in physics first identified in climatology to explain a pronounced variability within the climatic system, where very small changes can lead to profound impacts, such as a mini-ice age.

Stochastic resonance is where a very small variation in a cycle can 'tune in' with other periodical variations to create a massive impact. Its application depends on non-linear systems, where linear inputs do not equate to linear outputs — where the sum is greater than the parts.

'This is the Subtle solution: do not avoid noise, but exploit noise by SR. This is [made] possible by utilising the feedback action between switches and conducting channels,' reveals Mr Worschech. 'That is what naturally happens in nanoelectronics. The conductors are very closely spaced to each other. The interaction can even be tailored by the shaping of the conductors.'

Applied to signals, the phenomena opens up the opportunity for engineers to 'force' signal clarity by tuning noise within it. It offers a possible solution to the problem of noise in extremely small components. The idea is not new and was first mooted some years ago, but making it work is an enormous engineering and scientific challenge.

➔

A challenge greeted with gusto by the EU-funded Subtle project. The work programme was ambitious; they sought to conceive and create a new class of electronics that uses noise to enhance the signal.

'Subtle is a STREP project associated with nanoelectronic devices in which quantum-confined electron channels are so closely spaced to each other that tailored feedback action exists,' Mr Worschech notes.

This tailored feedback enhances the signal. The devices employ two, allied, phenomena: back action on the channel gate and noise-induced switching. A channel gate is used to route a signal, and back action is like feedback in an audio system. The subsequent noise can be used to switch the circuit from one channel to another.

Both required very sophisticated circuit design and fabrication and Subtle took full advantage of its partners, who are European leaders in the field.

They developed highly novel techniques and pushed the state of the art in a number of domains. They proved selective etching of independent contacts in a double quantum well structure, creating a quantum gate transistor. It is an extremely complex element at nano-scale dimensions and required molecular beam precision to be realised.

These are very sophisticated achievements that enable smaller, cheaper, more power efficient and complex circuits, and they may have application in other fields, too. For example, the Subtle team, as part of its work, developed sub-micron arrays of resonant tunnelling diodes that can act as an artificial neuron.

These are simple computing, logic gates. Their actions resemble the firing of signals as they are observed between neurons. The Subtle team believes that its devices can be thus used in the future to mimic neuron action in artificial networks and to serve as sensors for signals usually hidden under the noise.

This work demonstrates starkly the amazing potential of these new sensors. They can operate at less than millivolts, significantly less that the current state of the art. In combination, they could be used to create neural networks, where actions cascade based in part on the noise of individual spiking neurons. This incredible sensitivity makes the devices an ideal candidate for quantum computing.

And there's more. Typical computers focus on output, the result of a sum: 5 + 2 = 7. Conventional computers discard the input — the individual transistor states that give us the binary digits. However, the quantum transistors developed by Subtle can morph, or reverse, opening the prospect of maintaining the inputs.

'This could be a reversible computer, where you could return to the inputs from the output. It will probably be essential for quantum computing because there will be instances where you need the input,' explains Mr Worschech.

These are areas for further research, and the consortium is hoping to set up another project. In the meantime, the project has filed a patent and has been approached by companies that want to build sensors from Subtle technology.

'These gates work at such low voltages and with so little noise that they are far ahead of the current state of the art in terms of the sensitivity,' Mr Worschech reveals.

The wide variety of applications and the intensity of excitement generated by the Subtle project demonstrate the importance of its work. It has led to a new class of electronics and a whole host of potential new solutions to old problems. And all from some very subtle insights.

The Subtle project received funding from the FET-Open strand of the EU's Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=91229

Deriving value from the treatment of agro-industry waste

Scientists involved in an innovative European project used laboratory experiments to identify the most effective methods of pre-treating waste.

Proper waste management can not only reduce the amount of material being sent to landfills, but can also produce a valuable by-product in the form of biogas. The Hydro Engineering Institute Sarajevo (HEIS) in Bosnia and Herzegovina participated in a pioneering research project to advance the treatment of waste from agro-industry.

The project, entitled Agroiwatech(1), obtained support from the 'Confirming the international role of Community research' (INCO 2) programme. The team at HEIS was responsible for investigating the potential of pre-treatment prior to anaerobic digestion. The objective was to maximise the production of methane gas.

During the course of the three-year project, the HEIS researchers had the opportunity to assess seven different types of pre-treatment, ranging from mechanical to biological to chemical. The impact of each method on waste collected from different sources was measured using the biochemical methane potential (BMP) testing protocol.

