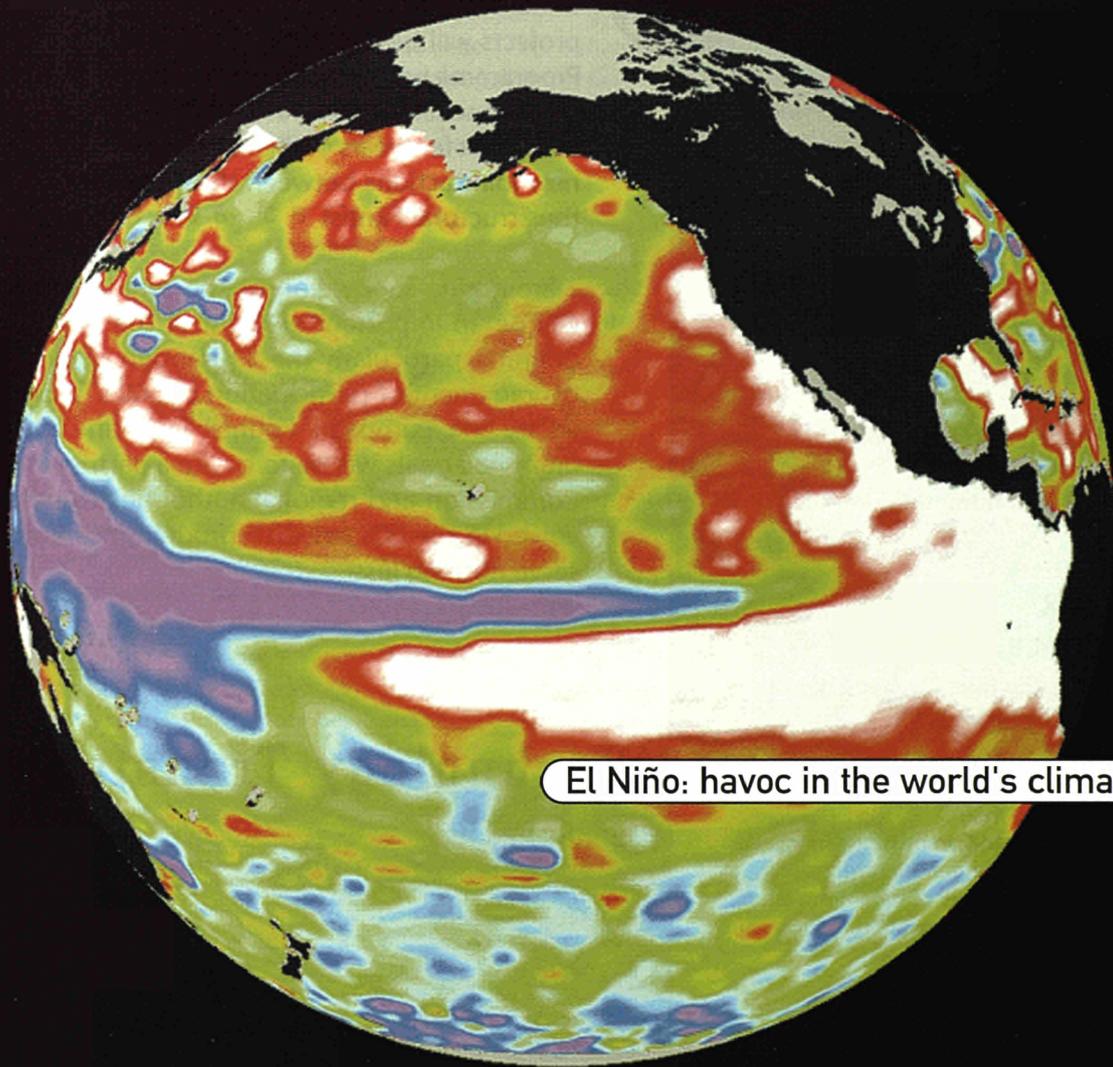


# Innovation & Technology Transfer

5/98

Earth Observation

## Feedback from a Small Planet



El Niño: havoc in the world's climate ?

Plus

Innovation in Europe's regions • A step change for photo-voltaics  
• New materials for old buildings • Video-telephony

... and more





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# Innovative Regions

The re-orientation of the next phase of the Structural Funds (2000-2006) towards a greater emphasis on promoting innovation is welcome news, as it is exactly what the Innovation Action Plan called for.

The Plan, for example, specifically mentioned the Structural Funds and the Framework Programme for Research and Development when calling on the Commission to lead by example and mobilise its own instruments. Hence it is heartening to see the level of coordination between the Innovation Programme and the Structural Funds administration in funding regional innovation projects - the so-called RITTS/RIS projects.

By the time the next phase of the Structural Funds gets under way, of course, the final stage of the current RITTS projects will be coming to an end and the Fifth Framework Programme will be into its second full year. I certainly expect that the success of the RITTS/RIS initiatives will be built upon in the first few years of the new millennium, perhaps through new joint actions between the Framework Programme and the Structural Funds.

Promoting innovation at the regional level, meanwhile, will be an important element of the new Framework Programme, particularly the "Promotion of innovation and encouragement of participation of SMEs" programme, adopted by the European Council last June. One of this programme's goals will be to create a partnership between the Commission and regional authorities to help SMEs get involved in the EC's research programmes. Europe's SMEs deserve nothing less.

Édith Cresson

## Innovation & Technology Transfer



The European Commission's Innovation Programme is under the responsibility of Edith Cresson, Member of the Commission responsible for Research, Innovation, Education, Training and Youth.

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# Marrying Innovation and Regional Support

*The lessons learnt in developing innovation at the regional level over the past few years will be reflected in the next phase of the EC's Structural Funds, 2000-2006.*



*The regional level is very appropriate for promoting innovation*

[Edith Cresson]

**B**efore 1991, the Structural Funds earmarked around 200 million ECU for encouraging innovation and R&D. Today, that figure has risen to five billion ECU," remarked Eneko Landaburu, Director-General of DG XVI (Regional Policy and Cohesion). "This is a quantum leap, there is no

question. But, to be honest, too much of this has gone on basic research and infrastructure, and too little on innovation. Overall, the funds have had a positive impact, but I feel we could do better."

Landaburu was speaking at Innovative Regions in Europe, a conference which assembled

around 200 participants in 'Regional Innovation and Technology Transfer Strategy' (RITTS) and 'Regional Innovation Strategy' (RIS) 'schemes, which are funded by DG XIII (the Innovation Programme) and DG XVI (see 'RIS/RITTS in Brief').

Held in late June, the conference

came less than one month after the Commission released 'Reinforcing Cohesion and Competitiveness through Research, Technological Development and Innovation'<sup>(1)</sup>. As called for in the Commission's Innovation Action Plan, the Communication outlines how cohesion, competitiveness, R&D and innovation can be brought together into a single, coherent framework. With the Structural Funds' budget for 2000-2006 amounting to some 218 billion ECU, this has significant implications for promoting innovation around Europe.

## BUSINESS CREATION

### Listening to the Jobmakers

*A conference this November will examine new ways of improving the conditions for business creation in Europe.*



**T**he conference, to be held in Vienna on November 12-13, is the culmination of nearly a year of consultation and study. The process was launched within the framework of the European Commission's Innovation Action Plan, when Edith Cresson, European Commissioner for research and innovation, brought together 100 key players from industry, science and finance in Paris in December 1997 to discuss the best ways of supporting business and job creation in Europe<sup>(1)</sup>.

They created three working groups, who presented their proposals and ideas at a conference in Luxembourg last May<sup>(2)</sup>. The invitation-only conference this November will see these ideas being discussed by a large number of successful entrepreneurs and decision-makers from around Europe.

#### Three Phases

The working groups looked at three separate phases in the development of new businesses - project gestation, the start-up phase and growth - and covered areas of policy as diverse as encouraging innovative attitudes, networking business angels and stock markets.

These ideas will be presented at the opening plenary session in Vienna, which will also feature several entrepreneurs discussing the general conditions for - and barriers to - success in Europe. A

number of case studies will be presented to illuminate issues such as forging links with research centres, financing start-up and growth and managing international development. Ways in which the European corporate environment can be made more 'entrepreneur friendly' will be debated, before the participants split into three parallel sessions, each chaired by an entrepreneur, to consider improving access to competences, financing and markets.

The conference will close with a major discussion of how the entrepreneurs' recommendations can be incorporated into the activities of the major actors in the field - SMEs and large companies, research centres, financiers, national and regional governments, and the Commission itself.

<sup>(1)</sup> The Paris and Luxembourg meetings were covered in editions 2/98 and 4/98, respectively.

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#### Taking Stock

The Communication sets out to ensure that future Structural Fund activities - which are funded by the EC but administered by national and/or regional governments - will integrate R&D and innovation into the productive fabric of their target regions. Despite previous efforts, these 'less favoured' regions still have a low R&D intensity, an over-dominant public sector, an emphasis on basic research at the expense of innovation and technology transfer, and poor connections to international research and innovation networks.

The current Structural Funds phase (1994-1999) did begin to address this - the RIS pilot projects, administered by DG XVI, are an obvious example, while some regions and countries have begun investing their Structural Funds in what Land-

<sup>(1)</sup> COM(1998) 275 final.

aburu calls 'abstract infrastructure' - raising the number of qualified R&D personnel and emphasising networking, brokerage and demand stimulation. In Ireland, he points out, the emphasis went from providing research for firms to supporting research in firms.

Despite this, most of the Funds still tend to be directed towards supporting the existing public science system, perpetuating and reinforcing the regions' structural problems.

According to Landaburu, "the experience built up through RITTS and RIS will be very important to ensuring that the next Structural Funds phase puts innovation at the heart of each region's strategy. Their success points the way forward - basing action on business needs, encouraging cooperation between

## RIS/RITTS in Brief

**R**ITTS and RIS projects are supported by the Innovation Programme and DG XVI's European Regional Development Fund (ERDF), respectively(1). Both have broadly similar aims - to help regional governments or development organisations assess and then improve their regional innovation system. They cover a wide range of issues, from the basic science infrastructure to the presence of finance, from technology transfer networks to coordination of consultancy services.

All of the EU's regions are eligible for RITTS, which bring in external consultants to do part of the work. As these consultants are usually involved in several RITTS projects, there is real scope for transferring experience and best practices across Europe. The RIS projects, on the other hand, are targeted only at those regions eligible for support from the ERDF, and therefore have the additional objective of improving the regions' use of the Structural Funds.

While these projects are not short-term in nature,

their findings are beginning to appear in regional policies across Europe, ranging from a new innovation centre in Hamburg to a voucher system in Helsinki which allows firms to 'shop around' for innovation support services.

Finally, the Innovation Programme has also begun supporting Trans Regional Innovation Projects to refine and then implement the action plans developed through previous RITTS/RIS projects. They each involve at least two regions, and as the participants must also set up a permanent evaluation and monitoring system they should result in benchmarking and knowledge sharing across Europe.

