ISSN 1024-0802

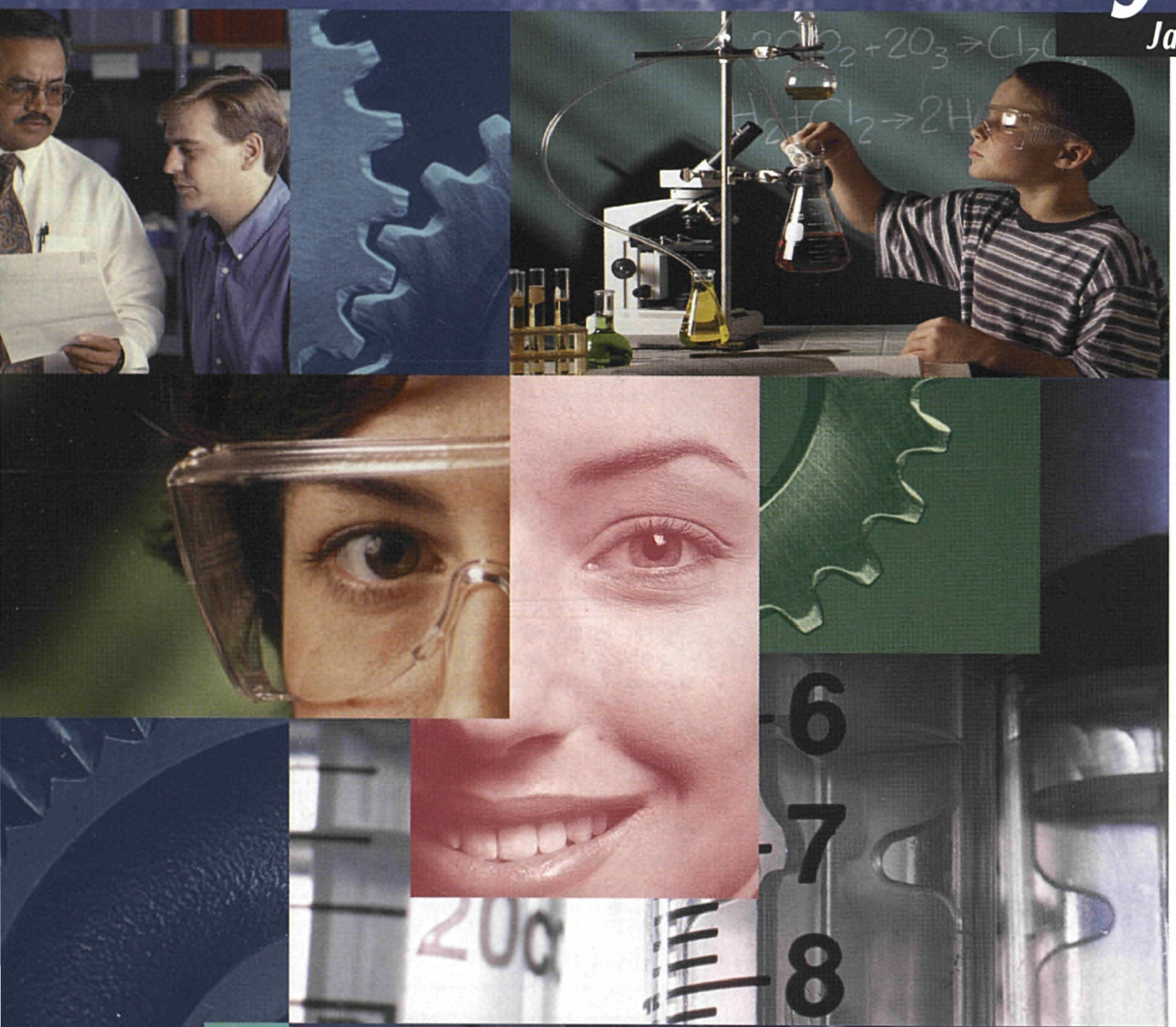
EUROPEAN COMMISSION

SCIENCE
RESEARCH
DEVELOPMENT

RTD info

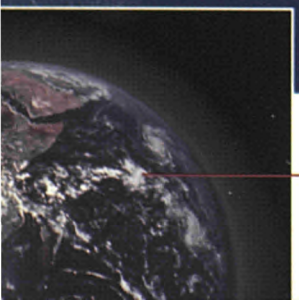
17

January 98



Research, employment, youth

A new alliance



Environment

A European effort to heal the world

RTD info 17

Contents

Mrs Edith CRESSON, Commissioner for research, innovation, education, training and youth.
Directorate General XII – Science, Research and Development

RTD Info is a newsletter on research and technological development supported by the European Union. It covers general aspects of Community research such as project results and research policy, as well as practical information including dates of calls for proposals, events, conferences, publications, and so on. RTD Info is aimed not only at current and potential participants in Community research programmes, but also at a wider public of industrialists, decision-makers, students, and others who are interested in developments in European research. Published quarterly, RTD Info is available in English, French and German. Subscription is free. To subscribe, fill in the form below.

