

# *Innovation & Technology Transfer*

5/95

## **The Joint Research Centre A European RTD Partner**

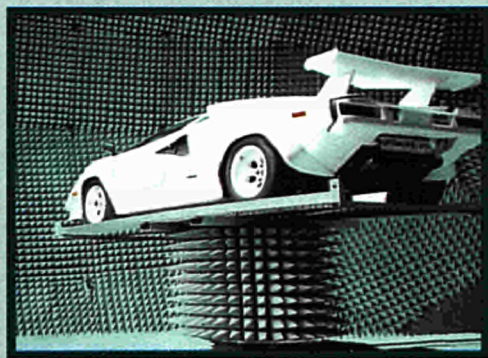
**plus**

- **Industrial Task Forces**
- **Information Society Update**
- **Software Valorisation Case Study**
- **Cheaper, Cleaner Magnesium**
- **and more**

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# C O N T E N T S



*The JRC's European Microwave Signature Laboratory in action (see Dossier, page 14)*

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**Cover photo:** The JRC's High Flux Reactor (HFR) at its Advanced Materials Institute in the Netherlands (see Dossier).

# JRC: Serving European Companies

## **The customer-contractor principle**

*This issue's Dossier reports on the Joint Research Centre (JRC) - the group of specialised research institutes run by the European*

*Commission. The JRC plays a prominent role in the implementation of the European Union's research programmes, it provides the European Commission with scientific and technical support, and it carries out research under contract for external clients. The Dossier focuses on the latter, increasingly significant, aspect of the JRC's work, covering the different research facilities and expertise available to European companies.*

*Also covered in this issue are the recently announced Task Forces, each concentrating on an important area of industrial technology relevant to environmental and quality of life issues.*

*This is followed on page 5 by an Information Society news round-up.*

*The Innovation Programme section includes news of a new network of Innovation Relay Centres, building on the pioneering network created under the earlier VALUE programme.*

*Finally, the regular Case Study and Programme Briefing sections cover, respectively, a new magnesium smelting process that also conveniently disposes of asbestos waste, and the European Commission's electronic data interchange programme which has issued a CD-ROM covering six important projects. ■*

## **ABOUT INNOVATION & TECHNOLOGY TRANSFER**

*Innovation & Technology Transfer* is published six times a year in English, French and German by the European Commission's Innovation Programme, which aims to strengthen Europe's innovation infrastructure and disseminate research results to industry.

The emphasis is on timely news relevant to these objectives and in-depth 'Case Studies' of successful projects. Each issue also includes a major Dossier on one topic. Subscription is free - please fill out the request form on the back page and fax or post it back to DG XIII/D-2.

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**Address**  
DG XIII/D-2, JMO B4-082, L-2920 Luxembourg  
Fax: +352 4301 32084

### **WRITTEN AND PRODUCED BY:**

**European Service Network, Brussels**  
Tel: +32 2 646 40 20  
Fax: +32 2 646 53 57  
E-mail: esn@infoboard.be

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**Ceuterick**  
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# Making the Most of European RTD

*The Industrial Task Forces established earlier this year are now operational. Together they aim to coordinate research across Europe in several key areas where industrial competitiveness and quality of life overlap.*



Photo: Photonews

**Commissioners Bangemann (left), Cresson and Kinnock launching the Task Forces last June.**

At present, 87% of public research funding is invested in purely national programmes, resulting in duplication. The basic idea behind the Task Forces is to reduce this duplication in six areas of European research: educational software and multimedia, vaccines for viral illnesses, intermodal transport and the car, plane and train of the future.

Each Task Force has begun identifying the various relevant public and private R&D initiatives in Europe, whether they be undertaken by the Member States, under the EC's Fourth Framework Programme or elsewhere in Europe. Meetings with industry throughout the summer will soon result in sector analyses, research priorities and proposals for combining projects within the EC's Specific RTD Programmes.

## Software and Healthcare

The Task Force on **Multimedia Educational Software** was formed because this fast growing, international market is dominated by American and Japanese producers, who can rely on powerful media industries and large, homogenous internal markets.

Europe's strong resources in this area face classically European disadvantages: an economically and culturally fragmented market, a compartmentalised school market and 'innovation-unfriendly' regulations.

After preliminary consultations with producers and users, the Task Force issued a Call for Ideas and Expressions of Interest in June. The results will be analysed by the end of September, with the final trimester of the year being dedicated to widespread consultation.

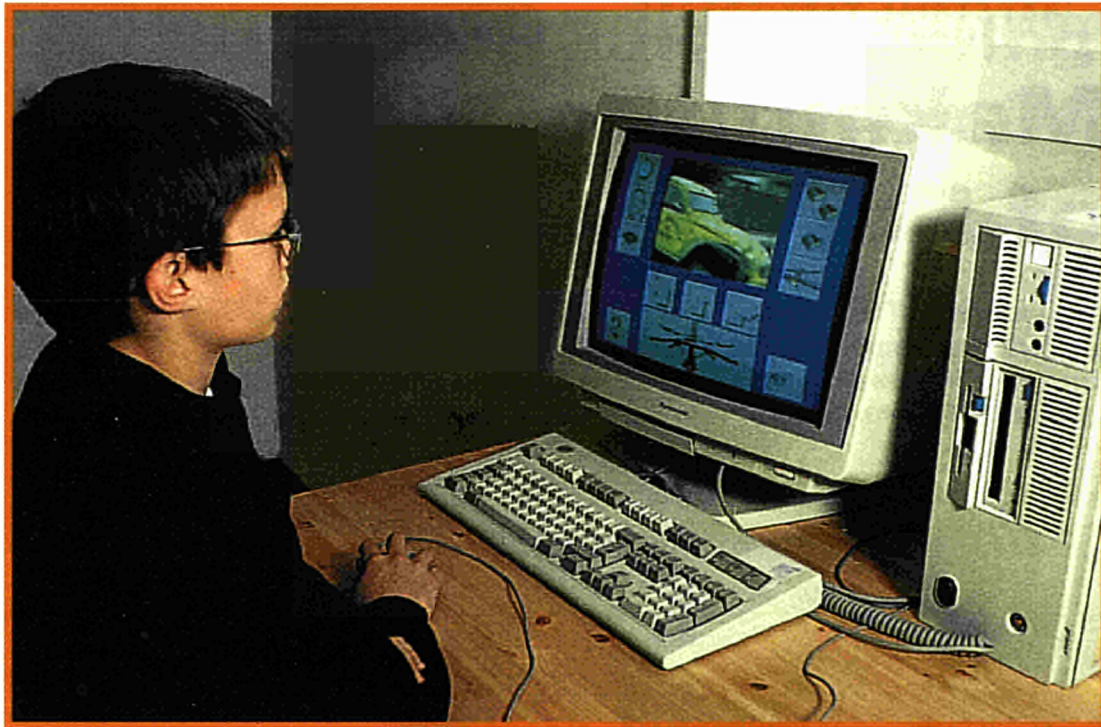
Another Task Force tackles an area which can improve public health and health care costs simultaneously - vaccine production. The Task Force on **Vaccines and Viral Diseases** aims to develop a research action plan to improve the position of European industry and to draw maximum benefit from European-scale action.

The market for vaccines is growing rapidly, and is set to reach 6 billion ECU by 2000. The US has 50% of the market, Europe another 28%. Most European R&D is carried out by six large companies, which together spend some 218 MECU in research each year. However, large American companies and the US Government perform the lion's share of the world's research effort.

Although the American and Japanese companies benefit from a large, homogeneous domestic market, Europe is still a contender. The European pharmaceuticals industry is one of the most efficient in the world, and the recent establishment of the European Agency for the Evaluation of Medicinal Products by the EU will help harmonise European regulation.

The Task Force's written consultation exercise, involving 80 potential industrial partners, large industrial associations, research institutes and the scientific community, resulted in the following consensus:

- improvements are necessary for research into and production of existing vaccines;
- new treatments are required for AIDS, hepatitis, tuberculosis and malaria;



**One project under the EC's IMPACT Programme showed that children as young as eight can learn from multimedia educational packages (pictured: 'A Safe Way to School').**

● ● ●  
 ■ 'lookout' and rapid intervention structures are required for emerging viral diseases;  
 ■ technical innovation in immunology and vaccine technology is required to improve the mechanisms for vaccine-induced protection.

Meetings are being organised on specific subjects. New initiatives will then be proposed to prepare for the launch of joint projects.

### Planes, Trains and Automobiles

The expected doubling of air traffic by the year 2010 will generate demand for roughly 15,000 new aircraft. The Task Force on **New-Generation Aircraft** aims to ensure that the European aerospace industry maintains and improves its share of this enormous market. It faces stiff international competition - the US market is twice that of Europe, and the R&D budget is over four times higher.

The Task Force's research objectives are based on the industry's 'Long Term Plans for R&D', proposed in 1993, and focus on aircraft efficiency, pro-

duction costs, environmental friendliness, safety and passenger comfort.

A working party of industrial representatives has been established and has already contributed to prioritising Task Force projects. The Task Force started combining a selection of projects from the Specific Programmes of the Fourth Framework Programme in July, and expects to have finished this process by October. A general progress report is to be published in February 1996.

The train, despite a steady decline recently, is still one of the safest and most environmentally friendly transport methods available. Europe is a world leader in high-speed trains, but the more than 1 billion ECU the Member States intend spending on R&D between 1995-1998 is not coordinated.

Hence the Task Force on the Train of the Future will help coordinate this R&D on a European scale. It will focus on the following problems:

- magnetic levitation trains, high speed trains, urban and suburban rail transport systems;
- traffic management;

- signalling systems;
- improving safety, punctuality and comfort through data processing and telecommunication technologies.

The Task Force aims to finalise the precise tasks and technological priorities by September.

The major challenge facing the **Car of the Future** will be to emit far less CO<sub>2</sub> and other greenhouse gases. The Task Force of the same name aims to facilitate the R&D required to develop this car by 2003-2005. With Europe lagging behind its competitors in clean car and electric vehicle technology, this will be a challenge.

The Task Force emphasises critical technologies (advanced energy storage and propulsion), the essential accompanying technologies (electronics, lightweight materials, telematics, etc.) and combining them together in zero-emission or hybrid vehicles.

A draft action plan is expected by October. Consultation with organisations and institutions is scheduled for December, with implementation of the action plan to begin later that month.

### Intermodal Transport

One of the most effective ways of optimising the transport infrastructure, however, is to combine the different transport systems together more efficiently. Many countries have developed effective national 'intermodal' transport infrastructures but, until the **Task Force on Intermodal Transport** was formed, there was no corresponding European initiative.

This Task Force's action plan covers:

- infrastructures and networks;
- standardisation, harmonisation and regulation;
- environmental impact;
- legal and institutional aspects.

It has established separate working groups for freight and passenger transport involving all the relevant Commission services, industrial representatives, transport operators and users. Precise tasks and priorities are currently being established. □

### Contact

■ **Multimedia Educational Software**  
 Mr M. Richonnier, EC, DG XIII  
 Fax: +32 2 296 8362

■ **Vaccines and Viral Diseases**

Mr B. Hansen, EC, DG XII  
 Fax: +32 2 295 53 65

■ **Car of the Future**  
 Mr E. Andreta, EC, DG XII  
 Fax: +32 2 296 68 82

■ **New-Generation Aircraft**  
 Mr P. Weissenberg, EC, DG III  
 Fax: +32 2 296 11 25

■ **Train of the Future and Intermodal Transport**  
 Mr J. Erdmenger, EC, DG VII  
 Fax: +32 2 296 83 52

# Growing Momentum

**Moves towards the Information Society are gathering pace, both within the European Union and internationally.**



**Meeting in Canada last June, the leaders of the G7 countries kept up to date on the 11 international Information Society pilot projects.**

On a global scale, the leaders of the eleven international G7 Information Society pilot projects<sup>(1)</sup> presented progress reports to the G7 summit held in Halifax (Canada) last June. The first phase of all projects - involving initial meetings and the preparation of action plans - is now well underway.