(1) See *Innovation & Technology Transfer: 'Reinforcing Europe's Regional Innovation Fabric' (Dossier, September 1997); 'Too Many One-Stop Shops? The Southern Sweden RITTS' (Case Study, March 1998).*



*The first edition of RIS/RITTS News, an occasional newsletter, appeared in June. Subscriptions are available from the RIS/RITTS Secretariat.*

firms and involving the regions' grass-roots."

### Integrating Innovation

Just how successful have RITTS and RIS been? According to Mme Cresson, Commissioner responsible for research, innovation and education, "they have been exemplary, they're at the forefront of promoting innovation."

"The regional level is very appropriate for promoting innovation - the people know each other, there is a sense of regional solidarity and networking is basically easier," she points out. "RITTS and RIS make a real difference in many ways, not least because they help ensure that R&D that is not relevant to local needs is not supported. They're also a useful illustration of how two different Commission services can mobilise their resources and coordinate their activities."

"The RITTS/RIS methodology has been widely approved," agrees Robin Miège of the Innovation Programme. "They have raised awareness of innovation as a regional development tool, and have helped integrate innovation into the many different relevant policies found at the re-

gional level. They do this by 'turning the pyramid upside down' - regional SMEs are no longer on the receiving end of regional policy making. Instead, it is largely up to them to indicate what type of services are needed. It often represents a major challenge in regional policymaking. The challenge today is to keep the momentum high, to benchmark the different activities and promote networking between the regions."

There is a genuine need to ensure that the different regional projects are brought together to form a 'learning network'. This summer, in fact, saw the launch of an evaluation of the current batch of RIS projects. "Many of these

projects have already finished their first phases," explains Matt Staton of Ecotec, the consultancy company running the evaluation. "We aim to learn lessons from these initial phases and then track these projects' development from now until their completion."

A general e-mail survey of all the RIS regions will lead to the in-depth examination of eight RIS regions to provide 'case studies'. The final conclusions are expected in November, with the lessons learnt appearing in the new edition of the RIS/RITTS Guidebook, expected soon afterwards.

An evaluation of the RITTS projects will be launched later this year. ●

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# Formula for the Future

*An eastern German research centre supported by 'Objective 1' Structural Funds is promoting biotechnological innovation. A sign of things to come?*



When Hans-Ulrich Demuth and Konrad Glund of Halle, in eastern Germany, looked for a place to develop more efficient ways to make drugs for diabetes and Alzheimer's disease, they found one in their own backyard.

Last December their biotechnology company, Probiodrug GmbH, rented 1,300 square metres of office and laboratory space at Bio-Zentrum GmbH, a research centre that received more than 26.4 million deutsche marks from the ERDF's 'Objective 1' funds, which target less economically developed regions.

"The centre is a lighthouse in the community," said Demuth, whose company was the first to sign up to use the centre's facilities. "We could have found property somewhere else, but it would have cost a lot more time and money. What's more, the centre's location is perfect for accessing the resources of the local universities, research centres and companies."

## Objective: Innovation

Bio-Zentrum, an extension of Halle's technology and innovation park, was founded in July 1994 with the ERDF funding plus 7.9 million marks each from the German and Saxony-Anhalt governments. By promoting technology transfer and innovation in areas like chemistry, biotechnology and the pharmaceutical industry, it exemplifies the EC's plans to focus the next phase of its Structural Funds on encouraging innovation.

Located in the heart of eastern Germany's chemical industry, Bio-Zentrum aims to renew the region as a centre of biotech research. It focuses on encouraging technology transfer between

the neighbouring Martin-Luther University and SMEs - about 49% of the facilities are expected to be used by the university, with companies using the rest. It is also located close to the Leibniz Institute for Plant Biochemistry and Buna Sow Leuna Olefinverbund GmbH, three eastern German chemical plants bought by the Dow Chemical Company in 1995.

"We offer regional companies modern laboratories and the opportunity to set up greenhouses under very favourable conditions," said Sabine Noll, Bio-Zentrum's deputy director. "So far, we have rented around 65% of our facilities, and plan to rent out the entire space in the next one to two years. By then we will probably have created 300 to 400 jobs in the region."

Probiodrug is one of four companies that have signed on to use the facilities so far. Other tenants include the Max-Planck Society's enzyme research department and the university. Probiodrug, which spent 3.5 million marks to install laboratory equipment and pays around 20 marks/m<sup>2</sup> a month, hopes to develop more efficient ways to make drugs it can later license to other companies.

"The rent is under the market level, so innovative companies having problems with capital can conduct research," explains Noll. "If they bring successful products to the market they can move elsewhere and make room for the next generation."

Lower labour costs for skilled workers were another incentive for Probiodrug, which plans to employ 10-15 doctoral candidates from the university every year. "For us it's very cost-efficient," said Demuth, adding that



*Bio-Zentrum GmbH, Halle*

the company plans to employ 30 full-time workers by year's end.

"Now that the centre is here, the next big challenge is to attract companies," said Gunthard Bratzke, director of the Institute for Structural Policy and Economic Promotion in Halle. Bratzke is also coordinator of a Regional Innovation Strategies (RIS) project which encompasses both Saxony-Anhalt and Saxony.

"Huge industrial complexes - and the networks they support-

ed - disappeared in the wake of German reunification," he explains. "The RIS is teaching us lessons in restructuring which should prove crucial in the next phase of the Structural Funds. After all, they will be dealing with the many regions of Central and Eastern Europe facing very similar problems." ●

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## The Innovation Programme In Brief

The Innovation Programme implements the Third of the four Activities of the Fourth Framework Programme (1994-1998). Run by DG XIII/D, the Innovation Programme encourages the exchange of research information and the absorption of new technologies by European companies.

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**Innovation Home Page**  
[Http://www.cordis.lu/innovation/home.html](http://www.cordis.lu/innovation/home.html)

shop' for information on all aspects of IPR arising from Community funded programmes. The Helpdesk will also offer customised assistance to the programmes' research contractors.

Although it will be formally launched by Mrs Edith Cresson at a press conference in Paris on 19 October, the IPR Helpdesk's website and associated telephone helpline should be operational several weeks beforehand. For detailed contact information, see the CORDIS Web site (<http://www.cordis.lu/>). ●

(1) See, most recently, the Communication 'Innovation for Growth and Employment', published by Innovation & Technology Transfer as a supplement, February 1998.

(2) The service may be launched under a different name, which had not been decided as this issue went to press.

# Stand Up for Your Rights

*Worried and confused about intellectual property rights? The under-use of patents to protect IPR has been identified by the European Commission as a key barrier to innovation – and thus to Europe's competitiveness in global markets<sup>(1)</sup>. Now help is available.*

**A**n Italian SME, the co-ordinator of an EC-funded project, has patented a technical process in Italy, though the resulting products have not been patented. Now it finds a product which can only have been manufactured using the patented technology entering the Italian market from Germany. The process is not patented in Germany. Does this constitute an infringement of the Italian company's rights, and what legal action can it take against the import or sale? IPR-related issues like this

confront European SMEs every day, and can seriously damage their performance, if not correctly handled.

The complaints about Europe's patent system are well known — it is complex, slow and expensive, and the 'twin tracks' of national and European patent law add to the confusion and the cost. Two thirds of the 170,000 European SMEs which produce patentable inventions do not use the system at all, preferring to rely on secrecy and speed to market. Competitors in Japan

## IPR Helpdesk

But Europe's comparative disadvantage in the area of IPR protection is compounded by ignorance about costs, benefits and mechanisms. In part due to the complexity of the system itself, many in the research community remain poorly informed about IPR issues — and until now there has been no single source for the definitive information they need.

Now, in a new initiative of the Innovation programme, a European IPR Helpdesk<sup>(2)</sup> is being established. Although it does not attempt to provide a substitute for the professional advice of patent offices, patent agents and lawyers, it will nevertheless go a long way towards plugging the information gap.

Its aim is to raise awareness as a first step towards improving the use of IPR protection by European SMEs in particular, and will provide:

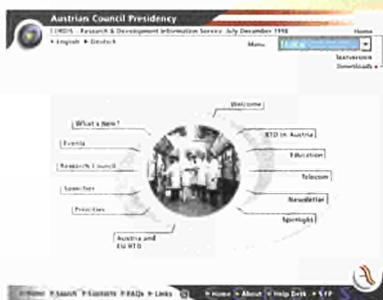
- basic information on R&D planning, technical co-operation and the protection and exploitation of results
- sign-posting to other specialised sources of information and advice on IPR and patents, including contact points in each Member State
- a bulletin board for the exchange of information and best practice by users of the service

Offering direct access to espacenet, the multilingual web service will serve as a 'one stop

*The Austrian Presidency of the EU Council began on 1 July. In the field of research, Austria will be responsible for finalising the Fifth Research Framework Programme for the period 1999-2002. A new information service for the Presidency (<http://www.cordis.lu/austria/home.html>) has been launched by CORDIS.*

and the United States, where intellectual property rights can be protected more easily and more cheaply, have a clear competitive advantage.

The urgency of the problem has stimulated efforts to improve the European system. With its espacenet service, for example, the European Patent Office (EPO) has recently made available over the Internet a searchable database of 25 million European patent documents.



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# Plugged into the Sun

*Twenty years ago, a German inventor saw a way to bring photo-voltaics to the mass market. The EU was prepared to back him, but the banks were not. Today, the Innovation Relay Centre (IRC) network is finally helping his technology to realise its enormous potential.*

**P**hoto-voltaic (PV) cells are fragile, and their efficiency is rapidly reduced by corrosion. It was in the mid-1970s that Bernd Melchior first encapsulated conventional cells in a tough acrylic, to extend their working life and make them easier to handle. A research project was funded under the EU's First Framework Research Programme.

His company — bmc Solar Industrie GmbH — has continued to develop the technology. Today's units, encapsulated in fluoropolymer (Teflon) on a base plate of toughened glass, are designed to operate for at least 50 years. "In terms of power yield, resistance to weathering, and ease of manufacture, they are state-of-the-art," says Melchior.

His second innovation addressed the difficulties which photo-voltaics present to architects. "Large panels on roofs look dreadful, and the supports often have to penetrate the roof, leading to leaks," he explains. In the 1980s, he hit on the idea of incorporating 'chains' of small solar cells into traditional roofing materials — tiles, slates and shingles. Special tiles, designed so that cells can be easily clipped into place, cost no more than standard ones. "An architect can specify photo-voltaics without compromising the aesthetic appeal of a building, and its owner can phase the installation of the cells to suit his financial situation."

## 'Kick-start'

"Both the man and the technology are extraordinary," says Peter Wolfmeyer, Director of the

IRC North Rhine-Westphalia. "Unlike many inventors, Mr Melchior grasps the business challenge, and is committed to working with us to meet it."