RTD Info is also available on-line on the European Commission's EUROPA server at:
http://europa.eu.int/comm/dg12/rtdinfo.html

Editorial Information

RTD Info is published by the Communication Unit of DG XII.
Head of Unit: Otto von Schwerin

For more information concerning the editorial content of *RTD Info* or the activities of DG XII please contact one of the following:

Michel Claessens **Tel.:** + 32-2-29 59971 **Fax:** + 32-2-29 58220
E-mail: michel.claessens@dg12.cec.be

Stephen Gosden **Tel.:** + 32-2-29 60079 **Fax:** + 32-2-29 58220
E-mail: stephen.gosden@dg12.cec.be

Piia Huusela **Tel.:** + 32-2-29 92138 **Fax:** + 32-2-29 58220
E-mail: piia.huusela@dg12.cec.be

Information on research and technological development programmes is also available on-line on the European Commission's EUROPA server at:
French: *http://europa.eu.int/pol/rd/fr/rd.htm*
English: *http://europa.eu.int/pol/rd/en/rd.htm*
German: *http://europa.eu.int/pol/rd/de/rd.htm*

53,000 copies of this issue have been printed.

Notice

Subscriptions

I wish to receive a free quarterly copy of RTD Info

❑ In English ❑ In French ❑ In German

Name : .....

Job Title : .....

Organisation : .....

Street : ..... N° : ..... PO Box : .....

Post Code : ..... Town : .....

Tel. : ..... Fax : .....

E-mail: .....

Mail or fax this form to DG XII – Communication Unit
rue de la Loi, 200 - B-1049 Brussels - Fax: +32-2-295.82.20
E-mail: info-dg12@dg12.cec.be

Research and employment: an undervalued link

This issue is devoted to the subject of research, employment, and young people, and in this context, I find the undertaking, given by the heads of state and government at the Employment Summit of 21 and 22 November, to stimulate research and innovation in order to help reduce unemployment in Europe particularly welcome.

This link between research and employment is still seriously undervalued in Europe. Research is seen primarily as an activity which produces knowledge, and technology is viewed in the workplace as competing with people and resulting in job losses.

Yet in our industrialised societies, in which consumer goods are increasingly the product of sophisticated technology, this link between research and employment is very real and, in fact, almost natural. By making companies more competitive, including those in the most traditional sectors, and by contributing to the development of new products, new services and thus new markets, research activities can create many new jobs, as the examples and figures presented in this issue demonstrate.

But it is not only a question of strengthening this link between research and employment, it is ultimately the building of tomorrow's world which is at stake here. If today we underestimate the importance of research and innovation, the effect will be to limit the role of Europeans in the future to that of consumers of technology, thereby abandoning our traditional role of contributors to progress, or even its driving force.

Like you, I am sure, I have my sights set on higher goals than that for the future of Europe, its youth, and the generations to come.

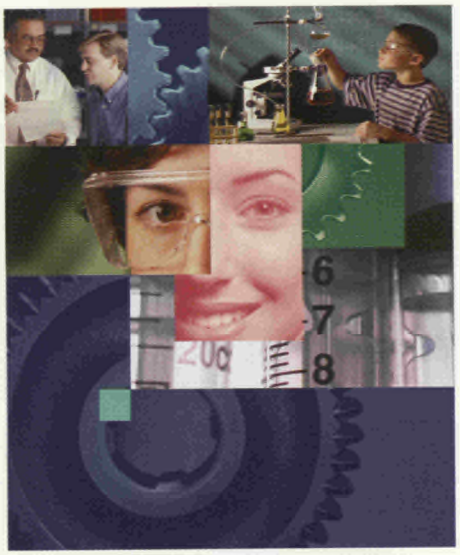
Edith Cresson

Edith Cresson
Member of the Commission, responsible for research, innovation, education, training and youth.

A new alliance

To vanquish unemployment which is eating away at a changing society. To create European jobs in a global market. To reject determinism. Such is the top political priority for the EU, which has just held a major employment summit. But how can scientific research and technological development help?