In Europe, there are a number of initiatives oriented towards the Information Society gathering momentum. On the research front, the three Specific RTD Programmes most closely related to the Information Society have finished selecting projects from the first Call for Proposals<sup>(1)</sup> under the Fourth Framework Programme, launched last December.

The three Programmes are Information Technology (ESPRIT), Advanced Communication Technologies and Services (ACTS) and Telematics Applications of Common Interest. ESPRIT aims to provide the components of the Information Society's infrastructure. Activities range from basic research on high speed comput-

ing to promoting best practice in software design. ACTS is oriented towards basic research into communications technologies, while Telematics aims to develop applications which are of interest to a wide number of user groups.

The fact that there are three different Programmes related to the Information Society reflects both the wide range of technologies that need to be developed and the enormous number of applications these technologies make possible. Although the different Programmes deal with different aspects, the three Programmes worked together during the selection process to an unprecedented degree.

## Networking Europe's Brainpower

Certain units of the ESPRIT and Telematics Programmes, for example, have joined forces to support the interconnection of Europe's national research and university networks at 34-155 megabits per second - fast

enough for multimedia network applications.

This is one of the ten target applications originally identified by the Bangemann Report on Europe and the Information Society<sup>(2)</sup>. Entitled 'Networking Europe's Brainpower', the 30 MECU pilot initiative draws equally on ESPRIT (where it has been treated as an ESPRIT Accompanying Measure) and Telematics (Area B/3 - Research).

By connecting together those national networks which currently operate at 34 Mbit/s, the project will empower Europe's researchers, help validate multimedia network applications and provide a high speed data network approximating a future commercial environment. A second phase is intended to both extend the network to other national networks when they reach 34 Mbit/s and increase the network's capacity to 155 Mbit/s.

The ESPRIT and Telematics Programmes, evaluating the proposals jointly, identified two highly suitable proposals. One consortium involved all of Europe's research networks and some PTTs (national telecommunication network providers), while the other was dominated by Europe's major PTTs. As a result, the Programmes urged the consortia to merge, forming one major effort involving practically all of Europe's suppliers and user groups. As *Innovation & Technology Transfer* went to press, negotiations were well underway.

## Other Sources

The European Commission's RTD Programmes, however, are not the only source of funding, support and policy ●●●



## PRESS REVIEW Information Society

DG XIII  
Issue number : 31  
22.05.95-15.06.95

**The ISPO Press Review keeps readers up to date with news on the Information Society.**

●●● initiatives for the Information Society. In 'Methodology for the implementation of information society actions', a Communication last June, the EC identifies a wide range of ways through which it can stimulate Information Society applications.

In most areas, according to the European Commission, the commercial viability of the new services and applications is sufficiently attractive to render public action unnecessary. But in cases where the prospects for commercial viability are judged by private investors to be uncertain in the long term, catalytic actions can be envisaged under the umbrella of public authorities, in particular in areas of collective interest. The EC can:

- **provide information and stimulate awareness**, for example by maintaining an updated inventory of projects that are planned or under way at national, European or international level (this is one of the 11 pilot projects identified by the G7 ministerial meeting in February 1995);
- **bring together actors** from different sectors with a common interest in certain initiatives;
- **guide and financially support projects.**

The available financial instruments to achieve these aims are:

- the trans-European networks support mechanism. For the trans-European telecommunications networks the Commission has earmarked an indicative amount of 450 MECU for 1995-1999;
- the Telematics Applications, ACTS and ESPRIT Programmes;
- the Structural Funds and the Cohesion Fund;
- the European Investment Bank and the European Investment Fund.

### Impact on Commerce

According to Mr. Papoutsis, Commissioner responsible for SMEs, trade is one of the first sectors to be affected by the Information Society. Speaking earlier this year to the annual plenary session of the Committee on Commerce and Distribution (CCD), the European Commission's advisory body on internal trade, he emphasised just how much this will affect Europe - over 20 million Europeans are employed in retailing and wholesaling.

"New forms of selling will bring consumers a greater choice at lower prices," he noted. "Costs will drop as intermediary transactions, the physical transport of information and unnecessary

coordination disappears."

"We do not believe that commerce as we know it is about to disappear, but it is possible that part of the market will be transferred to the benefit of new technologies," he continued. "The question is then whether traders will be able to acquire the necessary new skills. There is a pressing need to organise the adaptation of education systems and promote professional training, especially in the professions and trades most concerned. Continuous training will become more and more important: to show the way, the Commission has proposed that 1996 be the 'Year of life-long training'."

### Impact on Society

The Information Society, however, will affect more than just industrial competitiveness and commerce, which is why the European Commission places great emphasis on the need to understand the social implications of the Information Society. The EC wants a plan of action established to evaluate the consequences of the development of the Information Society and identify the measures that will allow all European citizens to take advantage of the expected benefits.

For this reason it has established a High-Level Expert Group on the Social and Societal Aspects of the Information Society, which had its first meeting in mid-May. According to the Commissioner for Social Affairs and Employment, Mr. Pádraig Flynn, "the Group will play an important role in helping the Commission launch an agenda for change, which will help equip Europe and Europeans for the challenges of the Information Society."

Mr. Flynn recognised that the key issue to be addressed in the first phase is employment: the amount of work which will be available in the Information Society, who will get access to this work, and when and where the work will be created.

"The principal concern is that citizens should seek to articulate

their demands on the Information Society, rather than just letting it determine their future," Mr Flynn stressed. "The solution of social problems should be the starting point for any inquiry into the Information Society. People must not be excluded from the Information Society just because they do not have the right diplomas, or because they are in the wrong part of their city or in a peripheral region, nor for reasons of gender, age, race or disability."

According to the President of the Group, Mr. Luc Soete, the Group hopes to provide the Commission over the next six months with some clear indications of where policy action is needed and, in a number of cases, what sort of policies are appropriate. □

## Contact

■ ISPO: Information Society Project

Office<sup>(3)</sup>

Tel: +32 2 296 88 00 / 89 00

Fax: +32 2 299 41 70 / 80

E-mail: [ispo@ispo.cec.be](mailto:ispo@ispo.cec.be);

Compuserve: 100137,370;

WWW: <http://www.ispo.cec.be/>

■ Progress Reports,

G7 pilot projects

WWW: <http://info.ic.gc.ca/g7>

(1) See edition 4/95.

(2) See edition 3/95.

(3) See edition 1/95 for an ISPO profile and Freephone contact numbers.

# Tackling the Single Market

**As a new EC report identifies the difficulties SMEs have with exploiting the Single Market, the EC continues to develop a strategy for this vital sector of the economy.**

In the early 1990s, a number of European professional organisations informed the EC that European SMEs were having serious difficulties in taking advantage of the Single Market. As a result, DG XXIII (Enterprise Policy, Commerce, Tourism and Cooperatives) launched a EURO-MANAGEMENT pilot action to investigate further and help these companies understand the Single Market.

Co-financed by DG III (Industry), the action involved auditing over 840 SMEs in the Member States and EEA countries according to a common methodology. It confirms that while SMEs

expect considerable advantages from the Single Market, many of them do not have an accurate understanding of its basic mechanisms.

The report<sup>(1)</sup>, produced by AFNOR, the European coordinator of the action, examined four main issues:

■ **regulation and standardisation:** SMEs are often ignorant of the principles of the Single Market and harmonisation, and have difficulty accessing and applying the relevant information. Few (25%) are involved in standardisation work;

■ **quality:** SMEs understand and apply the EN ISO 9000 standards

series with difficulty. In addition, over 30 other different models still exist. Furthermore, many of their consultants and clients demand the 9001 standard even when the less stringent versions (9002 or 9003) would do. Only a minority (less than a third) of SMEs implement a structured quality approach;

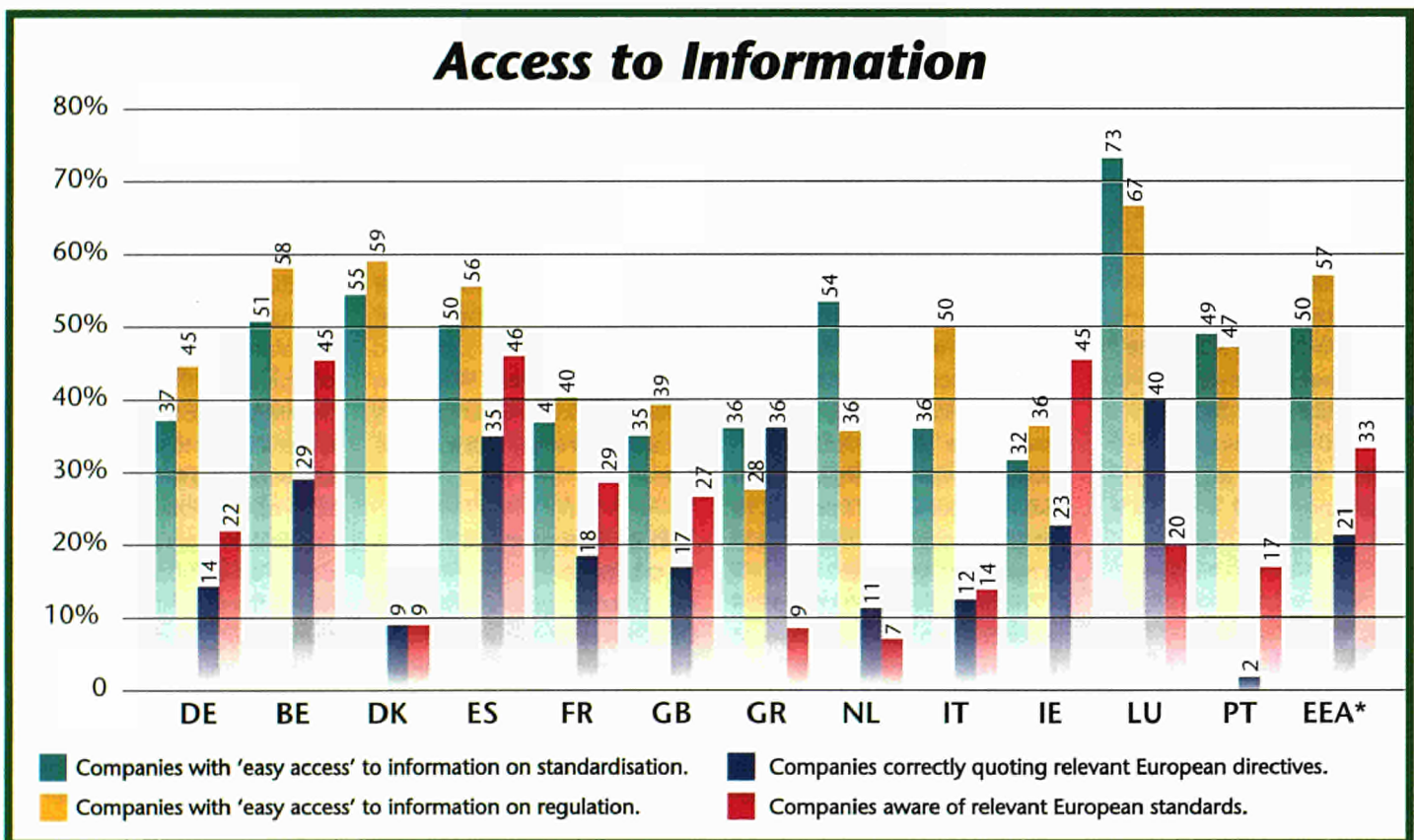
■ **certification:** similar confusion exists with certification as for standardisation. Virtually half of the SMEs, for example, said that they were familiar with the 'CE' marking, but only 20% were aware of the conditions for its use;

■ **health and safety at work:** SMEs are not well aware of ex-

isting or upcoming standards. Certain SMEs, worryingly, still consider safety standards as constraints.