By allowing home-owners to stagger their investment, gradually increasing the number of PV units until the desired output is reached, the bmc system overcomes a major barrier to take-up. But the polycrystalline silicon cells themselves are still expensive, and will remain so until demand grows enough to justify mass-production.

What photo-voltaics has always needed is the 'kick-start' of a large, high-profile building project. On two occasions — first, with a complex of holiday villas in the Canary Islands, and second with a massive Mediterranean resort development programme supported by the European Commission — Melchior has come tantalisingly close to achieving this.

He even developed a method for financing such projects. "In remote sites, where connection to the electricity grid is impossible, or where the noise of diesel generators is unacceptable, a building permit for an ecological development, powered by its own silent and non-polluting PV system, hugely increases the value of the land," he explains. "This increase, in theory at least, provides enough collateral to finance the infrastructure."

Until recently, however, it looked as though the first development would never be built. The German banks refused to finance these projects until they saw the technology in operation



*Specially designed but inexpensive tiles allow additional PV modules to be fitted easily at any time.*

in an existing resort. Despite substantial public subsidy, each had to be aborted when Melchior failed to complete a financing package.

## Enter the IRC

Nevertheless, the market potential is huge, and growing rapidly. Projected demand between now and 2010 is for PV units with an output of 3,000 megawatts in the EU, and 9,500 world-wide.

After carrying out a full market study, the IRC recommended licensing the 'PV-ready' tile design to manufacturers with established national distribution channels, and has used the IRC network — and in particular the members of the IRC Thematic

Group Environment<sup>(1)</sup> — to identify potential licensees. Lau-mans, one of Germany's leading tile-makers, has already signed an agreement. A second deal, with Austrian producer Ziegelwerke J. G. Wolf KG, was finalised at the 2nd World Conference on Photovoltaic Conversion in Vienna in July.

The IRC then helped bmc to prepare a successful proposal for an Innovation project. The project has led to certification of the technology by the Commission's Joint Research Centre (JRC) in Ispra (Italy), which Wolfmeyer describes as "a milestone on the road to market acceptance". In partnership with the JRC and

(1) See edition 4/98.

German company WIP, bmc is now establishing a scaled-up manufacturing operation in a new factory.

Fully automated mass-production, with an initial capacity of 1 megawatt per year, will sharply reduce the price of the modules. Melchior is co-financing the new production facility by selling shares in a separate company, which owns European, US and Japanese patents to the cell-encapsulation technology, the chained module array con-

cept, and the design of the tiles into which the modules are clipped.

### No Place Like Home

The IRC's faith in innovation is already being rewarded. With support from the North Rhine-Westphalian regional government, Melchior will by the end of 1999 have built a first PV-equipped estate of 40-50 homes on an 18,000 m<sup>2</sup> site not far from bmc's factory.

"We planned to build a demonstration site in the Mediterranean sunshine, but in the end we are building it at home. The region is famous for its dreadful weather," he jokes. "If our concept works here — and it will — we will have shown that photo-voltaics can be economic anywhere." ●

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## INNOVATION PROJECT

# A Safer Route to Innovation

*Product innovation is one area in which SMEs can outperform larger competitors. Vision and drive are not enough, however. Consistently successful innovation requires disciplined team-work, and the careful assessment of progress at each stage.*

**T**he rapid evolution of marketable technologies — a key source of regional competitiveness — is entirely dependent on the ability of companies to manage product innovation effectively.

Shorter lines of communication and relatively informal decision-making can give SMEs an advantage over large corporations, where innovation is often hampered by bureaucracy. But the single-minded pursuit of 'insanely great' technology is a high-risk business strategy. In general, SMEs can improve the success rate of product innovation projects by adopting a more structured approach.

Carolyn Hall of Chalice International co-ordinates an Innovation

project<sup>(1)</sup> which is adapting for the SME sector project management tools which have proved successful in improving product innovation in larger firms. "SMEs are rightly keen to avoid needless bureaucracy, and to maximise flexibility," she says. "But 'seat of the pants' management has its own dangers. PROMISE will help SMEs to develop structured procedures which reduce the risks of product innovation, without slowing it down."

### Wait at the Lights

The project involves six end-user SMEs — two each in Ireland, Italy and the UK. National intermediaries provide day-to-day support, while expert partners, including the International

Society for Professional Innovation Management (ISPIM), contribute technical expertise in specific areas.

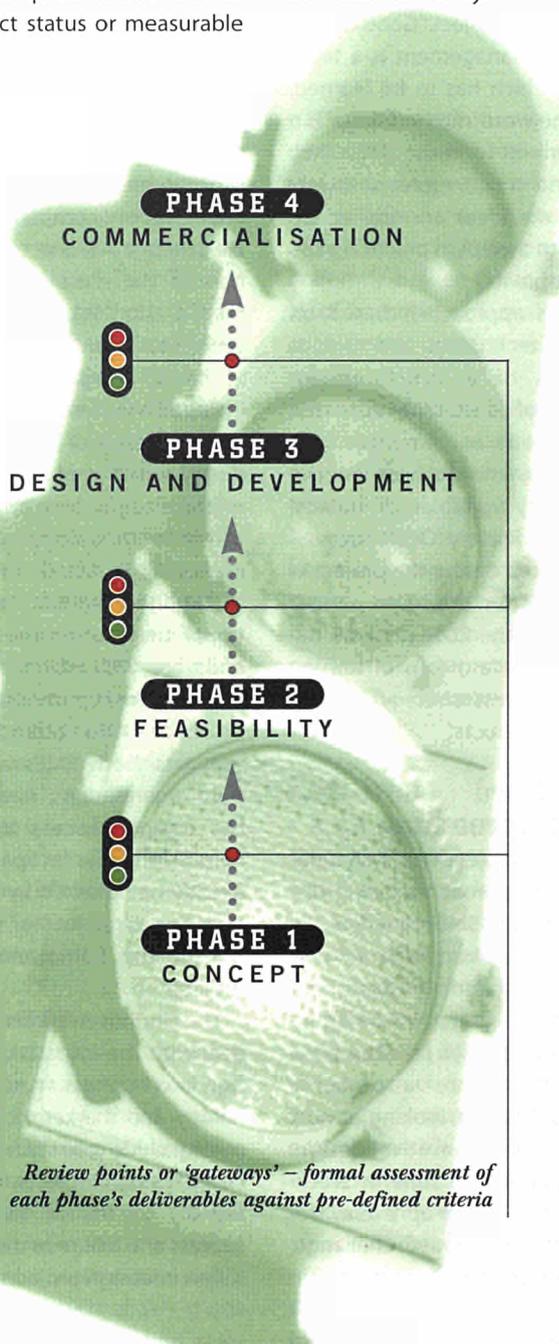
The end-users span a range of sizes and sectors, from Italmiko, an Italian manufacturer of mushroom-based food products, to Cylon Controls Ltd, an Irish producer of building energy management systems. All six are currently piloting a newly developed toolkit.

"We tried to identify the tools which worked best, to understand why and how they work, and to pick those which could be adapted for widespread use in much smaller firms," says Hall. "To be useful to SMEs, tools must be simple enough to be understood quickly, and readily adapt-

(1) IN1016211, Project Management of Product Innovation in Smaller Enterprises (PROMISE)

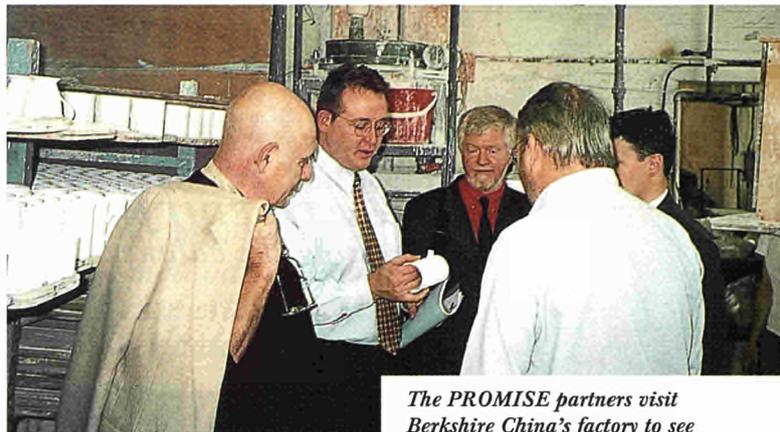
able to specific circumstances.”  
 Central to the PROMISE toolkit will be the concept of ‘gateways’ between project phases. “Product innovation projects vary in complexity,” Hall explains. “But typically they have four main phases — concept, feasibility, design and development, and commercialisation. Gateways are formal review points, at which the phase’s planned deliverables — project status or measurable

product attribute, for example — are assessed against predetermined criteria. Depending on the results of the review, the project is given a green light, allowing it to progress to the next phase, or an amber light, which means that further work is needed. A red light indicates that the entire project should be aborted at once, without committing further time or money.”



*Review points or ‘gateways’ – formal assessment of each phase’s deliverables against pre-defined criteria*

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*The PROMISE partners visit Berkshire China’s factory to see the impact of the gateway method on the company’s product innovation.*

### Early Adopters

The Gateway Design Tool — which will be implemented as a software product — guides SMEs through the development of a customised procedure, starting from a range of generic deliverables and assessment criteria, which can be adapted to suit their special requirements. The toolkit also encourages them to involve people from all parts of the company from an early stage.

Pilot users are receiving extensive training, and Hall expects first-time users of the finished package to need external support, too. “SMEs which already have a well-developed product innovation procedure will only require one or two days of training,” she says. “Others will need more in-depth support, ideally delivered in short sharp bursts.”

Once an SME has adopted the gateway system, however, it should be able to use it repeatedly without outside assistance. Some of the pilot users have already reached this stage. “We have adopted the gateway process as a core procedure,” says Tom Moore, R&D Manager of Dublin-based Cylon Controls Ltd. “We currently have seven new product ideas passing through the process — and it is working for us. We are looking at a growing portfolio of projects, and we see this approach as the sensible one for all our new product programmes.”

### Mugging up on Innovation

The innovation cycle for Cylon’s high-tech products is measured in months, but Hall stresses that the gateway concept is just as effective for shorter cycles. Berkshire China, also a pilot user, is a small UK mug manufacturer. For minor product modifications, the entire cycle from concept to commercialisation may take just a few days.