"Just one reason. Which can be summed up in just one word. Unemployment". This terse phrase was taken from the preamble to the White Paper on "Growth, Competitiveness and Employment". Launched in 1993, this initiative is the point of departure for the wide-ranging debate the European Union is now conducting in order to adapt our society to technological changes and globalisation.



A recent survey found that three out of four French people believe that technological progress creates more unemployment. A feeling which may well be shared by many Europeans who pay for their petrol with a credit card at an unmanned service station, scan their purchases at the supermarkets, and give their banking instructions over the telephone. It is based on a fact which is clearly evident: over the past couple of decades, in fields where computers and robots have been introduced, machines have replaced man on a vast scale.

But in more recent years the contrary would seem to have been taking place, and we now have reason to wonder if it is not because it has invested too little - or too inappropriately - in science and technology, that Europe is failing to create enough growth and is consequently facing a job shortage.

However, a debate in terms of direct links of cause and effect between technology and employment would appear to be missing the point. World-wide - in developing countries and the industrial world - we can clearly see that unemployment is lower in regions with high technological development. Twenty-three million new jobs were created in the United States between 1973 and 1985, due to the increased demand for goods and services with a high technological content. "The success of the US in generating new employment goes well beyond the domain of technology, covering issues such as the flexibility of the labour market and the general competitive environment," stressed Luke Georghiou, professor at Manchester University and director of PREST (Policy Research in Engineering, Science and Technology). "However, the principal advantage held by the USA within the technological domain is its entrepreneurial culture."

Employment, a factor in competitiveness

Europe's employment crisis thus involves a whole set of variables, not only technological but also economic, social, organisational and political. At the same time, it must be viewed in the context of an open world in which economic competition now takes place at a global level. It is therefore very closely linked to the question of competitiveness - which is itself dependent (although not exclusively so) on the level of technology.

Let us look across the Atlantic again. In the late 1980s, US industry was reeling under the impact of Asian competition. Under the *Made in America* banner, representatives of scientific, industrial, ☞

Research, technology, employment: Europe sets a new course

At the conclusion of the European summit in Luxembourg (20-21/11/97), the assembled heads of state and government highlighted the role played by joint research policy in increasing competitiveness and job creation - in particular through the promotion of innovation and transfer of technology to SMEs - and stressed the importance of the framework programme now being prepared.

The implementation of the *Amsterdam Special Action Programme* (ASAP) by the European Investment Bank was welcomed as an essential financial initiative. With funds of ECU 10 billion up to the year 2000, this plan should make it possible to generate some ECU 30 billion of job-creating investment. Three priority areas were decided:

- In partnership with European banks and financiers, and the EIF (European Investment Fund) in particular, a "special bank counter" *(guichet)* with ECU 1 billion will lend financial support to high-technology SMEs with a high rate of growth. In this connection, the EIB and EIF have just set up a *European Technology Facility (ETF)*. With ECU 125 million to support investments by SMEs in high technologies, this instrument could generate a risk capital pool in excess of ECU 800 million.
- The EIB will increase and widen the financing granted to sectors which are rapidly creating new jobs (education, health, urban environment, environment, etc.).
- New impetus will be given to funding trans-European networks and infrastructure networks.

☞ social and political circles got together on many occasions to consider the problem - an activity which resulted in the publication of various studies. They analysed the meaning of the term *competitiveness* in the new context of globalisation. The concept had previously been measured in terms of comparisons of productivity, calculating solely in terms of costs, and labour costs in particular. The Americans were the first to reject this as too limited a view (and one contradicted by many countries able to gain shares of world markets despite not being low-wage economies) and added an additional dimension to this excessively mathematical notion. In 1992, the US competitiveness council determined that competitiveness was based on the capacity to produce goods and services which meet the demands of international markets, "while simultaneously permitting US citizens to benefit, in the long term, from substantial progress in their living conditions."

In becoming established as the global standard, the European GSM standard - developed with considerable support from the Esprit programme - permitted the telephony components industry to make a considerable breakthrough. In Germany, there are 30,000 jobs in the mobile telephone equipment production sector alone.

Studies carried out in Europe on the employment crisis have also adopted this broader view. But they go further in explaining the concept. "Competitiveness is not only synonymous with an increase in profit, it also has a qualitative aspect. It relates to the day-to-day life of people, their working conditions, their standard of living, and the stability and growth of jobs," writes Jacques Santer, President of the European Commission, in his preface to *For European Competitiveness*[1]. This work brings together the conclusions and recommendations of an advisory group set up in 1995. The two *rapporteurs*, Alexis Jacquemin[2] and Lucio Pench, believe that the effects (and costs) of high unemployment - poverty, exclusion, increased friction in society, regional decline, recourse to protectionism - are all "factors which damage competitiveness." They also point out that "The fight against unemployment is not only a matter for social policy, it is also an economic imperative."