The AFNOR report recommends activities to improve the access of SMEs to infrastructure, training and consultancy. In addition, it recommends tax reductions for SME participation in the standardisation process and for recruiting staff responsible for standardisation or quality. □

(1) Contact EUR-OP, the EC's Office for Official Publications; for details of your nearest Sales Agent, see the back cover of almost any EC-sponsored publication.



**Depending on the country, anything from 32-73% of the SMEs surveyed find accessing information on regulation and standardisation easy. Less than 30% of the SMEs surveyed in most countries knew the European directives or standards relevant to their product. (\*EEA = European Economic Area, pre-1995)**

► CASE STUDY: VALORISATION

**THE INNOVATION PROGRAMME IN BRIEF**

The Innovation Programme implements the Third of the four Activities of the Fourth Framework Programme (1994-1998). It is devoted to disseminating and exploiting research results, and selectively builds upon the earlier VALUE and SPRINT programmes (see Dossiers, editions 1/94 and 2/94). It is run by DG XIII/D. See edition 1/95 for a brief profile.

**C o n t a c t**  
 ■ Unit D-1:  
 Technology transfer

and validation projects, JRC liaison, intellectual property

Fax: +352 4301 34129

■ Unit D-2: Community Information and Dissemination Service

Fax: +352 4301 34989

■ Unit D-3: Relay Centres and other services

Fax: +352 4301 34129

■ Unit D-4: Innovation policy, regional aspects, financing, EIMS

Fax: +352 4301 34544

**C o n t a c t**  
 Mr R. Cartuyvels,  
 IMEC

Tel: + 32 2 016 281 218

Fax: +32 2 016 281 214

e-mail: cartuyvels@imec.be

# Optimising the Market

*A new software integration package was developed with the aid of ESPRIT to improve micro-electronics manufacturing efficiency. A valorisation project then confirmed its far wider potential.*

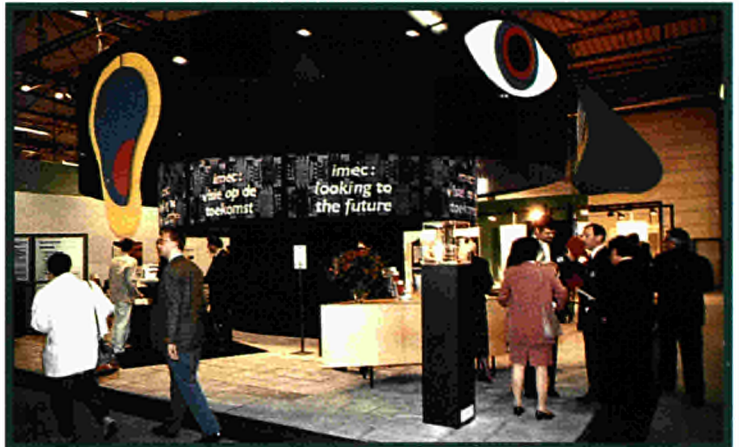
IMEC (Interuniversity Microelectronics Centre), the largest independent research centre in Europe, was founded in 1984 by the Flemish Government (Belgium) to encourage industrial and academic partnerships. A keen participant in the EC's Information Technology (ESPRIT) RTD Programme<sup>(1)</sup>, IMEC collaborated in 44 projects in 1994. These and other EC projects accounted for over 40% of IMEC's research revenue in the same period.

One of its latest innovations meets the double challenge of producing high performance quality components using high yield processes, such as those used in integrated circuit (IC) manufacture.

**STORMing Ahead**

"Hi-tech design tools are needed to optimise manufacturing efficiency without sacrificing quality," explains Mr Cartuyvels, TCAD Business Unit Manager at IMEC. "Computer simulations provide a relatively cheap solution, but conventional software processes can take days or even weeks. The 'NORMAN/DEBORA' software was developed within STORM, our ESPRIT project, to produce accurate simulations in a fraction of the time."

The original idea was to optimise submicron IC manufacture. At its launch at the Flanders Technology Fair in 1993, however, interest in NORMAN/DEBORA was so strong that IMEC requested a valorisation project to investigate its wider market potential. "We had a great response at the Technology Fair," recalls Mr Cartuyvels. "Not only from micro-electronics manufacturers but



**Looking to the future: IMEC's stand at the Flanders Technology Fair in 1993, where enthusiasm for NORMAN/DEBORA offered a first glimpse of its market potential.**

also from mechanical and chemical engineers who saw applications for NORMAN/DEBORA-style optimisation in their production processes."

Valorisation projects were introduced through the VALUE Programme<sup>(2)</sup> to help European companies and organisations realise the market potential of EC-supported innovations - an initiative which continues under the Innovation Programme. NORMAN/DEBORA showed obvious promise and IMEC was awarded 40,000 ECU to carry out a market study and business plan.

**The Perfect Couple**

As its name suggests, NORMAN/DEBORA combines two complementary processes. DEBORA is a non-linear optimisation tool which optimises product performance within specified tolerances using 'Response Surface Models' (RSMs). The RSMs are generated by NORMAN, a manufacturing simulator, which integrates various Computer Aided Engineering (CAE) tools and uses

a 'Design of Experiments' (DOE) approach. This is a winning combination: a task which would previously have taken a few months of engineering time can be performed by NORMAN/DEBORA in a matter of days. Importantly, the Open System architecture means that it can be applied to any UNIX-based CAE environment.

IMEC holds European Patents for many of its innovations and has already launched 7 spin-off companies. "IMEC is distributing NORMAN/DEBORA technology under licence to other electronics users, but this only represents 23% of the global market. The valorisation project revealed that a spin-off company could best realise the potential of this technology in other fields, particularly mechanical engineering, which represents 50% of the global market," Mr Cartuyvels explains. "As a result, we are negotiating with a number of major mechanical, chemical and steel manufacturers. Details of NORMAN/DEBORA - based prototypes may be available within the year." □

(1) A Dossier on ESPRIT will appear in the next issue.

(2) VALUE and valorisation projects were profiled in issue 1/94.



► TECHNOLOGY TRANSFER PROJECTS

# Exploring the Barriers to Technology Transfer

**A recent evaluation commends the exploratory nature of the SPRINT Programme's technology transfer projects initiative and highlights important lessons for the future.**

The Specific Projects Action Line (SPAL) was launched as an exploratory action by the now completed SPRINT Programme<sup>(1)</sup>. Many of the Commission's programmes are aimed at R&D, but SPAL's 5 year budget of 30 MECU was directed at transferring and diffusing existing technologies across sectoral and national boundaries. The SPAL aimed to:

- improve understanding of technology transfer processes and programme management;
- become an efficient technology transfer initiative in its own right.

At least one participant from each project was contacted for the Evaluation<sup>(2)</sup> and approximately 50% of all participants were interviewed. Rather than concentrating on effectiveness or efficiency, the Evaluation presents a 'broad exploration' of the lessons to be learnt.

## Two Phases Better Than One

A novel feature of the SPAL was its 2-phase approach. Two Calls for Proposals generated a total of 232 applications, 40 of which were accepted for a 'Definition Phase'. Around half (21) of these projects made it through to the second 'Main Demonstration Phase'.

This approach was particularly popular with SMEs, who appreciated the support provided during the early conception and formulation of their projects. Even those not granted further support after the Definition Phase benefited - one such company continued its project



**Although the SPAL was dominated by SMEs from the private sector, there were a wide variety of public sector and quasi-public or hybrid organisations.**

independently after establishing its feasibility during the Definition Phase.

Another novel feature of the SPAL was the 'Proactive Mentoring' approach adopted by SPRINT's managers. They not only helped with the bureaucratic procedures - also much appreciated by SMEs - but also played an active role in advising the projects. One example of this was their introduction of GOPP (Goal Oriented Project Planning), a management technique for transnational projects<sup>(3)</sup>. The Evaluation found that the SPAL was well administered overall but recommended more two-way interaction between Mentors and Project Leaders in future programmes.

The Evaluation found that the largest barriers to technology transfer were organisational. Four distinct barriers were discernible at each stage of the transfer process:

- **socio-institutional barriers:** establishing standards in different national settings. This was the most difficult process.
- **technical adaptation barriers:** fine-tuning the technology to the end users' needs;
- **socio-technical barriers:** e.g., different language formats for the same software package;
- **procedural integration barriers:** ensuring that the technology does not conflict with other established procedures.

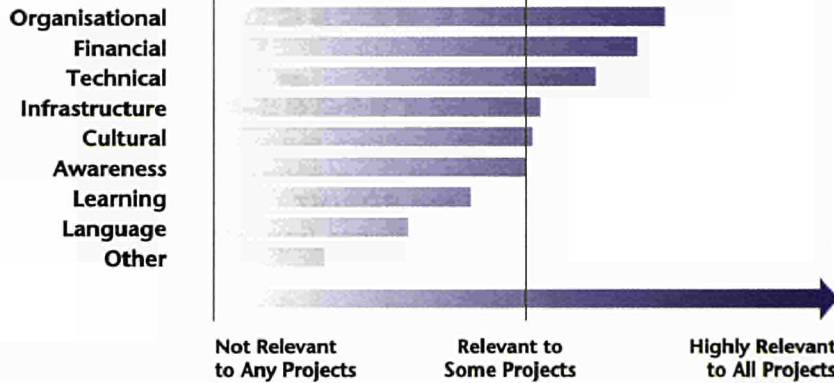
Language and cultural barriers were not as great as had been

anticipated. These may become more important, however, as wider dissemination strategies are developed.

## More Dissemination for the Future

The Evaluation finds that although the SPAL provided an excellent insight to the challenges facing technological transfer, it fell short of expectations when it came to disseminating project results. Project partners' reluctance to reveal their technological benefits to potential competitors was one factor in this. The proposed solution comes top of the list of the recommendations: ■ introduce better concepts for widespread promotion ●●●

## II. Technology Transfer Barriers



Source: [2]

**The barriers to technology transfer, as identified by participants in the SPAL.**

**C** o n t a c t  
**Mr G. Haesen,**  
**DG XIII/D-4**  
**Tel: + 352 4301 33594**  
**Fax: +352 4301 34129**

- ● ● and diffusion of project results. This will require Project Leaders to plan at an early stage how they intend to demonstrate the success and benefits of involvement in these types of action;
- place more emphasis on adapting existing technologies. Many proposals were rejected because they required further R&D;
- develop clusters of related pro-

jects, increasing project visibility and enhancing synergy;

- shorten the delay between the Definition and Demonstration Phases. This is especially important for SMEs, who often cannot afford to put a project on hold.

In conclusion, the Evaluation finds a place for SPAL to continue as both an exploratory tool - with more scope for effective

dissemination - and as a 'showcase' technology transfer tool. It also recommends that there is potential for 'Definition Only' projects in future programmes. □

(1) See the Dossier on SPRINT in edition 2/94.  
 (2) 'The Evaluation of the Specific Projects Action Line', Report EUR 15931.  
 (3) An article on GOPP appeared in edition 5/94.