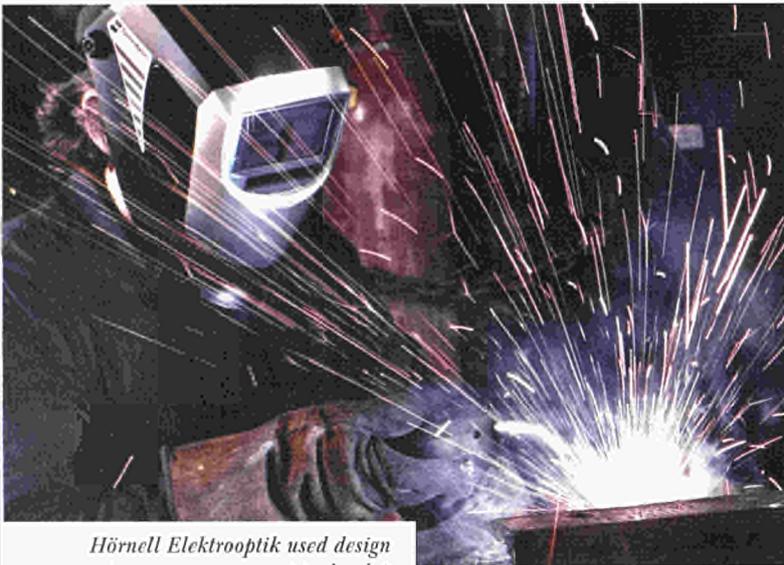
“They use the procedure in a slightly different way,” Hall admits. “But they still need to define the outputs of each phase, and the criteria by which these are evaluated.” And according to Berkshire China’s Managing Director Mark Dicken, the system works. “Our approach to product innovation used to be very ad hoc,” he says. “We have replaced that with logical decision making.”

When PROMISE ends in March 1999, Hall expects the toolkit to be taken up widely by consultants, business advisers and innovation agencies, to whom it will be promoted through existing networks of SME support organisations, including ISPIM and UEAPME, the European Association of Craft and Small and Medium Enterprises. ●



# Competitive - By Design

*Good design is an essential component of successful product innovation, but many SMEs focus more on the production process. The EDIT project has had considerable success in redressing the balance.*



*Hörnell Elektrooptik used design process management to develop an advanced welding helmet. To protect the welder's eyes, the window darkens automatically within one tenth of a millisecond of arc ignition, using liquid crystal technology.*

**O**ver 70% of product development costs are typically committed in the early stages of the design process, and design has a fundamental influence on product quality, production costs and time-to-market. So why do so many SMEs give it so little attention?

"SMEs are always short of time," says Irene Gil of the Spanish National Agency for Design and Innovation Development (DDI), which co-ordinates the European Design and Innovation

Tool (EDIT) project. "Good design process management is a technique which has to be learned, and the word 'methodology' is a big turn-off for most SMEs. They respond much more positively when the ideas are applied directly to their own practical, real-life problems."

EDIT's approach is based on proven techniques and tools. It consists of a structured sequence of consultant-supported assessment and improvement activities, and focuses on the three key variables of quality, cost and delivery (QCD). Successfully tested during the project in 16 SMEs from the seven partner countries, the EDIT partners describe it as "a means of turning your business strategy into effective products".

## The Word is Spreading

As the project nears completion, the approach is being disseminated to SME managers, design consultants and researchers, and design and innovation centres, in 35 regional workshops. Two pan-European conferences are also being staged. The first, looking at best practice in innovative design, took place on 8 June in Stockholm. The follow-up event, Design: The Integrative Challenge, will be held on 12 November in Eindhoven (the Netherlands).

Opening the Stockholm conference, Vicente Parajón Collada, Deputy Director-General of the European Commission's DG XIII, which includes the Innovation programme, emphasised the importance attached by the Com-

mission to industrial design. The findings of a new study on the application of design in research and development projects, commissioned by the Innovation programme, were presented, and Swedish company Hörnell Elektrooptik AB, one of the winners of the most recent European Design Prize, was one of several case studies<sup>(1)</sup>.

The 100 delegates at the event included a representative of Norway's Ministry of Trade and Industry, which is planning a programme to promote application of the methodology in Norwegian SMEs. In fact, Gil says, plans to continue the work on a national basis after the project ends are well-advanced in all seven partner countries.

"Those who attended the seminars, both SMEs and support organisations, have found the design process approach helpful," she says. "In Spain, DDI is already being asked by regional agencies to run further seminars outside the framework of the project."

The Eindhoven conference will deal with the integration of design into business strategy, technology and marketing, and will again include case studies of successful design projects. It aims to identify the critical factors for success and failure in the organisation of design projects. ●

*(1) The study, 'Integrating Design in R&D', will be published later this year. The European Design Prize was covered in 'Best Practices in Design' (Dossier, March 1997).*

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# Turning Problems into Profits

*Sewage sludge residues are a real headache for municipal authorities across Europe – current disposal methods are both expensive and hazardous. A novel technique converts the waste into a safe, soil-enriching compost with market potential.*

The sludges produced by wastewater treatment plants are currently dumped at sea, buried in land-fill sites, burned, or spread untreated on agricultural land. The first of these disposal methods will be banned from the start of 1999, the landfill directive will severely restrict the second, and burning and spreading both pose environmental and health hazards.

Soil Concept Sàrl is a Luxembourg-based joint venture established to demonstrate and commercialise a new composting method capable of converting sewage sludges into valuable and hygienic agricultural and horticultural products. Joining the new company in the Innovation project<sup>(1)</sup> are municipal authorities in Luxembourg and Germany, for whom Soil Concept is developing pilot plants, and two research institutes, responsible for scientific trials.

## Odour-free

"The technical innovation consists in the adaptation and combination of three established technologies," explains Soil Concept's Denis Godeaux. "Using the forced ventilation method, composting takes place under a semi-permeable membrane, which allows gases to escape while keeping rain-water out. The membrane also creates a region of oxygen-saturated air in which escaping gases are oxidised, so the process is odourless."

The final components are a

tractor-mounted mixing-sifting device for smaller installations, and a prototype mixer, which moves above the silo, for large ones. The technique produces uniformly broken-down material, of homogenous quality and consistency, after only ten weeks.

Soil Concept is already running a small pilot plant built for a consortium of local wastewater treatment plants in the Saar. Now a second, larger, pilot installation is being built in Luxembourg, with the capacity to process 12,000 tonnes of sludge per year. The company expects this to be operational by the start of 1999.

## Cost-free

It is not just the technical feasibility of sewage composting which is being demonstrated, but its financial and operational viability. The plant will be financed and owned by the municipal authority, but will be built and operated by Soil Concept, for a fee which is lower than the authority currently pays for less environmentally friendly disposal of its sludge. Sales of compost products may eventually generate additional revenues.

Godeaux hopes that the demonstration site will provide a platform for the widespread take-up of the method. "There is real interest from public authorities, which see it as a cost-free means of improving their environmental performance," he says. "We are also confident that



there are markets for the compost-based growing media which we have developed. Our market study indicates potential for applications in agriculture, municipal horticulture, and the reclamation of dumps, quarries and disused industrial sites."

The partners' final aim is to pave the way for a European standard for sewage-sludge composts, currently under consideration by a working group set up by the European Commission to examine sludge-related issues. Its own preference is for a quality standard based on an existing German regulation on bio-composts.

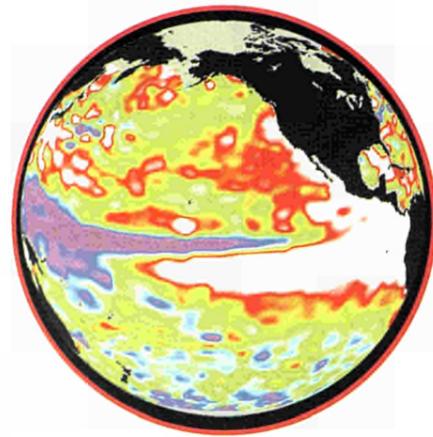
*In Luxembourg, a temporary composting plant has been built on an industrial dump as part of the reclamation programme.*

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# Feedback from a Small Planet



*The capacity to acquire and interpret satellite data is proving its worth to governments and industry.*

As populations continue to rise, sustainable development will require ever more sophisticated management of the conflicting demands made on Earth's finite resources. At the same time, the globalisation of flows of goods and investments is accelerating. Over the coming decade, Earth observation will assume increasing importance to both political and commercial decision-makers as a reliable and cost-effective source of accurate and up-to-date information (see Earth Observation: How it Works).

## El Niño

For example, good climatic modelling is essential as a guide for policy responses to global climate change, and as a means of monitoring their impact. It can also contribute to the efficient management of regional agricultural, energy and water resources by improving the accuracy of seasonal weather forecasting. The ocean,

covering more than 70% of the planet's surface, is a key factor both in long-term climate change and in seasonal weather patterns. But in-situ measurement is difficult, and cannot generate sufficient data for a detailed model of the entire ocean.

The time series on the next page, showing the development and dispersal of the recent El Niño over a 14-month period, vividly illustrates the power of data collected by orbiting satellites to supplement conventional monitoring techniques. The images are based on data from the radar altimeters of the US-French TOPEX-POSEIDON and the European ERS-2 satellites. They were produced by DUACS, one of the projects currently funded by the European Commission's CEO programme (see The CEO: A Profile) to demonstrate the cost-effectiveness of Earth observation applications. DUACS' customers include the European Centre for Medium-range Weather Forecasts.

*Earth observation is a key source of competitive advantage for Europe.*

## I. Space Race, Part Two

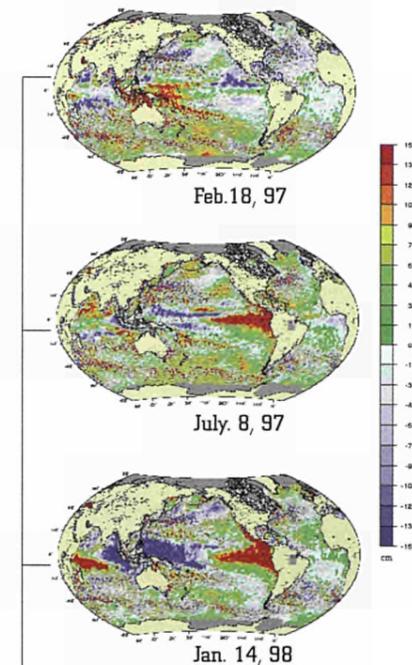
*Europe has pioneered the early scientific and technical development of Earth observation.*

The global market for high-quality environmental and land-use information based on satellite data is, at last, nearing critical mass. As this point is reached, the cost of the raw data will start to fall, stimulating additional demand among public sector and large corporate customers. This in turn will create opportunities for specialised SMEs to apply data processing, packaging and marketing expertise to open up new niche applications. Earth observation will be on a roll.

### Under-Used Asset

Europe's early leadership is widely acknowledged. ESA's European Remote Sensing Satellite (ERS) system and the French SPOT series — huge, multi-billion ECU projects — have been spectacularly successful. And the scientific basis for the operational application of Earth observation data relies largely on European academic research.