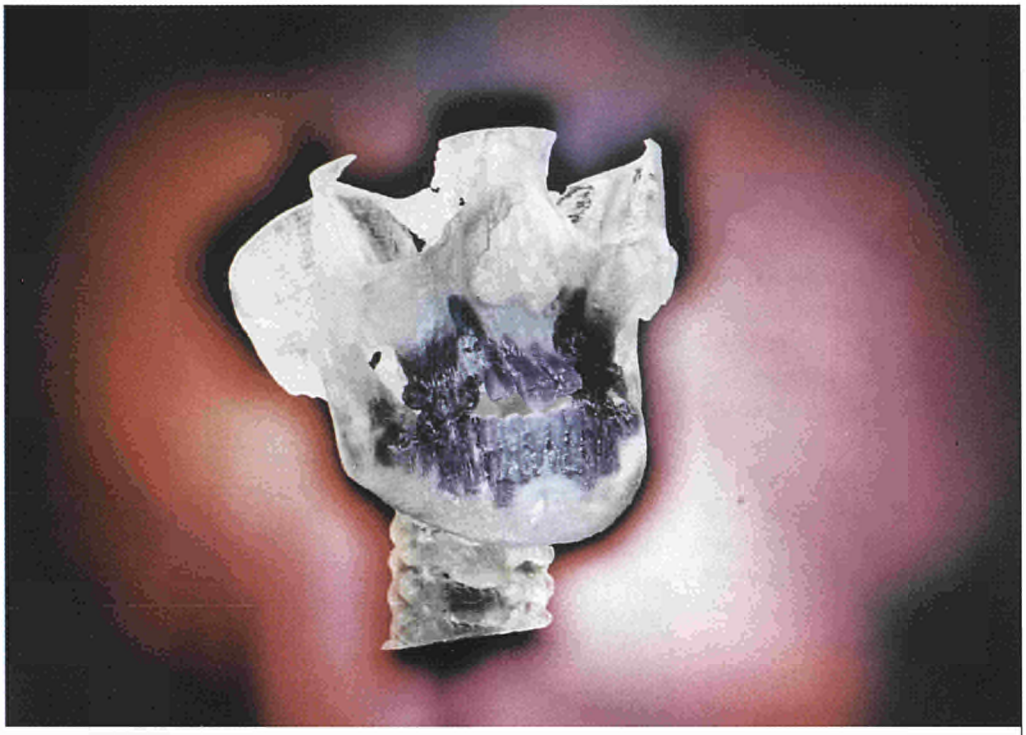
Innovating at the top

"Contrary to popular belief, Europe is not really lagging behind in fundamental research, and research and development," states Claude

(1) Published in French only under the title "Pour une compétitivité européenne", De Boeck ed., Brussels.
(2) Adviser to DG XII and member of the Commission's Forward Studies Unit.

Desama, member of the European Parliament's Committee on Research. "It is even well-positioned in relation to its Asian and American competitors. Its particular weakness only becomes apparent when it comes to converting research into innovation and, finally, into marketable goods."

This key word, innovation, brings us directly to relations between the world of research and technological development, and the employment crisis in Europe. Introducing her Action plan for innovation in Europe, launched at the beginning of the year, Edith Cresson stressed that "Europe's weakness in creating jobs must be seen in terms of its lack of innovation. New product development represents less than half of research expenditure in France and Germany, compared with more than 60% in the United States and Japan. It is not surprising that the European Union's trade balance and balance of payments on high technology goods and services are rapidly deteriorating. The situation of the American economy illustrates the impact of innovation on employment, particularly in the high technology fields. Of the ten million new jobs created over the last four years in the United States, two out of three of which were management and technical jobs, one-third were created by small and medium sized businesses in the high technology sector."



The 3D reproduction of organs analysed by scanner. An example of innovation in the field of medical technologies developed by a Belgian SME participating in the PHIDIAS (Brite-EuRam) project. The result: 20 licences sold and an order-of-magnitude increase in jobs in four years.

European research must therefore acquire a clearer view of its strategic objectives and applications. "We must create," stresses Herbert List, president of the IRDAC, a group which advises the Commission on behalf of European industry, "an integrated spirit of innovation, as part of a process in which everyone cooperates: fundamental research, technology developers, industries which supply the products or services, and the users for which they are destined. And it is very important for this integration to take place at a European or even international level - innovation means seeking out the necessary skills wherever they are to be found."