In some cases, such as the waste from a potato processing plant, none of the pre-treatments were successful in boosting biogas production. However, for industries producing less biodegradable waste, pre-treatment could achieve remarkable results. For example, a combination of chemical pre-treatments significantly increased gas production from brewery waste. Even more dramatic results were achieved by pre-treating sunflower industry waste with enzymes, which helped quadruple methane production in a relatively short period of time.

It should be noted that all the pre-treatment techniques identified by the scientists at HEIS are relatively straightforward to implement.

(1) 'Cost-effective technologies for wastewater treatment and waste biodegradation in agro-industries with reclamation of resources.'

Funded under the FP5 programme INCO 2
(Confirming the international role of Community research).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5403

See page 21, **'Turning brewery waste into animal feed with hydrolysis'**

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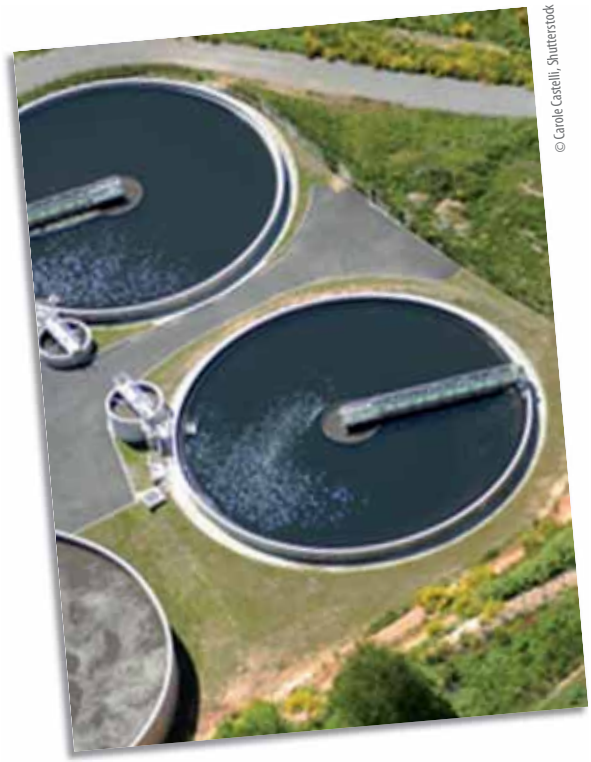
Complying with European wastewater guidelines

A new report from Wageningen University in the Netherlands explains in detail how to treat agro-industrial wastewater effectively using anaerobic techniques.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The Sub-Department of Environmental Technology (ETE) at Wageningen University coordinated an important project, Agroiwatech([1]), aiming to advance wastewater treatment in the Balkans.

Wastewater produced by breweries as well as sugar, potato and other fruit and vegetable processing plants was targeted. The proposed solution was an upflow anaerobic sludge blanket (UASB) reactor. Pre-treatment of the wastewater included screening, plate clarifiers and buffer tanks while residual solids and nutrients were removed during the post-treatment phase.

The result was removal of nearly 90 % of the chemical oxygen demand (COD), an indirect measure of the amount of organic material contained in the waste stream. This performance ensured compliance with the water quality requirements defined in the European Commission Urban Waste Water Treatment Directive.

The system's energy consumption was minimised since heating of the wastewater was not needed. Expanded granular sludge blanket (EGSB) reactors were also evaluated during Agroiwatech, but were found to be more complicated and less efficient at removing solids than their UASB counterparts.

The ETE researchers and their partners compiled a report following the conclusion of the project. In addition to elaborating upon different wastewater treatment scenarios, the report also encourages a more holistic approach to the issue of wastewater. For instance, the amount of effluent can be significantly reduced through more intelligent use of water in the factory. This in turn enables the use of a smaller UASB reactor which helps decrease both initial capital expenditure and ongoing maintenance costs.

(1) 'Cost-effective technologies for wastewater treatment and waste biodegradation in agro-industries with reclamation of resources.'

Funded under the FP5 programme INCO 2
(Confirming the international role of Community research).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5371

See page 20 **'The effects of war on water quality in the Una River'**

Experimental data for flashing liquid jets

Flammable liquids stored at high pressure are one of the main safety risks in industrial installations. The results of a series of laboratory experiments provided valuable insight into the complex behaviour of flashing liquids.

Leaks of combustible fluids, whether caused by human error or equipment malfunction, can cause flashing that can lead to a fire if accidentally ignited. Organisations from four different Member States joined forces during the 'Flashing liquids in industrial environments' (FLIE) project to study flashing liquids in detail. Support was provided by the EU's Energy, Environment and Sustainable Development Programme.