► WORKSHOP

# Building Durable Partnerships

Large firms are increasingly looking to SMEs for some of their specialised requirements. While in most cases they simply subcontracted to smaller firms intermittently, several leading large firms in Europe have recently discovered that longer term and more durable partnerships are worth the extra trouble and investment. The SMEs, of course, gain valuable resources and an increased involvement in global production plans.

A recent EC study revealed that many firms are keen to learn from the experiences of others in developing these more 'formalised' networks. The Innovation Programme therefore brought together large firms, national policy makers, academics and EC officials in an Innovation

Policy Workshop to discuss best practices. The Workshop, entitled 'Large Firm-Small Firm Technological Interaction: European Experiences' took place in Luxembourg last April.

So what makes a network like this work well? The consensus is that the right environment is essential from the start, and that creating this environment requires commitment. One example of this is the acclaimed French initiative, CREATI - Centres Regionaux d'Appui Technique et d'Innovation. CREATI diffuses technical and technological support from its founders - major French companies such as Elf, Rhône-Poulenc and Thomson - to SMEs, encouraging a climate of innovation and modernisation in which new networks can flourish.

The overwhelming conclusion is that once a network is established, the concept of mutual and reciprocal benefit is vital to its survival. Presentations from BP, British Aerospace, CREATI, Elf, Shell and others also focused on the importance of:

- **all-round support:** SMEs need commercial and technical support as well as technological knowledge. Large firms, on the other hand, can learn from SMEs to improve in-house capabilities;
- **the regional aspect:** many interactions are regionally-based and local authorities can be effective intermediaries. Furthermore, developments may include regenerating the communities from which future consumers will come;

- **several years of commitment:** both financial and managerial.

The workshop confirmed that formalised large firm - SME interaction can result in effective strategic action and greater competitiveness for all parties, large and small alike. A background paper for the Workshop is available (in English) and a synthesis report is in preparation. □

**C** o n t a c t  
**Mr G. Stroglyopoulos,**  
**DG XIII/D-4**  
**Tel: +352 4301 33945**  
**Fax: +352 4301 34544**

► EIMS UPDATE

# Technology Brokers in Europe

The European Innovation Monitoring System (EIMS) has published a survey of Europe's technology brokers and a Directory of Technology Services in Europe. The Directory contains 336 organisations which offer complete technology brokerage services.

Analysing these brokers showed just how challenging their environment is<sup>(1)</sup>. A successful technology broker must have:

- an understanding of both science and industrial culture;
- a commercial mentality and practical experience in business economics;
- basic legal knowledge concerning intellectual property rights, licensing and industrial

cooperation agreements;

- a complementary source of revenue.

This last point is crucial. According to the report, "no-one can make a living from technology brokerage alone". In fact only one quarter of the brokers surveyed made more than 25% of their income from technology brokerage.

Their market share was also found to be low - brokers were only involved in around 10% of the technology transfer agreements in most EU countries (25% in Denmark). However, this is because most transfer deals involve large companies, an impenetrable market for private brokers. In addition, publicly funded brokers, which mainly serve SMEs, offer their services free of charge, so

their market share is not included in this figure. The impact of technology brokers is therefore much higher.

## A Strategically Important Service

"Technology brokers", the study concludes, "are strategically important to Europe's SMEs, fully justifying public sector intervention". However, it has been pointed out that public brokerage services often lack skills and resources, which can harm the industry.

This has also resulted in "a confusing myriad of public and private services, forming a complicated support framework that intertwines local, regional, national and EU structures and programmes." In the resulting

environment, competition is unclear, with private and publicly subsidised brokers competing for the same market.

Therefore, "[public sector] involvement must be rationally implemented to achieve greater efficiency and to assure its progressive withdrawal." The best policy for the public sector, it appears, would be to stimulate the private market, not compete with it. □

**C** o n t a c t  
**Mr M. Dahl, Technical Assistance Unit**  
**Tel: +352 46 55 88**  
**Fax: +352 46 55 50**

*(1) Both the survey and analysis were carried out by an international team under the leadership of Nodal Consultants, Paris.*

► INNOVATION RELAY CENTRES

# New Network Established

**Following the Call for Proposals on December 15, 1994, the new network of Innovation Relay Centres is taking shape.**

The basic thrust of the Relay Centre concept, which was pioneered by the VALUE II Programme (1993-1994), is to both help transfer the results of the EC's RTD Programme to European industry and help companies get involved in the Programmes. They therefore provide an intermediary 'one stop shop' between the Commission RTD Programmes and local companies.

The new network has 52 Innovation Relay Centres (see map). The basic aim has not changed but the scope has been enlarged - although IRCs will give priority to the results of EC-supported research, they will also cover national and regional programmes.

They will carry out:  
 ■ "downstream work": the local industrial fabric is analysed and its technological needs determined. ●●●



**Innovation Relay Centres**

●●● The IRC then finds the owners of appropriate technological solutions, developed in European and/or national research programmes, and brings them together with the local companies;

- "upstream work": promoting the Community RTD Programmes to the local area, helping local organisations draw up project proposals, supporting them through their projects and aiding them exploit the results.

The range of activities needed to fulfil these objectives is very

wide. IRCs will hold partnering events and technology demonstration sessions, provide information on relevant financial support schemes, carry out technical audits of companies, help train companies in innovation, research exploitation and technology transfer, provide consultancy services on market studies and intellectual property rights, and much more.

The IRCs are hosted by existing regional or national organisations and include both private

companies and public bodies. There is also a second tier of Associate Members. These will receive just as much information from the Commission as the IRCs and can participate fully, but do not receive any Commission funding.

The full list of IRCs and Associate Members can be obtained from the IRC Central Unit. □

CONTACT

**C** o n t a c t  
**Mrs C. Couvreur and  
 Miss C. Trierweiler,**  
**IRC Central Unit**  
**Tel: +352 4301 34008**  
**Fax: +352 4301 34009**

► FINANCING INNOVATION

# Swedish Investment Forum

One of the key problems facing innovative companies is attracting the necessary private capital, particularly during the crucial early stages of development. The SPRINT Programme (1984-1994) tackled this question with a series of international investment fora to bring these companies together with technology-oriented 'early stage' investors.

Often known as seed capital or venture capital investors, these organisations invest in innovative companies at an early stage, usually in exchange for equity. As their financial return depends on the companies' performance, many also provide financial and management advice.

Although SPRINT finished last year, this particular budget has not yet been exhausted, so the Fora continue to be held<sup>(1)</sup>. The latest was organised in Stockholm on June 8-9 by the Swedish National Board for Industrial and Technical Development (NUTEK) and the French Agence Nationale de Valorisation de la Recherche (ANVAR). It attracted 26 investors from Scandinavia and France, as well as 28 companies, mainly SMEs from France, Norway and Sweden, who presented technologies



**Birger Tjälldin of System Innovation A.B., Sweden, demonstrates his company's prize-winning portable fax - shown here receiving a message from China.**

ranging from laser surface treatment to violin manufacturing.

NUTEK surveyed the participants after the event, and found a generally high degree of satisfaction. "Two thirds of the companies rated the event as quite or very successful," Thomas Jänmark of NUTEK observes. "The investors were also satisfied overall, but there was a larger spread - some thought it was excellent, while a few thought the opposite."

According to Mr Jänmark, this shows that investor expectations

vary enormously. "They're a difficult target group," he concludes. "I think more needs to be done to improve communication at a European level between these investors and the other actors in the field."

Final results from the Forum will only come to light in a few months. However, Mr Jänmark says that some firm offers were made within a few days of the event. "There were some real winners at the Forum," he recalls. "I'm sure some significant deals will result." □

**C** o n t a c t  
 ■ **Mr T. Jänmark,**  
**NUTEK**  
**Tel: +46 8 681 9468**  
**Fax: +46 8 681 9675**  
 ■ **Investment Fora: Bernard  
 Hex, Technical Assistance  
 Unit**  
**Tel: +352 46 55 88**  
**Fax: +352 46 55 50**

(1) SPRINT Investment Fora are planned for Madrid (autumn, 1995), Venice (early 1996) and Germany (autumn, 1996).

► CALL FOR PROPOSALS

# Regional Innovation Strategies

The Innovation Programme and DG XVI (Regional Policy) are preparing a joint Call for Proposals for Regional Innovation Strategy (RIS) projects. As *Innovation & Technology Transfer* went to press, the Call was expected to be launched on September 15.

Regional Innovation Strategies stem from two initiatives launched last year:

- in RITTS (Regional Innovation and Technology Transfer Strategies and Infrastructures), the EC financially helped regional policy makers and development organisations employ consultants - chosen from an approved list - to develop and implement strategies to improve the regional innovation and technology transfer infrastructure and policies;
- Regional Technology Plans

(RTP) exercises: the EC helped define regional technological plans in the framework of the Structural Funds, which are administered by DG XVI (co-organiser of the programme with DGXIII-D). Each RTP project aimed to encourage regional development of innovation strategies and policies and to provide an investment framework for regional RTD initiatives. □

**C** o n t a c t  
**Jaques Bonnin,**  
**Technical Assistance**  
**Unit**  
**Fax: +352 465 550**

► PUBLICATIONS

# Keeping Informed

The Innovation Programme produces regular periodicals, one-off publications and a quarterly CD-ROM to disseminate research results and help companies innovate. Many of the publications are based on the nine CORDIS databases, each featuring extra articles to provide 'added value'.

CORDIS focus, a fortnightly presentation of selected articles from the CORDIS RTD-News database, for example, has also recently featured:

- **the Call for Proposals supplement:** this summarises all the Calls for Proposals presently foreseen for all the specific programmes up to the end of the current Fourth Framework Programme. It details the global areas and sectors covered by each Call, as well as the launch and closing dates;

- **RTD Results supplement:** this quarterly supplement to CORDIS focus combines details of research results with potential market applications, selected from entries in the CORDIS

RTD-Results database. Each edition is divided into sections, with industry and technology, biological sciences, protecting man and the environment, and measurements and standards, taking the lion's share of around 150 entries in the June issue.

The monthly *Euroabstracts* is another CORDIS-based periodical. Apart from providing abstracts of all the science-based reports produced by the EC, it also contains feature articles reviewing major publications and profiling the EC's specific RTD Programmes. Major articles recently covered: the Telematics for Libraries Programme (September edition); Managing Collaborative R&D (August); the Advanced Communications RTD Programme (July).