But it remains a seriously under-exploited resource. "Remote sensing has been widely



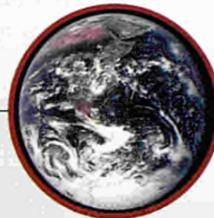
*As El Niño reached its peak, unusually warm water (more than 15 cm above mean sea level, mapped in red) piled up against Central America's west coast, while a trough of cool water filled the western equatorial Pacific.*

viewed as complex, costly and oriented towards scientific rather than commercial applications," says Martin Sharman. The CEO, whose shared-cost application projects Sharman manages as part of the Environment and Climate programme of the Commission's DG XII (research), is working hard to change this perception.

"The projects involve customers from both public and private sectors, as well as researchers and providers of data interpretation services," he explains. "In learning to meet the complex needs of real clients, the service providers are developing applications and expertise which will help them to win similar business in Europe and overseas. End-users are being given the opportunity to test the cost-effectiveness of the applications — and we hope that many will continue to use them as paying customers when the projects end."

## CONTEXT

### Earth Observation: How it Works



Remote sensing systems employing satellite data deliver frequently updated information about much larger areas than can be covered using ground-based sensors or inspection teams. Particularly in remote regions, and where no terrestrial sensing infrastructure exists, Earth observation offers a cost-effective means of mapping and monitoring territory. Existing fields of application include agriculture and forestry, environmental conservation, oil and mineral exploration, and watershed management.

There are already over 50 Earth observation satellites, most in polar orbits, circling at a fixed altitude of around 900 km as the planet turns below them, and gathering data from successive 'ground tracks' or strips of the Earth's surface. The SPOT satellite, for example, completes 14 orbits every 24 hours, and can view any point on the surface once every 26 days.

Satellites carry a variety of optical, spectral and radar sensors, designed to gather data about the topography, colour or reflectivity of the surface. Key sensor types include Synthetic Aperture Radar (SAR), Along-Track Scanning Radiometer (ATSR), Wide Field Sensor (WiFS) and Vegetation Monitoring Instrument (VMI).

Sensors' spatial resolution — simply, the area represented by each of the pixels making up a complete image — varies from over one kilometre down to less than ten metres square. Newer optical sensors with resolutions as high as one metre will soon be in use. Spectral and radiometric resolutions — the accuracy with which variations of colours and light intensity can be distinguished — is also improving.

Image data is stored on board the satellite,

and downloaded when it comes within range of one of its ground stations.

Automatic pre-processing routines convert the data into calibrated, oriented and despeckled images, which are then archived and catalogued.

Depending on the application, images from more than one sensor are often compared. To produce answers to real-world questions, data from terrestrial sources is often used as well. Computerised Geographic Information Systems (GISs) allow data from multiple sources to be overlaid, analysed, and examined in order to extract the required information. In some cases, specially designed algorithms are developed to meet the needs of particular clients.

The Earth observation industry involves: space agencies (such as the European Space Agency, ESA), which equip, launch and maintain satellites; data providers, which manage and sell the data they gather; and value-adders, which develop customer applications. In Europe, value-adders tend to be specialised SMEs, often working closely with research institutes, while in the US data providers increasingly offer an end-to-end service. In some cases, large corporations may establish in-house Earth observation units.

An essential part of many applications is the validation of results by comparison with directly measured ('in situ') sample data.

The information outputs required by customers do not always take the form of maps. Often, a succinct report is produced — giving, for example, the area and grid reference of newly-drained wetlands, of structures built or destroyed, or of fields planted with a particular crop. These may be used to direct efficient follow-up by inspectors.

"The aim," as CEO programme manager Peter Churchill puts it, "is to secure more operational customers for the data coming down from space."

## Fragile

Speeding up the development of domestic demand makes sense for a number of inter-related reasons — not least, says Sharman, because "Earth observation is a key source of competitive advantage for European industry and for European Union policy-makers, and one of which they could be making much greater use."



Nearly half the EU's population lives within 12 km of a coastline. These maps, prepared by the Lacoast project, show how land use in Zeebrugge, Belgium, changed between 1976 (left) and 1990. Space Applications Institute (data from GIM, IGN Belgium)

## CASE STUDY

# Profit Forecast

*Hydro-electricity supplies 70% of Austria's power. Better predictions of run-off from melting snow will reduce costs, helping to keep prices down.*

tut für Meteorologie und Geophysik (IMG) at Innsbruck University, are management tools. They help electricity companies to optimise their use not only of water already held in reservoirs, but also of that which will be released from glaciers and snow-fields over the next few days.

## Eye in the Sky

Conventional models use data from a small number of *in-situ* sensors. But scattered measurements can only give an approximate representation of the situation in the catchment basin as a whole.

Now IMG is working with Österreichische Elektrizitätswirtschaft AG to develop a comprehensive decision support tool for the power company, using remote sensing data to improve the accuracy of the current model's forecasts. "Satellite data can give a much better indication of the run-off which will occur as the snow melts," Rott explains. "It tells us the extent of the snow cover, and it shows the current melt condition, indicated by measurements of radar reflectivity, which varies with the liquid water content of the snow."

In addition to remote sensing data, the application will use measurements of actual run-off from automatic stations, and temperature and precipitation forecasts. In the pilot phase, it will also use three kinds of satellite data — imaging radar, and both medium-

and high-resolution optical images. "The costs vary widely," says Rott. "Interpreting radar images also presents a bigger technical challenge, but radar can see through the heavy cloud which covers the Alps for much of the year. Our aim is to establish which combination of data sources is the most cost-effective."

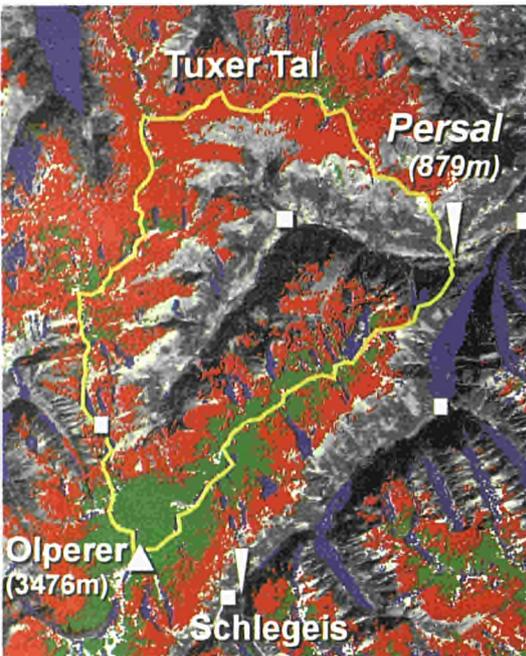
Half way through the three-year project, the methods for interpreting satellite data have been developed, and simulations are being run. Real-time forecasting tests will take place in 1999, in river basins in Switzerland, Sweden and Scotland, where Hydalp's other partners are based, as well as in Austria.

The potential of Earth observation in this field has never been demonstrated in an operational application before. If Hydalp is successful, Rott hopes that the technology will eventually find markets in many mountainous and high latitude regions, especially those without established networks of meteorological ground stations, such as the Andes and central Asia.

(1) *Hydrology of Alpine and High Latitude Basins, ENV4-CT96-0364*

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The 130km<sup>2</sup> Tuxbach basin (ringed in yellow), near Zillertal in the Austrian Alps. ERS-2 radar images were used to map snow cover on 12 May 1997 (red), and on 16 June (green).

**F**or the populations of mountainous regions, snow and ice are both a hazard and a critical resource. The ability to understand flows of meltwater is vital, and sophisticated hydrological models are used to design reservoirs, predict floods, and manage water supplies.

Reliable modelling is of particular importance to hydro-electric plant managers. "They cannot turn snow or ice into electricity," says Helmut Rott, who co-ordinates the CEO programme's Hydalp demonstration project<sup>(1)</sup>. "If they run out of water to drive the turbines, they have to turn on diesel generators, which is extremely expensive. On the other hand, if they know that they are going to have more than they need, they can sell surplus electricity at the moment when the price is highest."

Hydrological models, like the one developed by Rott and his colleagues at the Insti-

# The CEO: A Profile



*The design and implementation of the Centre for Earth Observation was launched in late 1995 following a feasibility phase. These days, it likes to be referred to simply as the CEO.*

"We are definitively not a Centre," explains programme manager Peter Churchill. "Activities are widely distributed, both geographically and by sector. The CEO's own staff of 30, based at the Joint Research Centre's Space Applications Institute (SAI) in Ispra, Italy, and at DG XII (research) in Brussels, acts as a catalyst. We are trying to change the perception of Earth observation among European members of the two key groups of potential customers — national and EU institutions, and large commercial concerns such as insurers, agricultural producers and oil and shipping companies."

Since 1996 the CEO, a joint programme of the European Commission's JRC and DG XII, has supported 150 projects involving 230 scientific, public sector and commercial organisations in 20 countries. Churchill describes the 46 current two- or three-year application demonstration projects as "bridging the gap between research and full commercial operation".

In support of this practical work, which accounts for the bulk of its budget, the CEO has undertaken detailed studies of Earth observation requirements in a number of key industrial sectors, as well as education and training projects. Under the title EO for Better

Information, it will stage a series of workshops in Ispra this autumn:

- EO for GIS and Mapping — Street and Field Scale, 6-7 October
- EO for Resource Management — Regional and National Scale, 20-21 October
- EO for Worldwide Monitoring — European to Global Scale, 10 November

## Out of Chaos, INFEO

Finally, the CEO is creating an electronic system to improve users' access to Earth observation data, information and services. The European Wide Service Exchange (EWSE), a web-based pilot system enabling information suppliers to publicise their products and services, and potential customers to broadcast their needs, has been running since 1994.

European remote sensing data is archived in many different locations, using a variety of incompatible cataloguing systems. EWSE helps users to identify and locate data relevant to their needs. The mature service, to be launched as INFEO in December this year, will offer full interoperability — users will be able to link directly to the data and information services they require, via a single easy-to-use search interface. "If the industry is to grow,"

says Churchill, "the data has to be made more readily available to non-specialists. INFEO will remove a large barrier to the development of new Earth observation applications."

The system is based on the Catalogue Interoperability Protocol (CIP) developed by the SAI, which has already been adopted as a de facto standard by the G8's Committee on Earth Observation Satellites, and has been submitted for ISO approval.

The CEO's work will continue under the Fifth Research Framework Programme, with an even greater emphasis on the development of applications to meet the needs of Europe's key institutional customer — the Commission itself.

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Second, Europe's young value-adding industry is vulnerable to growing competition from other regions. Without a strong customer base at home, it will be much harder for European companies to win contracts in other regions, in what is expected to be an increasingly lucrative world market.

"The median size of European value-adders is just ten people," says Tristram Cary of the European Association of Remote Sensing Companies (EARSC), who is an observer on the CEO's advisory committee. "But our target customers are very large governmental or corporate bodies. The discrepancy in size and strength creates real difficulties. It can take up to five years to persuade a new client to use Earth observation for the first time, which is a much longer development

period than a small company can afford."

Lastly, Europe lacks an obvious means of funding the new generation of satellites to meet the information needs of tomorrow's paying customers. To persuade commercial investors to finance an entire Earth observation mission, it must demonstrate that a revenue stream already exists.