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One of the participants, the Von Karman Institute for Fluid Dynamics in Belgium, performed a number of experiments in the laboratory. Several different laser-based optical techniques were employed to collect data near the point of release. Additional information regarding particle size and velocity was obtained with high-speed video photography and temperature sensors.

The team identified which techniques worked best in certain conditions. For example, particle image velocimetry (PIV) was well-suited to studying two-phase jets. In addition, problems with ice forming on the thermocouples used to measure temperature were avoided by controlling the relative humidity. Finally, the data was analysed to determine how various parameters, such as initial pressure, influence flashing.

It is expected that updated regulations based on the findings of the FLIE project may reduce the number of flashing accidents at chemical and other industrial plants.

Funded under the FP5 programme EESD
(Energy, environment and sustainable development).
Collaboration sought: information exchange/training.
http://cordis.europa.eu/marketplace > search > offers > 5385

Polypropylene textiles can take the heat

European researchers have produced the ideal fabric. Soft, yet fire resistant, the polypropylene-based material can be produced using halogen-free, environmentally friendly methods.


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Textile scientists from the 'New fire retardant textiles' (Nerefite) project developed new fire retardant (FR) treatments for polypropylene. The consortium was part of an EU-funded safety initiative to develop FR treatments that enable fabrics to withstand conditions of extreme heat without causing a fire.

Researchers investigated new types of FR additives for the binder resin of the padding of non-woven polypropylene. The new compounds were developed on the basis that they would cause the surface of the textile to swell to several times its thickness when exposed to fire, the so-called intumescence process.

Once the charred surface of the material has expanded, the underlying fibres, the fuel, remain protected from the surrounding fire. The material underneath is deprived of the other two essential requirements for the combustion process — heat and oxygen. The now charred exterior acts as a thermal insulator and also blocks the diffusion of oxygen.

The FR halogen-free compounds developed by the Nerefite project represent a significant step forward for the European textile industry. The new polymer materials can be used in the production of lightweight and hardwearing safety clothing for firefighters and other hazardous occupations. Fire-retardant textiles for interiors of cars, trains and private homes also stand to improve safety overall for the EU citizen.

Funded under the FP5 programme Growth (Competitive and sustainable growth).
Collaboration sought: further research or development support.
http://cordis.europa.eu/marketplace > search > offers > 5368

Small companies add value by sharing commercial information

Small companies prepared to share commercially sensitive information can add value and develop new services for their customers, using a distributed track-and-trace software solution.

Small companies will be able to track-and-trace the movement of their materials and products from their suppliers through to their final customers, using a new open source and free solution.

One of the characteristics that makes the 'Identity based tracking and web-services for SMEs' (Traser) project's track-and-trace solution different is that the product location information is not owned or controlled by a central authority. Instead, the companies along the supply chain share their data in the interests of all.


© Traser

Traser will adapt easily to larger customers' supply chain management or enterprise planning systems. And it enables companies to make rapid changes to their supply networks while maintaining high security levels.

Most supply network systems designed to track products — such as the EPC Global ONS/EPCIS system being championed by major retailers and product manufacturers around the world — are centralised to some degree. ONS/EPCIS has a central lookup service that must be contacted by someone looking for information on a product with a unique identifier. The lookup service returns a service address for the unique identifier where further information on the product can be found.

There are advantages to the ONS/EPCIS approach. If the product changes ownership the details at the central lookup service can be changed to direct enquirers to the address of the new owner's services for that product. But there are also major disadvantages. If the central lookup service can't be accessed for whatever reason, services relating to the product can't be accessed.

By combining a product ID with a company web address, Traser creates a unique product identifier that does not depend on regis-

tration at a centralised supervisory authority. Each company remains responsible for the maintenance of their own product data and any links to product-related services. By dispensing with the need for a central lookup service, the network is less vulnerable to malfunction or abuse.

Services for any item must remain accessible at the same address for the entire life span of the identifier. Where there is a change of ownership, the new owner would usually issue a new identifier.

'Traser is designed as an entry-level solution platform,' says Dr Elisabeth Ilie-Zudor, coordinator of the Traser project, and a researcher at the Computer and Automation Research Institute of the Hungarian Academy of Sciences. Traser involved researchers in Finland, Hungary, the Netherlands and Romania from both academia and business.

'We strove to keep it as simple as possible in operation. Still, it remains vital to understand what is actually done in a track-and-trace network to make it work.'