Published quarterly, the **CORDIS CD-ROM** holds the same data as the CORDIS databases. Although its information is obviously not as up-to-date as that offered by the online service, the CD-ROM format offers an easy-to-use alternative for those

who prefer to do most of their searching offline, before switching to the online service for the most recent data. □

**C** o n t a c t

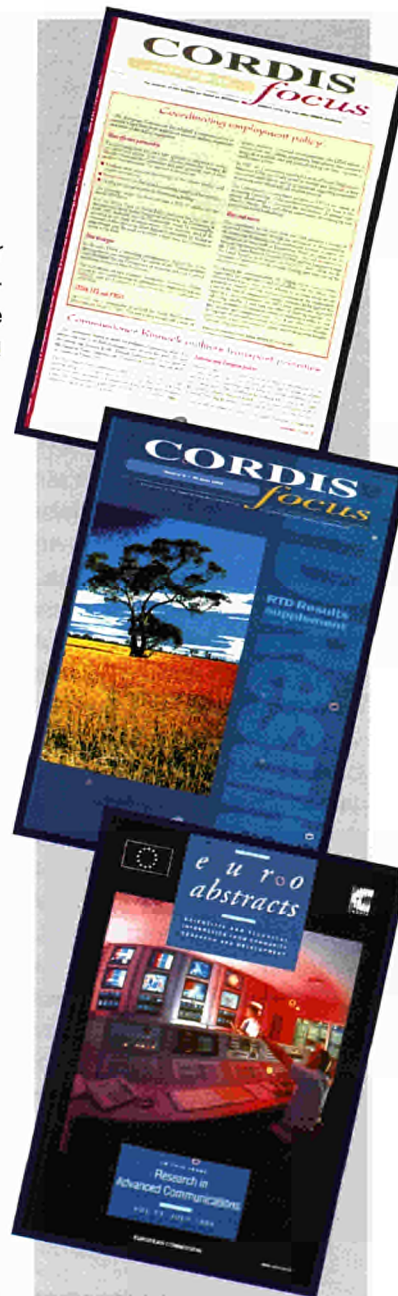
- **For CORDIS focus and its supplements as well as for a specimen copy of Euroabstracts:**

**RTD Help Desk**  
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- **For an annual subscription to Euroabstracts (12 issues, 63 ECU), contact your nearest EUR-OP Sales Agent:**

**Addresses are given in the back of almost any EC-sponsored publication.**

- **An annual subscription to the CORDIS CD-ROM (4 issues, 250 ECU) is available from:**  
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# Your European



*With eight research institutes in five European countries, the Joint Research Centre (JRC) has always been an excellent partner for innovative European companies in search of scientific and technical expertise. With the Fourth Framework Programme (1994-1998) encouraging the JRC to be more market-oriented and play a greater role in the Specific RTD Programmes, more European research consortia are tapping these resources than ever before.*

Operated by the European Commission, the JRC was originally established as the Joint Nuclear Research Centre in the late 1950s under EURATOM, the treaty of the European Atomic Energy Community (EAEC).

Today, the JRC covers a much wider range of activities. It is composed of eight Institutes located in research sites in Geel (Belgium), Karlsruhe (Germany), Ispra (Italy), Petten (the Netherlands) and Seville (Spain). The Institutes are:

■ **IRMM:** Institute for Reference Materials and Measurements (Geel) - reference samples, mass spectrometry, radio-nuclide metrology and neutron beam analysis;

■ **ITU:** Institute for Transuranium Elements (Karlsruhe) - nuclear fuel, studies on actinides;

■ **IAM:** Institute for Advanced Materials (Petten & Ispra) - studies of materials and components (surface treatments, testing and analysis, composites, thin film deposition, etc.), operating the High Flux Reactor;

■ **EI:** Environment Institute (Ispra) - analysis of chemical waste, foodstuffs, air and water pollution and chemicals;

■ **RSA:** Institute for Remote Sensing Applications (Ispra) - mapping, modelling and monitoring of terrestrial and marine environments, advanced sensing and image interpretation techniques;

■ **IST:** Institute for Safety Technology (Ispra) - industrial hazards, structural reliability, nuclear accident analysis, nuclear waste management and tritium technology;

■ **ISEI:** Institute for Systems Engineering

and Informatics (Ispra) - risk assessment, industrial reliability, diagnostics, nuclear safeguards, non-nuclear energy and software;

■ **IPTS:** Institute for Prospective Technological Studies (Seville) - technology monitoring and assessment, forward studies.

Together, these Institutes boast over 2,000 staff. Several hundred visiting scientists, seconded experts, post-doctoral scientists and post-graduate students increase its breadth and depth of expertise every year. In addition, more than 30 years of investment has provided the JRC with many sophisticated research facilities, ranging from the IAM's High Flux Reactor to the IST's 'Reaction Wall' structural assessment facility (see page 19).

In 1994, two thirds of the JRC's budget was spent on 'Institutional Research' - R&D for the 1992-1994 Specific Programmes. Another 23% was devoted to 'Institutional Support' - supplying the European Commission with the unbiased, high quality scientific and technical support it needs for its legislation, regulation and other activities.

Of most interest to Europe's technology-oriented companies, however, is probably the JRC's 'Third Party' work, where the JRC carries out research on a contractual basis for external clients. Third Party work provided the JRC with 7% of its budget in 1994. Most (75%) of this work remains in the nuclear sector, with environmental research accounting for most of the remainder. The Institute of Advanced Materials has so far won the most Third Party contracts<sup>(1)</sup>.

# Research Partner

## A New Partner in European R&D

Introducing Third Party Work was the first step in opening the JRC up to competition. This process recently reached a new stage with the Fourth Framework Programme (1994-1998), which aims to gradually introduce a market-oriented 'customer/contractor' relationship into most JRC activities.

As a result, around 20% of the billion or more ECUs the JRC needs for 1994-1998 will have to be won from the market. However, this market has been expanded - for the first time, the JRC will receive EC funding when taking part in the shared cost research projects of the Specific Programmes.

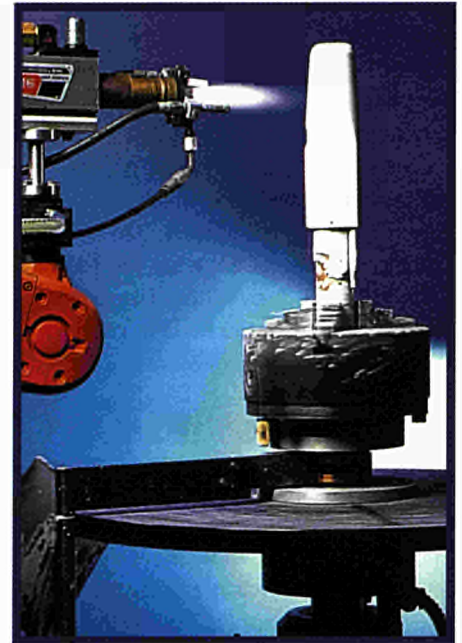
In addition, 128 MECU of the JRC's Institutional Support budget has now been opened to competition - the JRC will have to outcompete other research providers in supplying the EC with scientific expertise. Thus the JRC is highly motivated to take part in the shared cost research projects under the new Specific Programmes. Has European industry responded to this opportunity?

Preliminary results from the Calls for Proposals issued this year indicate that it has. By mid-May there were many

more project proposals involving a JRC Institute than ever expected. The vast majority involve the JRC as an 'invited partner', rather than the coordinator, demonstrating that the JRC does have something to offer research project consortia as a source of high-quality research. In addition, 1994 saw a considerable growth in Third Party work.

As *Innovation & Technology Transfer* went to press, these proposals were still being evaluated. What can be seen, however, is that certain Programmes attracted certain Institutes (see Graph 1). The Institutes for Advanced Materials, Systems Engineering and Informatics, Remote Sensing Applications, Safety Technology and the Environment Institute produced just over 90% of the proposals. This is unsurprising, as their expertise and facilities closely match the requirements of many companies and research institutes involved in the Specific Programmes. For this reason, this Dossier focuses on these Institutes.

A fuller picture of the JRC, of course, would be much longer, and can be obtained by reading the JRC's Annual Report, the Annual Reports and Work Programmes from each Institute and many project-specific publications.



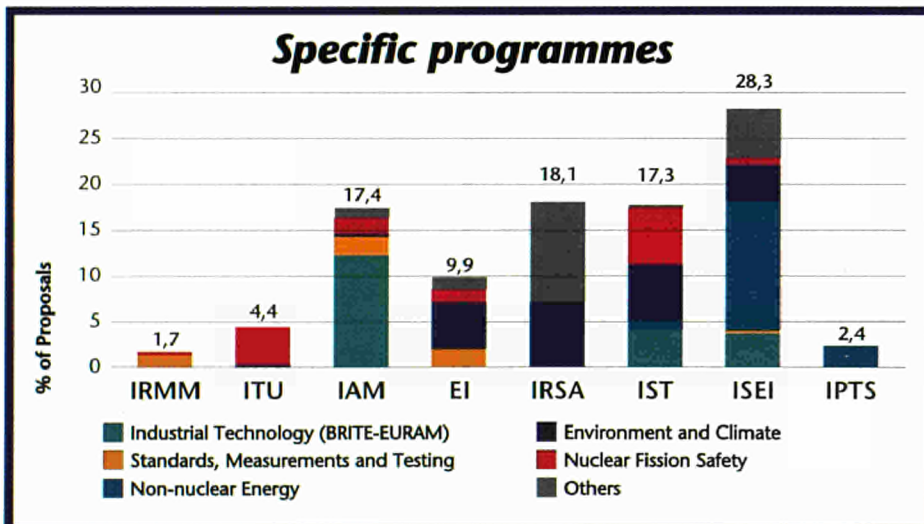
**The IAM's automated high velocity flame spraying equipment producing experimental high density carbide layers.**

## 1. Advanced Materials

The IAM has over a decade's experience in the development and characterisation of both metallic and ceramic materials for advanced, high temperature applications. It also operates the High Flux Reactor in Petten and a cyclotron in Ispra. Its core research themes are:

- Advanced Testing, leading to European quality standards for testing materials;
- High Temperature Materials, driven particularly by applications in industrial plants and propulsion engines;
- Energy and Environment, focusing on the recyclability of industrial materials;
- Surface Modification Technologies - the IAM has laser, ion beam, coatings and thin film deposition facilities;
- Rejuvenating Aged Materials;
- Inspection Qualification<sup>(1)</sup>;
- Fusion materials.

(1) Case Studies on the IAM can be found in editions 1/94 (crack growth in turbine blades) and 3/95 (PISC - inspecting steel components). Edition 3/94 features another Case Study on a multi-Institute, multi-disciplinary project to develop the science base of Sicily.



**Over 90% of the proposals stemmed from five Institutes, and well over half were for the Environment & Climate, Industrial Technologies and Non-Nuclear Energies Specific Programmes.**

●●● The IAM is very industrially-oriented, and offers a wide range of testing services (mechanical deformation, crack growth, corrosion, etc.) for an equally wide range of materials and components (alloys, ceramics, composites, tubular components, etc.). It also runs a High Temperature Material Databank.

Companies wishing to develop and test new materials can tap the IAM's almost 200 scientists and engineers, backed up by support staff and first class experimental and computer-simulation facilities. The past year has seen progress in areas ranging from aeroengine gas turbine blades<sup>(1)</sup> to ceramic joining techniques. An Advanced Coating Centre has also recently been installed, providing a European focus for coordinated R&D in coating technologies.

## II. Systems Engineering and Informatics

The ISEI's wide ranging expertise includes environmental risk assessment and management, industrial safety and reliability, non-nuclear energy, optical diagnostics and applications of artificial intelligence, parallel computing and 3D image processing.

In 1994, for example, ISEI studies of reasoning and decision making processes in complex work environments resulted in a model of stress that will improve interfaces and communications in industrial plants, air traffic control and many other environments (see page 17).

The ISEI decision support models for environmental management have been applied to projects in Ireland and Italy. 1994 also saw field-testing of the ISEI's new Electronic Speckle Pattern Interferometer, which scans objects with a laser and analyses the interference patterns to locate microscopic cracks and deformations. The portable instrument has already analysed materials ranging from composites to ancient paintings.

The ISEI's experience with advanced information technologies were used to develop, among other technologies, digital compression systems for processing satellite images, techniques for visualising oceanographic modelling data in three dimensions and a neural network for guiding a remotely operated robot.