"The European satellites have been a technical triumph," says Sharman. "But most were not designed as commercial systems — they were put up to test new sensor technologies, and to gather data for scientific studies. They are reaching the ends of their lives. At some point, they will have to be replaced. Europe's position would be weakened if its only access to satellite data was under the control of third nations."



*Accurate contour mapping based on remote sensing data is helping the UK to develop models which will provide early warning of floods.*



*To improve the quality of life of Europe's city-dwellers, policy-makers need reliable data about urban dynamics. The Murbandy project will use high-resolution images such as this, which shows the eastern edge of Milan.*

## Towards Commercial Operation

The CEO projects are making the best possible use of data from existing satellites to show that future operational systems can be of substantial value to European governments and businesses — and so to justify the creation of Europe's own commercial remote sensing satellite capability. Build the market, the thinking goes, and the market will build the satellites.

"It is very different in the US," says Tristram Cary. "The federal government funds research, but also stimulates the market directly — as a customer. The Department of Defense, for example, contracts with data

providers to purchase large volumes of data over an extended period."

Commercial Earth observation got off to a late start in the US — until recently, efforts were entirely directed towards scientific studies. But with the end of the cold war, data from military reconnaissance satellites has been declassified. Lockheed, Boeing and a number of smaller companies are now winning a rapidly growing share of the world market. "They will finance new systems of their own on the basis of these long-term public sector contracts," Cary predicts. "Satellites gather data globally, so they will naturally be trying to sell it to every government in the world."

## II. Serving EU Policies

*Increased use of Earth observation by the EU and national governments would kick-start the industry — and save public money. But there are cultural and institutional obstacles.*

"Earth observation has so much to offer public authorities," says the CEO's Peter Churchill, "because of the huge sums they have to spend on mapping and monitoring. They already form the biggest market, but could still make much greater use of the available data."

The CEO works hard to raise awareness of Earth observation's potential within the Commission, and to identify areas in which it could contribute to EU policy. In these cases, pilot applications are generally developed by one of the SAI's five specialist working units, serving agriculture, the marine environment, and so on.

The Lacoast project, for example, is conducting for DG XI (environment) a study of land cover and land use change in the EU's coastal zones, using SPOT and Landsat data. The Murbandy (Monitoring Urban Dynamics) project aims to produce Earth observation data on urban areas for DG XVI (regional policy), using very high resolution satellite im-

agery from the Indian IRS-C satellite. It will map change in 15 European cities over a period of 20 years or more, and develop scenarios for future urban growth. The results of both projects will also be used by the European Environment Agency (EEA).

### Timely Crop Yield Forecasts

Earth observation has already helped to get rid of the Common Agricultural Policy's food mountains. "Setting the CAP price supports at the right levels depends on accurate crop predictions," explains Churchill. "These used to be calculated on the basis of statistics collected by each Member State using its own sampling techniques — and the estimates were typically not available until five months after the harvest. With remote sensing, we still use statistical sampling, but on a uniform basis across the whole EU — and we can let DG VI (agriculture) have estimates in advance of the harvest."

Satellite imagery is also being used to

monitor farmers' subsidy claims. "Cutting subsidy fraud by 10% would save enough money to pay for an entire satellite system," Tristram Cary points out. But there are barriers to take-up, both technical and cultural. "Customers naturally want assurances that the service will be regular, but at the moment that is something we cannot guarantee," says Cary. "Data streams from today's scientific satellites sometimes dry up because the orbit has been changed as part of a particular experiment."

For the British National Space Centre (BNSC), which is encouraging use of Earth observation data by United Kingdom government departments, continuity of supply is also an issue. "Potential users want to know that the satellites which provide data today are going to be replaced when they reach the end of their useful lives," says BNSC's Martin Shelley.

The UK's Department of Environment<sup>(1)</sup> already makes use of Earth observation to monitor coastlines, river catchments and environmentally sensitive areas, and is currently developing a flood modelling application. But BNSC expects further progress to be slow. "It is not easy to identify new users," says Shelley. "And although the potential cost savings are large, these are hard to demonstrate while traditional data acquisition methods, often involving large teams of inspectors on the ground, are still being used."

### The Kyoto Challenge

At EU level, monitoring the international climate change agreements reached at Kyoto offers a perfect opportunity to demonstrate the value of Earth observation. "We want EU policy-makers to have the benefit of high-quality, timely information based on satellite data," says Martin Sharman. "But we still have work to do — Earth observation was not mentioned in the official Kyoto text<sup>(2)</sup>. We would like it to be one of the first information sources people think of."

The CEO is beginning to open up the European Earth observation market, in both public and private sectors — and its lead is being followed by many Member States. But Tristram Cary is worried that these efforts will be too little, too late. "Unless the EC itself makes long-term use of Earth observation on a large scale," he says, "it will be very difficult to establish a robust European industry."

(1) Full title: Department of Environment, Transport and the Regions (DETR).

(2) But see 'Increased Co-operation with US under FP5', Notebook section, page 18, for recent developments.

# Watching the Earth Move

*Can images from space help surface-mining companies to restore the landscape when extraction is finished?*



*Satellite image of the Asterismos test site in the mountains of central Greece.*

**G**reek SME Integrated Information Systems (IIS) has already shown that the use of remote sensing data is cost-effective in the search for mineral deposits. "Particular types of clay are good indicators for many mineral ores," explains Dr Athanassios Ganas of IIS. "Spectral data from Landsat enables our clients to identify clay deposits, and so save costs by focusing exploration efforts in the most promising areas."

Through the Asterismos project<sup>(1)</sup>, IIS is developing a second Earth observation application for the same industrial sector - a decision support tool for the restoration phase. Supported by the CEO programme, Asterismos involves SMEs from the Netherlands and the United Kingdom, research centres from Greece, Spain and Austria, and two potential customers - Athens-based ferro-nickel producer Larco, and the Spanish power company ENDESA, which operates a number of large lignite mines.

## Cleaning Up

The environmental impacts of surface mining can be catastrophic. The movement of huge quantities of soil and rock frequently leads to subsidence and water-course contamination. Both the appearance and the ecology of very large areas can be permanently affected.

Tough new EU and national regulations oblige mining companies to plan effective reclamation and restoration programmes before extraction begins, and to carry them out meticulously after it is finished. But the costs of such programmes are enormous. The goal of Asterismos is to show that Earth observation can reduce these costs.

"Choosing the right restoration approach is essential," Ganas says. "They need to be able to estimate the costs of different options in advance. Our aim is to give the mine engineer maps which show clearly where trees can be planted, for example, and where he can find soil suitable for planting them. When such large volumes of material are involved, identifying the nearest source can produce big savings."

The system will use satellite data on gradients, population densities, and land-cover distribution prior to mining, as well as on changes to these parameters brought about by the mining itself. "As much as 50 km<sup>2</sup> of mountainous terrain is often involved," says Ganas. "Mapping this every six months using conventional survey techniques is slow and expensive. Remote sensing can perform the task to the required accuracy more quickly and more cheaply."

## All the Help You Need

Started in April 1997, Asterismos will enter its validation phase in 1999. End-users will receive the decision support system on CD-ROM, ready to load onto a standard PC. For the EC-funded tests, site-specific mapping data will be supplied by the project partners. Paying customers — whom IIS hopes will buy the system after the project ends — will be able to purchase maps of their own sites produced from satellite data by value-adding firms. The CD will list sources of the appropriate data, as well as giving a detailed specification for the required mapping inputs.

"We are making the system as generic as possible," Ganas explains. "We want to create a tool which will be of value to the entire European open-cast mining industry."

*(1) Application of space technology to environmental aspects of surface mining, ENV4CT960373*

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## Further Reading

- For an overview of EU policies and actions on all space technologies, *The European Union and Space: fostering applications, markets and industrial competitiveness*; ISBN 92 827 9262 5, EC 1997, ECU 7.
- For a compendium of research projects related to space carried out under the Fourth Research Framework Programme, *Technical overview of EU space research projects*; EUR 18030, ISBN 92 828 2440 3; ECU 16.50.

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## Plant Biotechnology Network Launched

Reflecting the emphasis on transnational co-ordination and networking of FP5's Quality of life and living resources thematic programme, the European Commission has recently launched the European Plant Biotechnology Network (EPBN) with funding of ECU 426,000 from the Biotech programme. Its aim is to promote networking between laboratories working on EU-funded research, and to facilitate the dissemination and exploitation of results. The EU currently funds 45 different projects in plant biotechnology, involving 394 laboratories in 20 countries.

The new initiative, which has been established in collaboration with the Plant Industrial Platform, the European plant science community and AMICA, a pan-European association representing plant research in the Member States, has three objectives:

- the transfer of technologies from plant biotechnology research projects to industry
- greater interaction between researchers and end-users
- promotion of the benefits of plant biotechnology

EPBN will conduct contact meetings with industry, organise entrepreneurial workshops, operate a technology brokerage service, produce public relations material and co-ordinate a European Plant Biotechnology Week.

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## Increased Co-operation with US under FP5

The stage is set for more practical collaboration between the European Union and the United States in the area of scientific and technological research. From the start of 1999, funding will be available under the EU's Fifth Research Framework Programme (FP5), and similar allocations will be made in the US.

A major scientific conference, held in Washington in early June following last December's signature of the EU-US Science and Technology Agreement, endorsed co-operation as a means of avoiding the costly duplication of research efforts. The Agreement will not be ratified until September — but participation by US companies in 20 Esprit projects, and co-operation on both yeast and human genome projects mediated by international bodies, have clearly demonstrated the potential benefits.

Four areas with particular potential for co-operation in the coming years were discussed at the conference:

- tools to model climate change and monitor implementation of the Kyoto agreements, especially in the field of Earth observation (see this issue's Dossier)
- information science and technology
- multi-modal transport systems
- endocrine disruptors — a class of chemicals which mimic hormones and cause serious health and environmental problems

A follow-up conference, to be held in Europe, has been scheduled for early 1999.

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## New External Advisory Groups

There has been no shortage of nominations for the 17 EAGs which will provide the Commission with independent advice on the content and direction of the research carried out under each of the key actions of the Fifth Framework Programme. Members will include senior industrialists and academic researchers, as well as end-users, regulators and investors.

An initial selection is currently being made by the Commission from the 4,000 people who applied directly, or were recommended by Member States or the Commission itself. Short-lists are being prepared, and final decisions will be announced on 23 September. It is hoped that the EAGs will be able to give advice on the contents of the draft FP5 work programmes before the launch of the first calls for research proposals.

The Commission intends that each EAG will have a membership of between 15 and 20 (or up to 25 in the case of the Information Society Technologies programme). The initial selection, however, will be at the lower end of this range, in order to allow room for the later inclusion of members from the associated countries — Norway, Israel and Central and Eastern European Countries.