The owner of any Traser server can set access rights to data on an item-by-item, partner-by-partner basis. The Traser platform uses web services for server-to-server and client-to-server communication. A WS-Security standard communication channel is used to sign and encrypt the contents of the messages, using a public-key communication approach.

A Traser network has a core of interconnected company servers, surrounded by an 'envelope' of clients. Those clients may gather information from bar codes, radio frequency identification (RFID) tags or other carriers of a product's unique identifier. Whatever client is used, the interface between client and server is uniform. Therefore, Traser can adapt to a wide range of input types.

In the same way, Traser can adapt to other IT components such as customers' enterprise resource planning (ERP) or supply chain management systems. In Traser pilots, client-adaptors were developed for some of the existing ERP and peripheral middleware systems.

'Developing adapters for all major ERP examples was not within the scope of the project,' according to Dr Ilie-Zudor. 'However, we have closely examined all issues of adapter design and implementation that may surface in a business application and we have provided guidelines that users can rely on for a systematic adaptation approach.'

'Once users attain an adequate "picture of the world" and become able to relate their own business scenarios with the possibilities and principles of Traser, implementing an initial solution is fairly easy,' says Dr Ilie-Zudor.

During the Traser project, the consortium members led a number of pilots — ranging from a closed-circuit asset-tracking system to the flow of materials along a supply chain. They also ran a special pilot tracking the distribution of electronic documents for a collaborative design project.

'The Traser platform remains in use at some of the piloting companies,' adds Dr Ilie-Zudor. 'One of the consortium members also offers Traser as a tracking component in its enterprise IT solution.

'And one IT company outside the consortium has examined and tested the Traser platform and explored how it can be coupled with its own tracking network solution.'

Few small companies have track-and-trace capabilities at the moment. There is growing pressure for transparency along supply chains because of the greater certainty that gives customers. However, widespread use of systems like Traser will require a change in mindset among SMEs, according to Dr Ilie-Zudor.

'There is a general wariness about sharing information related to production and delivery. But companies need to view shared data as an investment where the creation of a better picture for everyone leads to a payback in cost reductions, better working methods and greater coordination.'

The Traser project received funding from the ICT strand of the Sixth Framework Programme for research.

Promoted through the ICT Results service.
http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&ID=91034

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Watch this space!

Coming up in issue 25 of *research*eu results supplement* a special dossier on 'Smarter, better transport'. Europe is on the road, track, path… to more sustainable, safer and joined-up mobility solutions.

The following upcoming events were selected from the event diary of the Directorate-General for Research and from the CORDIS event calendar.

For further information on past and upcoming events, please visit:

http://ec.europa.eu/research/events
http://cordis.europa.eu/events

Marine biotechnology: future challenges

A six-day conference on marine biotechnology will be held in Acquafredda di Maratea, Italy from 20 to 25 June 2010.

This conference is designed to promote scientific excellence in marine biotechnology, give a platform for leading scientists and young researchers to present their work and discuss the future of the field in Europe.

Organised around seven half-day sessions, event topics will include: algae and seaweed biomass; aquaculture; bioprospecting; human and environmental health; enzymes; marine bionanotechnology and biomaterials; marine models; pollution and bioremediation; and bioinformatics and research infrastructures.

For further information, please visit:
http://www.esf.org/activities/esf-conferences/details/2010/confdetail330/330-conference-overview.html

Workshop on tools for cryptanalysis 2010

A two-day workshop on all aspects related to cryptanalysis research, mixing symmetric and asymmetric cryptography, as well as implementation issues will be held in Egham, UK on 22 and 23 June 2010.

Organised under the umbrella of the Ecrypt II network of excellence, the workshop is a forum that will present new software and hardware tools including underlying mathematical ideas and practical applications. The programme committee includes academics from throughout Europe.

For further information, please visit:
http://www.ecrypt.eu.org/symlab/tools2010

The 2010 European Space Agency living planet symposium

Bergen, Norway will be hosting the symposium from 28 June to 2 July 2010.

The symposium, with the support of the Norwegian Space Agency, will present the latest results and research from ENISAT — the largest Earth observation (EO) spacecraft ever built. Researchers and scientists from the ERS, GOCE, SMOS, Cryosat and ESA third-party missions will also showcase their work.

Newly obtained knowledge, however, will not be the event's only function. The symposium will present the development of applications and services like the 'Global monitoring for environment and security' (GMES). The ESA will display their climate change initiative.

Finally, the event will also discuss future ESA missions. This includes GMES sentinels, Earth explorers and meteorological missions and national EO missions.