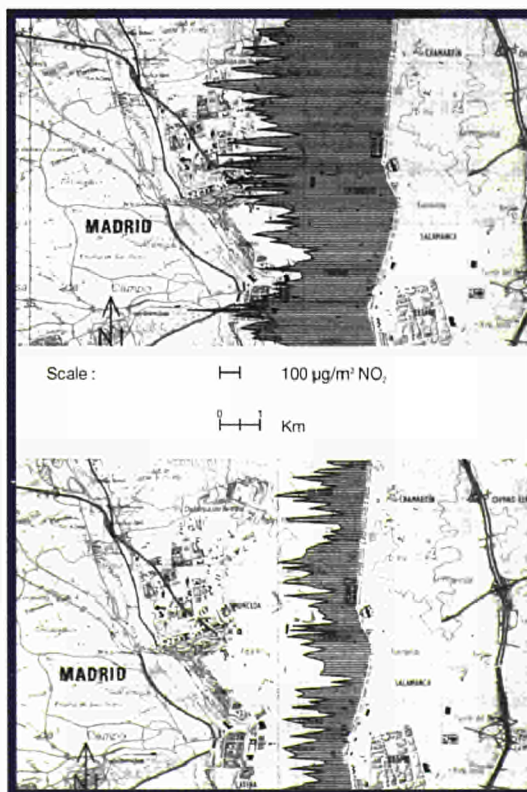
**A 3D scene generated by the ISEI on its high speed SUPERNODE massively parallel transputer computer, developed within the EC's ESPRIT Programme.**

The ISEI's many experimental facilities include the:

- European Solar Test Installation, for testing and qualifying photovoltaic cells;
- TELEMAC laboratory, where remote handling equipment for heavy loads is simulated and tested;
- Computer Aided Engineering Laboratory;
- STRIKE Laboratory, for fatigue and thermal shock tests;
- Laser and Applied Optics Laboratory, which focuses on using optical techniques for diagnostics.

## III. The Environment Institute

The Environment Institute has developed a wide range of technologies and techniques for analysing various aspects



of the environment, from air monitoring networks to the evaluation of environmentally-sensitive chemicals.

Advanced analytical techniques (e.g., mass spectrometry, nuclear magnetic resonance, laser spectroscopy and chromatography), coupled with world-class laboratories and over 250 scientists and technicians (including visiting fellows), have made the EI a successful partner in many Third Party work contracts, which rose from 0.7 MECU in 1990 to 6.5 MECU in 1994.

The EI's activities range from research into global change to environmental quality. Projects range significantly in size and scope. For example, in 1994, the EI:

- analysed and developed models of the adsorption/desorption of several Volatile Organic Compounds on/from furniture surfaces;
- performed field and laboratory studies on pollution-soil-water interactions and the toxin production associated with algal blooms;
- set up two Mobile Analytical Laboratories, resulting from a EUREKA project<sup>(2)</sup> for in-situ sampling and analysis of polluted soil and water;
- created a World Data Centre for Aerosols in collaboration with the World Meteorological Organisation;
- inaugurated the European Centre for the Validation of Alternative Testing Methods (ECVAM), which aims to develop and validate tests which do not involve animals;
- developed techniques to identify the origin of alcohol in wines and spirits;
- continued operating the European Chemical Bureau for evaluating existing and new chemicals.

## IV. Remote Sensing Applications

IRSA focuses on turning satellite data into useful, accurate and

**The EI's mobile air pollution laboratory measured NO<sub>2</sub> distribution along North-South boulevards in Madrid both during a pollution episode (above) and after a cold front (below).**

<sup>(2)</sup> See the Case Study on EU 674 - Mobile Analytical Laboratory, in edition 5/94.



## Case study: ISEI/EUREKA

## Software for Safety

**The first fruits of a five year EUREKA project involving the ISEI and major software and industrial companies is undergoing its first commercial trial in France.**

**M**odern industrial plants are extremely complicated. The control room operators must continuously monitor enormous amounts of data and evaluate process changes instantly. The pressure is real, because mistakes can have catastrophic consequences, as accidents in Bhopal, Seveso and elsewhere show.

To avoid such disasters, plants are usually shut or slowed down whenever there is the slightest problem. This, of course, is hardly ideal for the producers, who would prefer greater control to reduce plant downtime, increase safety and improve product quality.

Greater control, however, requires greater mastery of the information presented to the operator. This is the rationale behind the EUREKA<sup>(1)</sup> project FORMENTOR (EU 19), where the ISEI's expertise in system modelling and safety engineering is being tapped by the French companies Cap Gemini Innovation and APSYS (an Aerospatiale subsidiary), Det Norsk Veritas Research (Norway) and British Petroleum.

### Knowledge-Based Systems

Like the human operators, the Formentor system monitors around 50 key process parameters. When these parameters start drifting away from normal, however, Formentor is able to review hundreds of sensor outputs to try to identify the problem. It combines this data with knowledge-based techniques, including expert systems, process models and so on, to suggest ways of handling the problem before anything more serious develops.

"Formentor is not intended to be an automatic system, it simply helps the operator make the right decision," emphasises ISEI scientist Marc Wilikens. "To begin with, it is able to spot future problems earlier than most operators. It can then suggest courses of action which are 100% safe but may not involve a complete shutdown.

"We've calculated that if Formentor

prevented just half of all shutdowns in a typical plant, it would pay for itself within a year," he continues. "But there is more to it than economics - Formentor will help the operators take faster and more effective action when the situation does go critical. And with as many as ten different alarms sounding at the same time, the operators need all the help they can get."

### A TOTAL Solution

The Formentor methodology and software toolkit are designed to be as generic as possible - only 20% of the software will have to be tailored to each individual application. In this way the partners aim to target markets such as nuclear power, space programmes, oil production and chemical manufacturing.

The project's first phase ended after pilot tests at a BP plant and an Aerospatiale satellite ground centre. The industrial development phase began in 1994. As is common with many projects of this type,

all the partners can commercialise the technology. However, if any partner needs technical assistance in developing solutions for their new-found clients, they must first turn to the other partners.

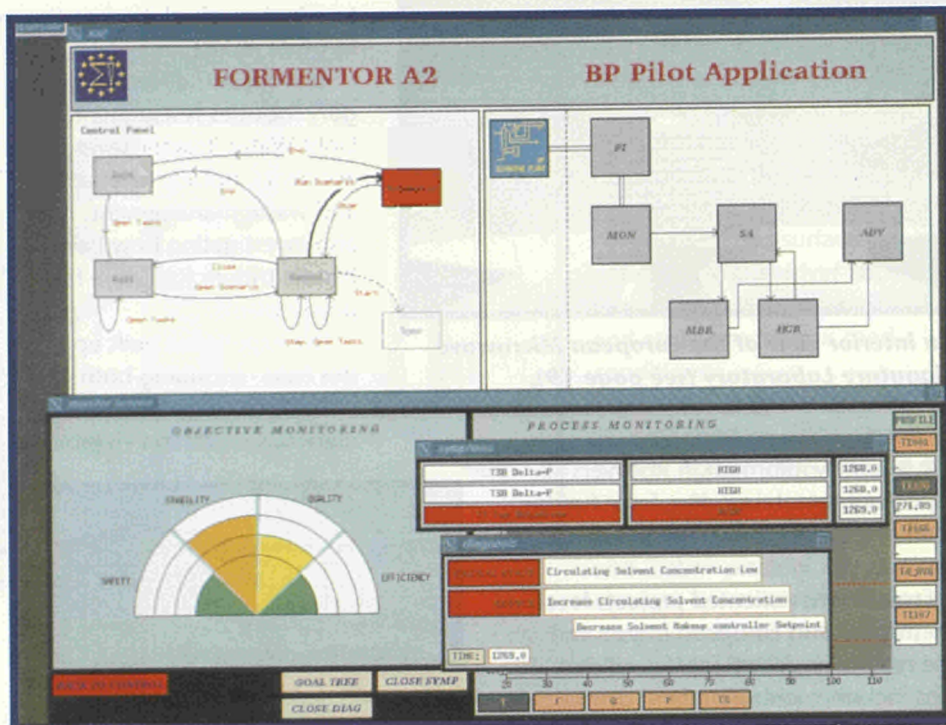
This is the case with the first commercial application, which is being led by Cap Gemini and involves both Aerospatiale and the ISEI (under a Third Party contract). Together, the partners have installed a Formentor system in a catalytic cracking unit within the French petroleum company TOTAL's oil refinery. An initial evaluation is expected by October.

**C o n t a c t**  
**Dr M. Wilikens, ISEI**  
**Tel: +39 332 78 9737**

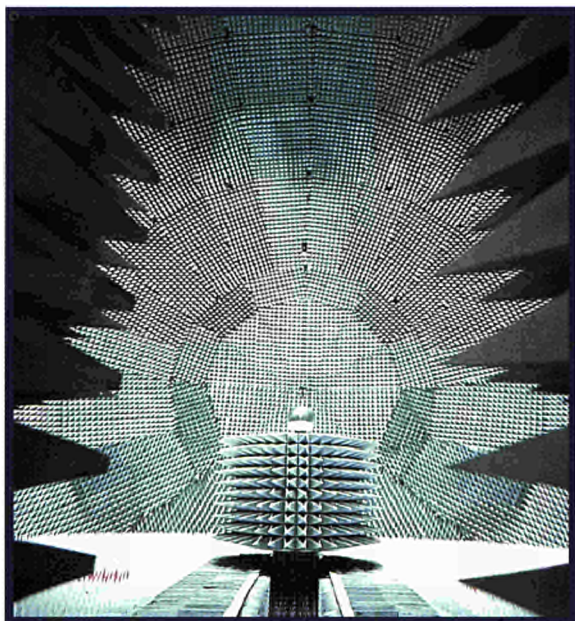
**Fax: +39 332 78 9472**

**E-mail: Marc.Wilikens@jrc.it**

(1) EUREKA was profiled in the Dossier of edition 5/94



**Formentor was pilot-tested at a BP petrochemical facility.**



**An interior view of the European Microwave Signature Laboratory (see page 19).**

●●● timely information. It covers all aspects of remote sensing, from fundamental research to large application projects.

Environment-oriented projects focus on tropical and European forests and the marine environment. Specific activities include monitoring land degradation, water use management, coastal erosion and tropical bushfires.

The IRSA has also pioneered the application of remote sensing to monitoring agriculture. The Monitoring Agriculture with Remote Sensing Programme (MARS) successfully showed that multiple-satellite data, combined with agro-meteorological models and ground measurements, could improve agricultural statistics and crop forecasts.

IRSA's Advanced Techniques Unit concentrates more on long-term research, ranging from theoretical work (e.g., electromagnetic modelling, radar scattering) to validating new applications (e.g., detecting oil slicks, monitoring ship traffic). Signal analysis and processing is a key activity. The European Microwave Signature Laboratory (EMSL, see page 19) is a recognised European large-scale facility. Integrated information systems capable of fusing different data, including neural networks and geographic information systems, are also under development.

Lastly, IRSA is presently managing the 'Pathfinder Phase' of the Centre for Earth Observation. The CEO project is part of the joint EC-ESA European Earth

Observation System, and aims to stimulate user-oriented services based on Earth Observation data.

**V. Safety Technology**

The IST both carries on its original remit to ensure the safety and security of nuclear power systems and continues to adapt much of its expertise to other industries.

Its work in the former category includes research into Light Water Reactor severe accidents, nuclear safeguards and waste management. It is also investigating how best to handle tritium for future fusion power plants.