The call for nominations to the EAGs will remain open for at least two years, as the Commission is keen to establish a reserve list from which vacancies can quickly be filled as they occur.

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## EU-South Africa scientific co-operation

Agreement reached at a meeting between senior European Commission and South African officials in June provides the basis for continuation of co-operation between the EU and South Africa under the forthcoming Fifth Research Framework Programme (FP5).

The first meeting of the Joint Science and Technology Co-operation Committee (JSTCC), established under the EC-SA Scientific Co-operation Agreement, took place in Brussels on 3 June 1998. The meeting was jointly chaired by the Commission's Director-General for Science, Research and Development, Professor Jorma Routti, and the Director-General of the South African Department of Arts, Culture, Science and Technology, Roger Jardine.

The original Agreement, which took effect on 11 November 1997, allows for participation by South African and EU research organisations in one another's research programmes. Its continuation under FP5 will ensure that the basis already established for a science and technology partnership between the EU and South Africa can be built upon, and is expected to be beneficial in the context of broader bi-lateral relations between the two parties.

The recent meeting concentrated on the practical implementation of the Agreement and on measures to facilitate researchers' participation. Among the measures discussed was an information strategy incorporating initiatives such as electronic newsletters, websites and databases.

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# Science, Art, and Competitiveness



*The European Commission's programme of research for the protection of our cultural heritage has led to startling new applications of advanced materials and techniques – and is helping to create a dynamic restoration and conservation industry.*

**W**ith the September 1997 earthquake in Assisi, television viewers all over Europe were sharply reminded of the vulnerability of our most precious monuments. Millions saw the dramatic shots of the roof of Assisi's Basilica of Saint Francis crashing to earth in a plume of dust.

Europe's cultural heritage enriches its present population both culturally and economically. Nowhere else in the world are there such dense concentrations of historic buildings, statues, paintings and books. But the tourist trade which this heritage draws to our towns and cities adds to the environmental pressures which threaten its destruction. We must find ways to preserve it — not just as a legacy for tomorrow's citizens, but for the sake of today's.

## Our Crumbling Heritage

For over a decade, the European Commission has supported collaborative research in this field, bringing the skills and resources of different Member States to bear on these common problems. Successive programmes have sought to improve understanding of the impacts of atmospheric pollution and other environmental risk factors, to develop diagnostic techniques and tools, and to demonstrate new protection and restoration technologies.

More than twenty projects are funded under the current work programme, focusing on non-

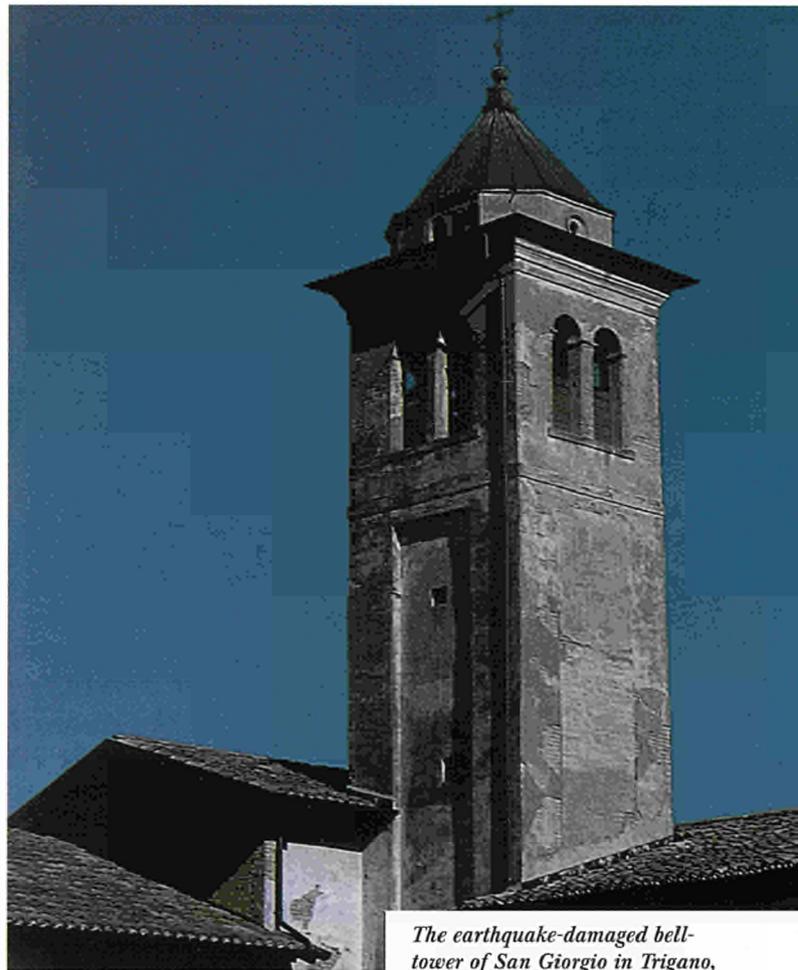
destructive and reversible techniques for diagnosis, protection and conservation. It is not only conservationists who are involved — the projects draw expertise and advanced technologies from fields as varied as agriculture, aerospace, construction and medicine.

"Europe's strength in science, applied to its urgent conservation problems, has given it leadership in a field with significant market potential," says Julia Acevedo of the Commission's Environment and Climate programme. "A substantial SME sector has grown up to adapt established technologies and apply them in the field of protection and conservation. Not only is it helping to preserve Europe's heritage. It is also exporting these techniques, to regions such as Asia and the United States, and is becoming an important source of new employment."

## Space-Age Support

In partnership with the Commission's Joint Research Centre and other research centres in Italy, Portugal and Greece, Italian SME FIP Industriale SpA is developing a revolutionary technique for improving the stability of historic monuments in earthquake zones, using 'shape memory' alloys originally employed in the aerospace industry.

Ancient buildings cope relatively well with minor quakes — the loosely jointed masonry is flexible enough to ride out small tremors. But a full-blown earth-



*The earthquake-damaged bell tower of San Giorgio in Trigano, northern Italy, which is being restored using hidden shape-memory alloy devices.*

quake can be devastating, as in Assisi. Strained past a certain point, structures simply collapse.

The ISTECH project<sup>(1)</sup> has developed a technique which retains the natural flexibility of walls and columns, while greatly extending their resilience. Previous solutions — which seek to insulate entire buildings from potential shocks, or to stiffen them — are extremely costly, and are usually either invasive or highly visible.

*(1) CT95-0106, Development of Innovative Techniques for the Improvement of Stability of Cultural Heritage, in particular Seismic Protection*

The technique developed by the ISTECH partners uses wires of the super-elastic alloy to increase the vertical compressive forces which hold a building together. In a quake, the pre-stressed masonry can still shift, dissipating energy, but will not collapse. The devices have been successfully tested using scale models and full size masonry walls, and are currently being installed in the earthquake-damaged 14th century bell-tower of San Giorgio in Trignano, northern Italy.

"What we are doing is helping the tower to help itself," says Renzo Medeot of FIP, the project's co-ordinator. "Our method is non-invasive, reversible and cost-effective. The alloy itself is very expensive, but represents only 3-4% of the total cost." Now, he says, there is a chance that the tech-

nique may be used in the restoration of the Basilica in Assisi.

### Increased Funding

EC-funded work in this area will assume increased importance under the forthcoming Fifth Research Framework Programme (FP5), within the key action 'City of Tomorrow and Cultural Heritage'.

Those interested in applying the results of earlier research, or in participating in the new programme, will be keen to attend a major conference — to be held in Aachen, Germany, on 19-20 November<sup>(2)</sup> — which will include presentations of a number of innovative technologies developed in earlier EC research projects.

Research for the Protection of Cultural Heritage: Opportunities for European Enterprises aims to

bring together local authorities and other agencies responsible for the management of historic buildings and artefacts, and researchers and companies offering diagnostic and conservation techniques, products and services. The conference, which is being hosted by ZENIT, the SME support agency which operates the Innovation Relay Centre North Rhine-Westphalia<sup>(3)</sup>, will be followed by a partner mediation event on 21 November. The aim is to broker initial contacts between suppliers and users of new conservation technologies, and to create consortia for new research projects under FP5. ●

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*(2) Registration for the conference is being handled by ZENIT (see Contact).*

*(3) See also edition 4/98, and page 8 in this edition.*

## ADVANCED COMMUNICATIONS TECHNOLOGIES



# A Buzzing Marketplace

*Small and medium-sized enterprises (SMEs) are among the most dynamic high-tech innovators. But when a technology has the potential to revolutionise business processes in all sectors, it is important that participation in research is not confined to specialist SMEs.*

**P**rogress in communications has always been a major driver of social, industrial and economic change. For Europe, advanced communications technologies now constitute an industrial sector of huge importance. But the continuing health of that sector is, more and more, essential for the competitiveness of all European manufacturing and service industries.

The ACTS programme is the primary focus of the EU's research effort to speed the deployment of advanced communications infrastructures and ser-

vices. Research priorities include the implementation of interactive multimedia services, intelligent, high-speed networks, mobile communications, and secure communication systems. Research is linked to real needs, and is usually conducted in the context of practical trials, designed to demonstrate the potential of the technologies concerned.

### Street SMARTS

You do not have to be involved in IT yourself to use advanced communications tech-

nologies. Increasingly, their use is a core part of all businesses. Hauliers, retailers, food producers and furniture makers — all rely increasingly on such technologies to improve internal and external communications. If an SME is not using them to speed, simplify or enrich transactions with its suppliers, its customers and its partners, then it is in trouble — because its competitors certainly are doing so.

The SMARTS project<sup>(1)</sup> was launched at the start of 1996 to increase the participation of SMEs in ACTS projects — either

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as research contractors or as pilot users. It established a sophisticated electronic marketplace on the Web, enabling potential partners to make contact. As the projects have started to produce near-commercial technologies, the marketplace has evolved, and now offers a 'shop-window' on these products and services. In the current pre-competitive phase, visitors can still sign up as alpha users, but when ACTS finishes at the end of 1998, they will be able to visit the same marketplace as paying customers. SMARTS has become a key source of new technologies for the small business sector.

### Businesses in a Hurry

"SMEs are incredibly demanding IT users," says Klemens Gutmann, managing director of Teleport Sachsen-Anhalt, which has co-ordinated SMARTS. "They expect any investment in communications technology to pay for itself within a year — through savings or improved profits. They are only interested in technologies which improve efficiency immediately.

"For most SMEs, optical switching and gigabit transmission will not be important for another five years. We have concentrated on the multimedia and broadband applications they need today, such as collaborative engineering work environments, electronic marketing and payment systems, and teleconferencing — in short, technologies which support business transactions."

If SMARTS' objective was to lower the entry threshold for non-specialist SMEs, then its success to date has been impressive. When it publicised the third ACTS call for proposals last June, 16,000 visitors used the site to find out more about the programme. Nearly 7,000 SMEs used the partner brokerage service, and 370 went on to submit formal expressions of interest.