For further information, please visit:
http://www.esa.int/LivingPlanet2010/

Teichmüller theory and its interactions in mathematics and physics

The theoretical and mathematical analysis of the Teichmüller theory will be discussed at a conference in Bellaterra, Spain from 28 June to 3 July, 2010.

Teichmüller Theory is the study of moduli space of geometric structures on surfaces. The conference aims to highlight some of the most important advances in Teichmüller theory. This theory will be considered both from the geometric point of view (Thurston's theory and its ramifications) and from the analytic point of view (the Ahlfors-Bers theory and its ramifications). The connection with physics will also be emphasised.

In addition to specialised presentations, there will be several 'survey talks' given by leading experts in the field. Young researchers are particularly encouraged to participate, and graduate students in the field are also welcome.

The European Mathematical Society and the European Research Centre on Mathematics, in partnership with the European Science Foundation, are organising this event.

For further information, please visit:
http://www.esf.org/index.php?id=6305

'ESOF2010' Euroscience open forum

The Euroscience open forum will be held in Turin, Italy from 2 to 7 July 2010.

This biennial European meeting dedicated to scientific research and innovation will discuss how best to achieve the Lisbon agenda goals. The Lisbon agenda is a set of strategies that the European Union has deployed for its economic and social development.

What will be the most important challenges that Europe will have to face in 2010 in the field of science and technology in relation with the rest of the world? Attend the event to find out.

For further information, please visit:
http://www.esof2010.org

Nanotechnology for sustainable energy

The impacts of nanotechnology on the development of sustainable energy systems will be explored at a conference in Obergurgl, Austria from 4 to 9 July 2010.

The impact of nanotechnology on the environment will also be discussed. The aim, though, is to provide a comprehensive overview of nanotechnology and showcase the latest developments in the field with respect to energy research, technologies and opportunities. Discussions will revolve around the basic science of energy and environmental technology, and application oriented research.

The conference also aims to identify synergies between disciplines and people, and to catalyse global contacts and collaborations among world leading experts and laboratories.

The conference is organised by FWF (Fonds zur Förderung der wissenschaftlichen Forschung) in Austria and Leopold-Franzens-Universität Innsbruck in partnership with the European Science Foundation.

For further information, please visit:
http://www.esf.org/index.php?id=6489

Training school on climate change and agriculture

The two-day training programme will take place in Keszthely, Hungary on 5 and 6 July 2010.

The European Cooperation in Science and Technology (COST) is accepting applications for those interested in the impact of climate change on agriculture.

The training seminar will cover issues concerning the evaluation, assessment and modelling of climate change and variability impacts to European agriculture. Practical sessions have been organised with leading scientists who will discuss climate forecasting and modelling, and agro-climatic indices and modelling.

The main themes will be climate variability, climate change, agrometeorological and agroclimatic indices, models, estimation of hazard and application of remote sensing techniques.

For further information, please visit:
http://tiny.cc/1cax1

Conference on networking technologies

The eighth international network conference 2010 (INC2010) will take place in Heidelberg, Germany from 6 to 8 July 2010.

This conference, one in a long-running series, will bring together leading figures from academia and industry to present and discuss the latest advances in networking technologies from research and commercial perspectives.

The event will be held over three days, with presentations delivered by researchers from across the international community. Social events and a conference banquet are also scheduled.

For further information, please visit:
http://www.inc2010.org

Fourth international symposium on physical sciences in space

A five-day symposium on physical sciences in space will be held from 11 to 15 July 2010 in Bonn, Germany.

This event will address a number of space-related fields including experiments carried out on drop towers, parabolic aircraft flights, sounding rockets, unmanned recoverable capsules and, last but not least, the international space station.

The event wants to encourage discussions and so has limited the number of sessions. Keynote speakers will present some of the latest developments in the field. Oral presentations and poster sessions will also be in order.

Research areas include fundamental physics, fluid physics, materials science, and interdisciplinary projects.

The symposium is organised jointly by European Space Agency and the German Aerospace Center on behalf of the International Microgravity Strategic Planning Group.

For further information, please visit:
http://www.congrex.nl/11A02

New perspectives in the study of late life

A six-day summer school on the latest research in ageing will be held in Keele, UK from 18 to 23 July 2010.

Organised by Keele University, the summer school will include course work and discussions on: ageing and theory, methodological issues and ageing research, critical issues in social policy, practice and older people, and family life and ageing.

The programme is intended for policy makers, practitioners, and students in the field. Invited speakers, guest lecturers, and events should provide an ideal forum for discussion, debate, and networking.

For further information, please visit:
http://tiny.cc/95o9v

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