The experience built up in this field - including both experimental research and numerical simulation - is proving

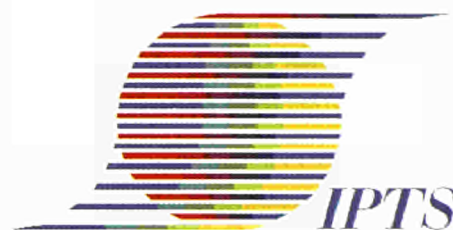


**A southern view of the IST's European Laboratory for Structural Assessment (see page 19), complete with a new facade of photo-electric panels as part of the Ecocentre project (see page 20).**

very valuable to the study of industrial hazards. The Facility for Investigating Runaway Events Safely (FIRES) project, for example, uses a 100 litre batch chemical reactor for studying the process dynamics of a wide range of industrial chemical processes. Other work ranges from analysing chemical reactor stability using chaos theory to numerical simulation of reactor flows.

The IST is also a world leader in assessing structural integrity, including analysing the earthquake behaviour of building structures and crash-testing automotive components. Again, numerical simulation is combined with first-class experimental facilities, including ELSA, the 7 MECU European Laboratory for Structural Assessment (see page 19). □

**IPTS:  
Looking Ahead**



The Institute for Prospective Technological Studies seeks to understand the impact of science and technology on the economy and society and to help decision-makers manage change from a science and technology perspective.

IPTS studies are multi-disciplinary and cover fields such as energy, environment, industrial technologies and others. IPTS is setting up the European Science and Technology Observatory, based on a network of national organisations, to stay up-to-date on scientific and technological trends in Europe.

By the end of this year a number of new reports will be available from the IPTS library, including studies into recycling plastic waste, CO<sub>2</sub> disposal and storage, climate change research and policy and photovoltaic technology. In addition, some reports from the Institute's earlier days will be republished (the 'PROMPT Series').

**C** o n t a c t  
**JRC Public Relations Office,  
 Ispra**  
**Tel: +39 332 78 91 80**  
**Fax: +39 332 78 57 18**  
**E-mail: e\_rossi@cen.jrc.it**

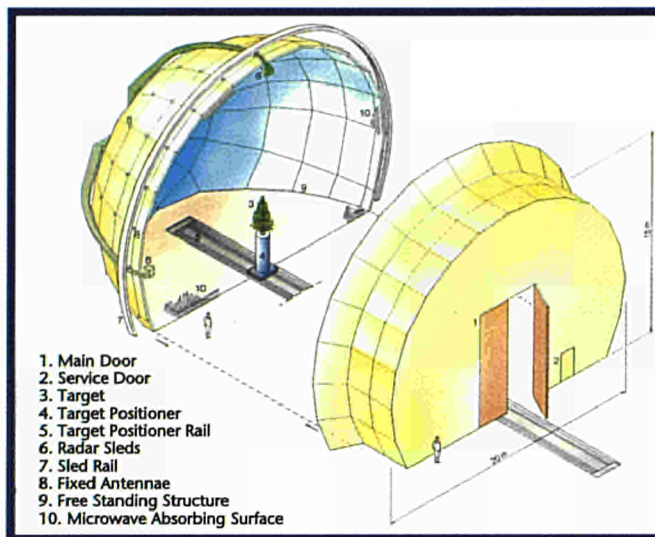
## Case studies

## IRSA: Radar on the Road

**In a classic example of developing new applications for remote sensing, the IRSA's European Microwave Signature Laboratory (EMSL) is helping Daimler-Benz improve driver safety.**

The EMSL analyses the way objects reflect radar waves. An object is irradiated by two radar transmitters, which can be moved around the EMSL's roughly spherical dome in two dimensions (see diagram). The interior surface is studded with radar antennae to pick up the reflections and covered with foam pyramids to absorb scattered radar signals.

The EMSL is providing crucial information on the scattering process itself. And because it can deal with objects weighing several tonnes, it is producing a rapidly expanding library of radar signatures of real-life objects (trees, terrain surfaces, cars, etc). Overall, the EMSL is crucial to improving the power of synthetic aperture radar (SAR) remote sensing for an ever-widening range of applications.



An 'exploded view' of the EMSL.

### Spotting Problems Ahead

How can this help a car manufacturer? The near future will see many new vehicle information systems on the road, in-

cluding radars to cut through fog and rain to spot obstacles ranging from other cars to traffic cones. These radar signals will also be reflected back from the road, so if the relationship between this backscattered signal and the road surface can be determined, the driver could be forewarned about 'black ice' and other treacherous road conditions.

IRSA launched the ROCOCO (Road Condition and Control) project in June 1995 with Daimler-Benz. It has already shown that the radar 'signature' of a 2x2m<sup>2</sup> piece of asphalt changes when it is dry, wet and

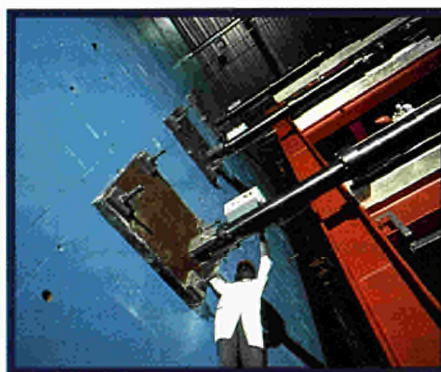
icy. Further research, the partners hope, will one day reduce traffic accidents and spawn new technologies for Europe's vehicle industry.

## IST: Better Buildings, Old and New

Many European laboratories use shaking tables to investigate how earthquakes destroy buildings. However, these tables can only carry models. Full-sized experiments have to be carried out at the IST's European Laboratory for Structural Assessment (ELSA), which can handle test structures up to five storeys high.

ELSA is the largest 'reaction wall/strong floor' system in Europe. It consists of a prestressed, reinforced concrete wall, 16 metres high and 4 metres thick, set into an even larger floor. It shakes the test structures using a set of computer-controlled hydraulic rams, or actuators.

The mass of these structures (up to 350 tonnes) means that ELSA cannot recreate the violence of a true earthquake. Numerical modelling is used to derive a profile of displacement over time which



Engineers fit actuators onto the ELSA and a test structure for earthquake behaviour testing.

accurately reflects the displacement a real earthquake creates, albeit over a longer period of time. The actuators generate displacements matching this profile, providing a 'slowed down' version of the earthquake.

### Monument Conservation

ELSA plays a key role in refining Europe's building design codes. However it is also useful to fields ranging from the off-shore industry to cultural heritage.

Portugal's General Directorate for National Monuments (DGEMN) and Laboratory for Civil Engineering, for example, are using ELSA to determine the best way of retrofitting a centuries-old church in Lisbon. Damaged by earthquakes and plundered for stone, the Sao Vicente De Fora is difficult to model analytically because the properties of its stone are poorly understood.

The three partners have built a copy of part of the church - a triple arch - from original materials. Data from the upcoming test on this structure will help identify and validate the best analytical model for the church, leading to a plan of action to save it from collapse.

## Case study: Environment

## Greening the Ispra Site

*The Ecocentre Project harnesses the talents of all the Institutes based at Ispra to make the site as 'green' as possible.*

Most of the 150 heated buildings on the Ispra site were built between 1958-1968, when environmental issues were barely considered. The site's function as a nuclear 'big science' research centre capable of hosting 4,000 staff meant that these buildings - which now need significant renovation - were spread right across its 160 hectares.

The Ecocentre project aims to simultaneously reduce the site's energy consumption and maintenance costs and improve its biodiversity. It will be an important demonstration of how 'eco' can stand for both ecology and economy.

### Buildings: New and Old

Work began in 1993. A Master Plan was developed with the help of a Geographic Information System, integrating maps and databases on the site's structure, occupancy, energy usage, ecology and so on. An aerial infra-red survey identified points of high heat loss.

The Plan rules out building on almost one third of the site for ecological reasons and foresees the demolition of around 50 maintenance-intensive single storey buildings. These will be replaced by a much smaller number of multi-storey, low-energy buildings clustered together, reducing energy, maintenance costs and interior traffic.

Strict building regulations have been developed covering issues ranging from energy efficiency and biodegradable materials to Legionnaire's disease and cyclist facilities. Two of these buildings will be finished by the end of 1996.

In parallel with the development of



*The JRC's 160 hectare site at Ispra, in the north of Italy.*



*The site's road network today (left) and a possible future configuration.*

the Plan, eight buildings were identified for retrofitting by the end of 1995. Their energy bills will be reduced, on average, by at least 50%, and the investment is expected to pay for itself within 20 years. They were chosen to provide as many different types as possible - one is a staff canteen, another is a 17m high experiment hall, others include "hot" labs which must be declassified from their current radioactive status, and so on.

The third major project, begun in 1993, finished in October last year, when 540m<sup>2</sup> of photovoltaic cells began supplying the JRC with electricity. Placed on the southern facade of the

IST's European Laboratory for Structural Assessment (see page 19), the amorphous silicon cells produce around 25kW of energy on a sunny day.

### Future Projects

The next major project will be to build a new energy source. The technical specifications have already been finalised - it will be a methane-powered co-generator, producing both electricity (6MW) and heat (12MW). The JRC has calculated that the reduced energy bill will pay for the new 7 MECU plant in less than ten years.

The next few years will see cycle paths, electric cars, recycling schemes and other new initiatives. An ecological recovery scheme is also underway, aiming to develop the landscape into a mosaic of different ecosystems typical of the region.

The Ispra site is hardly the only site of its kind in Europe - many ageing research centres, university campuses, hospitals, industrial centres and other sites need retrofitting and redesign. The Ecocentre project provides an excellent example of how modest investments can reap major long-term rewards, both in terms of finance and the environment, stimulating the 'greening' of Europe's construction industry.

**C** o n t a c t  
**Mr H. Langenkamp,**  
**Environment Institute**  
**Tel: +39 332 78 9487**  
**Fax: +39 332 78 9158**

► BRITE-EURAM

# Cheaper Magnesium from Toxic Waste

**University groups, SMEs and major research companies have pooled their resources in a BRITE-EURAM project to develop a new magnesium smelting process that is both more efficient and consumes dangerous asbestos waste.**

The new process originated in Dr Andy Cameron's research group at the University of Manchester Institute of Science and Technology (UMIST). They targeted a key problem with the Magnetherm process - an important magnesium production method.

"Magnetherm involves heating a mixture of magnesium ore, which contains magnesium oxide, and the oxides of aluminium, calcium and silicon," explains Dr Cameron. "Reductants are added to the resulting slag, reducing the magnesium oxide to magnesium. This then evaporates off, and is condensed to form the liquid metal."

Unfortunately, the process needs a partial vacuum. This is difficult and expensive to maintain in an industrial plant, and means the magnesium has to be processed in batches.

"Our aim was to modify Magnetherm to run at atmospheric pressure, which we calculated would reduce operating costs by 20-30%," Dr Cameron adds. "The resulting process can also use a wider range of raw materials, including asbestos."

## A New Pilot Plant

In late 1992 Dr Cameron formed a consortium with Belgian, British and French companies to launch the 1.3 MECU MAGRAM project under the BRITE-EURAM Programme. The aim was to prove the process' viability by building a 300kW pilot plant, which was recently completed on a site in Cheshire (UK) belong-



**The 300kW MAGRAM pilot plant.**

ing to EA Technology, another British partner.

UMIST led the project's scientific aspects, thermodynamically modelled the process, verified the models in laboratory experiments and carried out economic studies. EA Technology supervised the plant construction, officially led the project and developed the magnesium condenser. The other partners - Redco from Belgium, Enthalpie from France and Tecronics from the UK - also provided vital expertise.