### Two-Way Traffic

Now SMARTS is evolving again. "In the past, non-specialist SMEs used the site to access new communications technologies," explains Gutmann. "We had created a busy virtual marketplace, in which the ACTS programme itself had a central booth. Now the visitors are starting to do business with one another. We want to make sure that it is not just the high-tech companies which are doing the selling."

SMARTS is on its way to assembling a group of 5,000 pilot 'content providers' — companies from all sectors and all European countries, who are advertising their products in the marketplace. For many, this is their first active use of an advanced communications technology. Already, around 50% are drawn from outside the high-tech sector. Their involvement brings them into contact with SMARTS partners, such as the Sophia Antipolis technology park in the south of France, where clusters of companies are using ACTS technologies to improve their competitiveness. The non-specialists can observe, make contact, and perhaps join in.

The service will continue after the end of the project. "We have core partners in eight countries, including Russia," says Gutmann. "We are currently developing a business plan for self-financing operation, based on the development of a more commercial regional electronic market in each country, using the SMARTS layout and database technology."

In Spain, for example, Galicia's top exporters are collaborating to establish an ambitious, graphics-rich web-based marketplace. In other regions, the service will develop differently. But the SMARTS search engine will provide a single point of entry to all the regional sites — and each of them will offer a link to SMARTS, so visitors will still only be one click away from information about ACTS technologies. ●

*The multilingual SMARTS service is evolving into a network of linked regional marketplaces.*

(1) SME and Regional Telecom Support, ACT14.



# Facing the Future

*The human face is a critical component of almost all multimedia applications. Conventional transmission of a high-quality 'talking head' requires massive bandwidth, but an ACTS project has found a way to encode facial movement efficiently, and in synchrony with speech.*



*Using a synthetic 3D model of the human head, VIDAS allows the appearance and movement of a speaker's face (left) to be transmitted efficiently, in synchronisation with the accompanying audio signal.*

**W**e absorb information most easily face to face. So valuable is the ability to interpret facial expressions that evolution has reserved special areas of the brain for this 'high bandwidth' application. To date, communications technologies have struggled to keep up. Not only do we find the 'flat' or 'jerky' images of today's video telephones irritating — we also easily misinterpret what is being said.

## MPEG-4

Tomorrow's interactive multimedia communications applications will be based on the MPEG-4 standard, which supports the coded representation of audiovisual 'objects'. "This will make it possible to combine and manipulate multimedia content from any number of different sources," says Fabio Lavagetto of DIST-University of Genova, in Italy, who co-ordinates the ACTS VIDAS project<sup>(1)</sup>.

"VIDAS is attempting to show that, with MPEG-4, applications

which have conventionally been considered only in the context of computer graphics are also viable in telecommunications products," he says. "We use synthetic objects to model the human face. This means that only a small number of parameters need to be encoded, so a lifelike image of a speaking face can be transmitted in just a few kilobits of data per second."

MPEG-4 only defines the bitstream syntax and the role of each parameter. VIDAS is developing the algorithms for extracting these parameters from an input video, and for reproducing the face's shape, texture and movement at the decoder as properties of a generic three-dimensional model. The project has already achieved image quality almost equivalent to that of traditional video-conferencing, which requires 64 kbits/sec or more.

## Read My Lips

The technology has been developed by a consortium of nine research centres and companies, together with a pilot end-user, the Irish National Association for the Deaf. "Listeners' understanding is seriously compromised by poor synchronisation of speech and lip movement, especially if they have impaired hearing," Lavagetto explains. "We encode visemes — the mouth-shapes associated with particular phonemes — so that sounds and lip movements can be precisely coupled."

A second key feature is scalability. A basic receiver will extract

minimal data from the bitstream in order to display a simple face, while a more sophisticated one can use the full data content to display a recognisable image.

VIDAS is closely involved in the continuing development of the MPEG-4 standard, as a member of the face and body animation (FBA) work group. "Our project looks specifically at video telephony, but there will also be other applications of the concept," says Lavagetto. He foresees its use in mixed natural/virtual video production from 2005, in multimedia publishing, and in advanced user-friendly information system interfaces. "Today, children can watch an actor reading their favourite stories on a video. In the future, they will be able to select a reader from a gallery of faces — including their own mother or father."

Visitors to the IST 98 Information Society Technologies Exhibition in Vienna at the end of November will be able to watch a live demonstration — and even to see their own face reproduced by the VIDAS technology. ●

<sup>(1)</sup> Video Assisted Audio Coding and Representation, AC057.

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## IST 98 – Information Society Technologies Conference and Exhibition

30 November - 2 December, Vienna (Austria)

IST 98, the EU's annual conference and exhibition on Information Society Technologies, which supersedes the series of European Information Technologies Conferences (EITC), will this year address the theme "Living and working in the Information Society". It will also specifically look at how new technologies can empower individuals and give them new ways to enjoy themselves.

A key event will be the introduction and presentation of the Commission's new "Information Society Technologies" (IST) programme, which from 1999 will bring together the current ACTS, ESPRIT and Telematics Applications programmes to provide a single integrated programme reflecting the convergence of information processing, communications and media technologies.

The parallel exhibition will present leading-edge technologies and products stemming from these EU programmes, plus demonstration and technology transfer events. It will also feature a "Meeting Austria" zone and a series of Central and Eastern European showpoints. An Investment Forum — by invitation only — will introduce venture capitalists to selected high-technology SMEs. The 1998 European IT Prizes will also be presented.

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## UNISPIN: Promoting University Spin-off Methodologies

8-9 October, Twente (Netherlands)

In response to strong demand for an additional event after the success of four workshops held in 1997, the Innovation programme's Unispin project (see edition 5/97) is organising an improved and updated workshop on how to create, manage and finance a university spin-off programme in your own region. The event will provide participants with individual counselling, followed by tailor-made assistance in carrying out a feasibility study and planning local programmes.

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## Maritime information technology and multimedia services

13-14 October, Brest (France)

MARCOM'98, the third European workshop on maritime information technology and multimedia services, will review the results of projects conducted during the Fourth Framework Programme. The potential for such projects under the Fifth Research Framework Programme will also be discussed.

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## Technology transfer and business opportunities

26-27 October, Helsingborg (Sweden)

A new European technology transfer network will be launched at this event, organised by a consortium of Swedish private and public bodies in co-operation with the Innovation Relay Centres network and the Technology Response Network. Participants will be able to meet around 40 selected regional companies from the following sectors:

- environmental technology
- communications technology and telematics
- transport and logistics
- graphic technology
- plastics

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## New developments in biomaterials

12-13 November, Thuringia (Germany)

The Innovation Relay Centre Southern Germany is organising a technology transfer event in the field of biomaterials, as a follow up to the 1997 Bioappliance convention. The event will offer participants the opportunity to present their expertise, technology and co-operation goals in a catalogue distributed prior to the event. Individual meetings with other companies with similar interests will be pre-arranged.

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## The role of research and development in regional economics

13-14 December, Vienna (Austria)

A second conference on the potential of research and development in structural support schemes for the enlargement of the EU is being organised with the support of the European Commission, DG XII. Aimed at policy-makers and industrialists in the applicant countries, it will highlight the potential for enhancing regional development by stimulating research and technological development.

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## Academic and industrial co-operation in space research

4-6 November, Vienna (Austria)

The aim of the conference, organised by the European Space Agency (ESA) and the Austrian Ministry for Science and Transport, is to provide a forum for representatives from universities, research centres and industry — in particular SMEs — to exchange ideas and enhance space-related research co-operation. The emphasis will be on practical issues.

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<http://www.estec.esa.nl/CONFANNOUN/98c16/index.html>

## Yeast as a cell factory

30 November - 2 December, Vlaardingen (the Netherlands)

The aim of the symposium, which is a sectoral meeting of the Biotech programme's Cell Factory project, is to bring together yeast researchers involved in the biochemical, physiological and genetic engineering of yeast for industrial applications. The focus of the event will be on the industrial exploitation of yeast and issues such as public perceptions of gene technology and its use in the food industry.

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## Demonstration projects in the life sciences programmes

EUR 17784 EN; ECU 13.50

Information on 17 projects selected under the second and third calls for proposals of the FAIR, BIOTECH, and BIOMED programme has been published by the European Commission, DG XII. To fill the gap between research and exploitation, the concept of demonstration projects was introduced as a means to prove the technical viability of research results, and to encourage adoption of newly developed technologies.

## Europe's environment: the second assessment

ISBN 92-828-3351-8; ECU 70

The European Environment Agency (EEA) has produced the second report on the state of Europe's environment, a follow-up to the Dobris Report of 1995. It concentrates on the 12 key environmental problems covered by the earlier report, as well as identifying the main socio-economic driving forces exerting pressure on the European environment. Presenting a clear picture of the changing state of the environment, it identifies progress made with the main European environmental problems and the key areas where further action is needed.

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## The Single Market Review

ECU 1,980 for complete series, or from ECU 48 for individual reports

The Single Market Review, a series of 38 sector reports and the results of a business survey, is written by leading experts, co-ordinated by the European Commission, DG XV (internal market) and DG II (economic and financial affairs). The sub-series cover:

- impact on manufacturing
- impact on services
- dismantling of barriers
- impact on trade and investment
- impact on competition and scale effects
- aggregate and regional impact

A summary progress report, 'The Single Market and Tomorrow's Europe' is also available, price ECU 12.

## Research policy and technological development in the Southern Mediterranean

EUR 17711

The Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre has published a report on research policy and technological development in the Southern Mediterranean countries. It presents the results of a questionnaire sent to representatives of 12 southern and eastern Mediterranean countries at the end of 1996. These show wide diversity — co-ordination structures are in place, but expenditure is low, except in Israel, Algeria and Tunisia. Co-operation is less well developed among the Mediterranean countries than between them and the EU.

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## Note

Publications are free unless otherwise stated. If specific contact information for obtaining a publication is not supplied, and there is a price listed in ECU, then the publication can be purchased from the sales and subscription office in your country of the Office for Official Publications of the European Communities (Eur-OP). Addresses can be found in most EC publications, on the WWW (<http://eur-op.eu.int/en/general/s-ad.htm>) and by contacting Eur-Op (fax: +352 2929 42759).

## SMEs and industrial models in the Euro-Mediterranean zone

EUR 17731 EN

This IPTS study provides an overview of issues raised by economic development in Mediterranean countries, and describes the special position of SMEs in these developing economies in relation to EU policy strategies to encourage their development. In the EU, due to the pressures of globalisation, the predominant development model is that of SMEs integrated into networks or linked to larger companies. The Mediterranean countries on the other hand are promoting the creation of new, independent SMEs by abolishing perceived obstacles to their development. The final part of the report deals with the limits inherent in the assumption that the Mediterranean can learn from the experiences of Europe's SMEs.

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