"Redco is a large research enterprise associated with the Athernie Group, a world leader in asbestos products," Dr Cameron explains. "Their expertise in

characterising the asbestos industry's waste streams - MAGRAM's raw material - was vital to optimising the process for industrial applications. They also provided excellent analytical services."

"Enthalpie and Tecronics, on the other hand, are both SMEs specialised in plasma furnaces," he continues. "We needed their expertise because asbestos does not conduct electricity, so electric arc furnaces, the traditional way of creating the slag, could not work."

## 40-50% Cheaper

The pilot plant trials should be over by the end of October, but the partners are already sure that

MAGRAM is economically viable. "Apart from the 20-30% lower costs from operating without a vacuum, asbestos is a cheaper raw material, and is so toxic that MAGRAM operators could be paid to destroy it," Dr Cameron explains.

UMIST has filed for patent protection in Europe, North and South America, Australia and South Africa. Before anyone buys a licence, however, much more needs to be done. "First we need a market survey and an engineering feasibility study," says Dr Cameron. "That's why we recently applied for a technology validation project<sup>(1)</sup> under the Innovation Programme. We should have the results within six months of funding, assuming we receive it."

That will lead to the next step - a full scale (4-5MW) demonstration plant. Only then will the partners know exactly how efficient MAGRAM can be made. "The problem is that the pilot plant is too small - it only produces 10 kilograms of magnesium an hour," explains Dr Cameron. "At this scale the magnesium vapour cannot be kept hot enough, and condenses within the furnace, before being extracted. Larger plants should be more efficient. Taking everything into account, we believe that MAGRAM could produce magnesium for 50-60% of today's prices."

## Financing Demonstration

It will nevertheless prove very difficult to find the 10-15 ●●●

●●● MECU required for the demonstration plant solely from the private sector, due mainly to the uncertainty concerning the condensation process. Once the market survey and engineering studies are complete, Dr Cameron and his colleagues plan to approach other European and national programmes for support.

They have already visited one possible location - the abandoned Balangero asbestos mine in Piedmont, Italy. The neighbouring villages, both situated in a valley below the mine, have suffered from health problems and high unemployment since its closure. The Italian Departments of Industry and of Mines are both very interested in the MAGRAM process, as is an Italian magnesium producer.

"A new magnesium die-casting plant is also under construction just outside Turin, heart of the Fiat automobile empire," Dr Cameron notes. "A partnership between the magnesium produc-



Tapping slag from the MAGRAM furnace.

er and ourselves could supply this new plant with cheaper metal, generate employment in the villages and destroy their asbestos problem. Similar situations exist

worldwide." Studies have shown that replacing car steel with magnesium saves more fuel than either aluminium or plastics. With all car

manufacturers vying to meet stringent pollution regulations, the market for low-cost magnesium has never looked better. If the MAGRAM consortium can show that they can meet this need, Europe could become the world leader in magnesium production, boost the fuel efficiency of its cars and solve its asbestos waste problem. □

**C** o n t a c t  
**Dr A. Cameron,**  
**UMIST**

**Tel: +44 1612 36 33 11**  
**Fax: +44 1612 00 35 86**

(1) See edition 2/95.

► ENVIRONMENT

# Land Management Software Commercialised

The European landscape is under constant assault from pollution, including acid rain, heavy metals, nitrates, phosphates and more. All of this permeates into the soil, affecting agriculture, forestry, our health and our supplies of drinking water. The problem is, however, that calculating exactly what happens to this cocktail once it reaches the soil is far from simple.

The Institute of Land and Water Management (ILWM) of the Katholieke Universiteit Leuven (Belgium) has been working on this problem for many years. In the mid 1980s they began

extending and revising the SWATRER (Soil, Water and Actual Transpiration Rate) model. Part of this work took place within two projects funded under the EC's 1989-1992 STEP (Science and Technology for Environmental Protection) Programme:

■ **STEP-0032:** Integrated analysis of water and solute flow to predict the environmental hazard of farm management strategies in the EU;

■ **STEP-0034:** Modelling of nitrogen and pesticide transport and transformation on catchment scales.

Together these two projects

involved research institutes and universities from six European countries, the USA and New Zealand (the latter two as scientific advisors). The ILWM has taken this and other research to produce the WAVE (Water and Agrochemicals in the soil, crop and Vadose Environment<sup>(1)</sup>) model.

This has now been released as a commercial software package. The various modules simulate the soil energy balance, water flows, solute transport and the movement and transformations of nitrogen. They also simulate the growth rate of several field crops, making it a

unique tool for improving land use management, evaluating the impact of agricultural chemicals and much more. □

**C** o n t a c t  
**Professor J. Feyen,**  
**ILWM**

**Tel: +32 16 23 13 81**  
**Fax: +32 16 23 06 07**  
**E-mail: Jan.Feyen@agr.kuleuven.ac.be**

(1) The unsaturated zone of the topsoil layer.

► **ELECTRONIC DATA INTERCHANGE**

# Getting the Message Across

*A new CD-ROM demonstrates how international standards of data transfer can be used successfully in European projects*

The European Commission's TEDIS Programme encourages the development and use of internationally recognised standards of EDI (Electronic Data Interchange - see Glossary) within the Community. This is essential to the successful integration of EDI systems, which requires a collective decision amongst users to invest in standard technical and organisational changes. TEDIS is therefore strategically important for the rapid growth of trade.

Six TEDIS telecommunications projects are presented on this CD-ROM:

- **EUROMED:** uses EDIFACT messages for the secure transfer of medical files. In addition, X-ray results, moving scanner imagery and verbal annotations can be transmitted via ISDN to allow remote diagnoses;
- **EUROPRODUCT:** uses TEDIS-supported technologies in the furniture industry. Customers can view all the latest designs in a 'virtual reality catalogue'. Small retailers can thus offer a broader and more competitive range of goods;
- **COBODATA:** develops an



*Each of the six projects presented in the CD-ROM features introductory explanations, while many include demonstrations and tutorials of the actual software.*

- established paper-based building trade catalogue into multimedia format using the EDIFACT guidelines developed in EUROPRODUCT;
- **FORTIUS:** offers an intermediary transactions service. Its subscribers - mainly SMEs - can then concentrate resources on their main business concerns;
- **EDIRA:** a 3-phase study of best practices for registration of network users, including a common

- accord between Europe and North America;
  - **GEN-EDI:** discusses scenarios and requirements in different sectors of EDI.
- Many of the projects include case-study examples. Also included is an introduction to the concepts of TEDIS and a documentary on the socio-economic effects of modern telecommunications. □

## TEDIS IN BRIEF

- TEDIS: Trade EDI Systems Programme:**
  - launched in 1988 to coordinate the use of EDI in the Community. Continued to Phase two in 1991 to maximise the effectiveness of EDI;
  - supports the use of X.400 and FTAM telecommunications;
  - promotes the development of EDI systems oriented towards SMEs;
  - encourages the international UN/EDIFACT standard;
  - administration completed in July 1994; contracts and independent evaluation will continue until the end of 1995.

**C** o n t a c t  
**Mr Patrice Husson,  
 DG III**  
**TEDIS Programme**  
**Fax: +32 2 299 0286**  
**E-mail: patrice.husson@dg3.cec.be**

## GLOSSARY

- **EDI (electronic data interchange):** combining computer and telecommunications technologies to interchange well-structured data, as opposed to free-form electronic mail. EDI messages are processed rapidly and unambiguously.
- **UN/EDIFACT:** an internationally recognised system of EDI messages and syntax for administration, commerce and transport.
- **EDIFACT Messages:** more than 160 'ready-made' internationally-approved messages. Examples include product enquiries, order forms and transactions.
- **OSI (open systems interconnection):** the concept of compatibility between different manufacturers' equipment.
- **X.400 & FTAM:** both are OSI telecommunication protocols. X.400 is best suited to handling many short messages (such as electronic mail) while FTAM, on the other hand, can handle large volumes of EDI (bank transaction data, etc).
- **ISDN (integrated services digital network):** a means of combining telecommunications and multimedia. ISDN is capable of transmitting approximately 8,000 characters per second - compared to 300 characters per second on conventional networks.

## ► CONFERENCES

**EUROPEAN IT CONFERENCE**  
27-29 November,  
Brussels



The theme of this conference - organised by the EC's ESPRIT Programme - is 'Managing Change'. It will explore the latest information technologies, and debate the wider issues and future directions of the Information Society. The programme will deal with:

- strategic technological issues, with an emphasis on leading-edge technologies and the IT R&D programme;
- cross-sector industrial IT appli-

cations and the broader issues relating to the emergence of the Information Society.

These issues will also be reflected in an exhibition to be held concurrently. A special feature of the

Conference will be the IT European Awards Ceremony, hosted by Commissioner Bangemann.

Contact: European IT Conference Secretariat  
Fax: +32 2 296 99 30

## NOTE

If specific contact information for obtaining a publication is not supplied, refer to the 'Quick Reference Guide' (1/95). Publications are free unless otherwise stated.

CD-AJ-95-005-EN-C

## NANOTECHNOLOGY

The Centre in Scotland for Nanotechnology will be holding two conferences at the end of October.

**ADVANCES IN GENE THERAPY, ANTISENSE DRUGS AND DRUG DISCOVERY - MEDICAL REVOLUTIONS IN THE MAKING**  
31 October-1 November, Glasgow (Scotland)

This two-day conference focuses on the latest European technologies and future medical treatments. Internationally recognised industrial researchers will present topics including:

- clinical applications;

- gene delivery technologies;
- immune engineering & vaccine development;
- drug discovery screening systems;
- combinational chemistry;
- regulatory issues.

Contact: Dr Jane Connolly, Centre in Scotland for Nanotechnology, c/o Technology Transfer Centre  
Tel: +44 141 226 3824  
Fax: +44 141 226 3828  
E-mail: euro\_ttc@nsagw.nsa.bt.co.uk

**MICROENGINEERING: APPLICATIONS AND OPPORTUNITIES**  
October 25, Glasgow (Scotland)

This one-day meeting will include presentations from SECO, Lucas Industries, the Defence Research Agency, the Microengineering Common Interest Group and Exitech.

Contact: Miss Jacqueline Caldwell, Centre in Scotland for Nanotechnology (as above).

## ► PUBLICATIONS

**INDUSTRIAL AND MATERIALS TECHNOLOGIES - CRAFT & FEASIBILITY AWARDS: SYNOPSES OF CURRENT PROJECTS 1994**

EUR 15963, 23 ECU, 218 pages  
This book outlines all the projects selected for funding by the EC's Brite-Euram II Programme through its two schemes aimed at SMEs: CRAFT and Feasibility Awards. There are synopses of

173 CRAFT projects and lists of a further 391 CRAFT and 268 Feasibility Awards. The book is divided into two main areas:

- **Materials:** raw materials and recycling, and new and improved materials and processing;
- **Design and manufacturing:** product and process design, manufacturing techniques, and engineering and management strategies.

**GOOD PRACTICE IN TECHNOLOGY TRANSFER**

Two volumes of about 50 pages  
The experience gathered during the ten years of SPRINT - the EC's former programme for innovation and technology transfer - has been collected and published in a two-volume manual: 'Good practice in managing transnational technology transfer networks'. The key aspects of

networking are discussed, and illustrated with more than 25 case histories. An introductory brochure and a CD-ROM based dissemination tool are also available.

Contact: DG XIII/D Technical Assistance Unit  
Fax: +352 465 550

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