The spread of innovation in Europe is also determined by other factors linked to the financial (venture capital), legal, and regulatory ☞

Made in Europe - made for living

Apart from its technology watch brief, the Institute for Prospective Technological Studies (IPTS) at the EU's Joint Research Centre in Seville (Spain) also has a research unit specifically targeted at the relationship between Technology, Employment, and Competitiveness (TEC). This group explores the triple challenge which determines the development of a sustainable and balanced society: improvements in the quality of life of citizens combined with increased competitiveness; the development of a sustainable social policy providing a fair distribution of work and revenues; the mobilisation of innovation in the service of regional development.

One of the research projects, *Made in Europe*, seeks to propose ways for Europe to break into a new virtuous circle of lasting growth in a global economy. *The IPTS Report* no. 15 (June 1997) is devoted to four avenues of research pursued by this project: the definition of a European approach to competitiveness; the need for organisational changes, especially within companies; the impact of globalisation on European integration; the importance of sustainable welfare systems to increased competitiveness.

Contact Peter Fleissner, TEC, IPTS
Fax: +34-5-448.83.59
E-mail: peter.fleissner@jrc.es

environment, especially in the case of SMEs.

The cognitive society

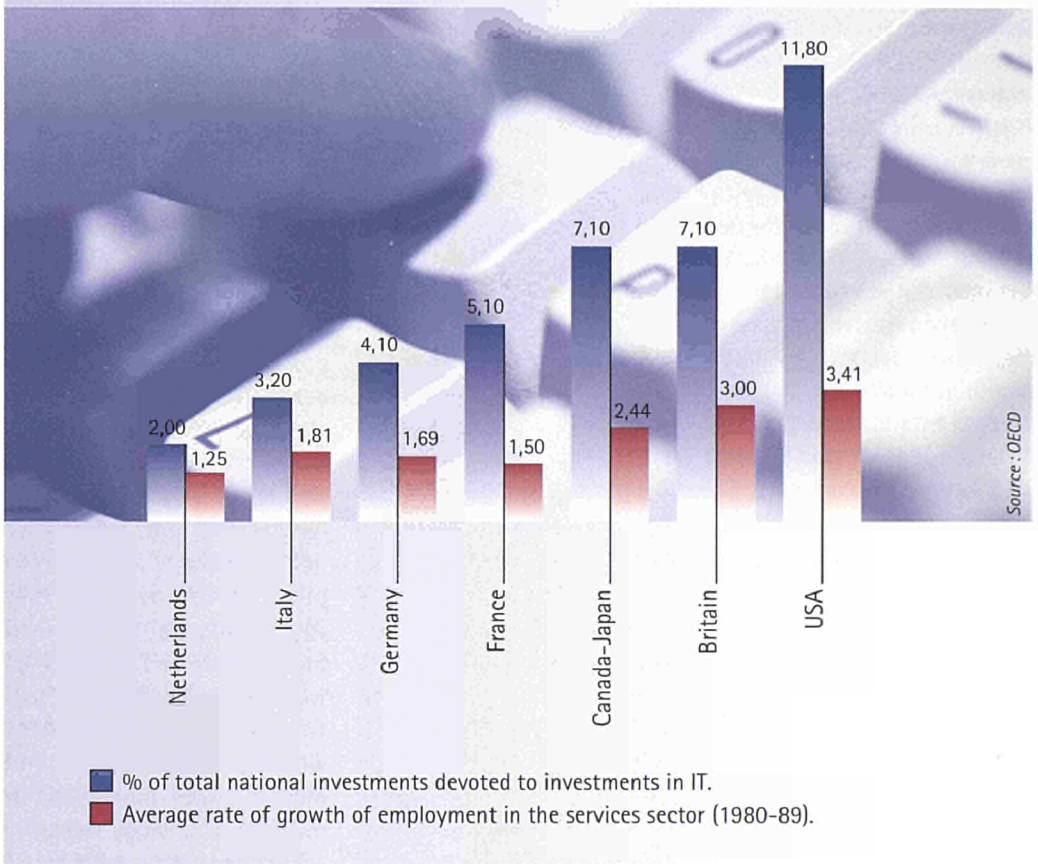
"For Europe, as for other parts of the world, competitiveness is essentially a matter of the capacity to accumulate and improve human resources," stress Alexis Jacquemin and Lucio Pench. The essential and universal change which technological progress, with the advent of the information society, is now imposing on employment is unlike anything we have ever seen before. Work will increasingly consist of managing a growing abundance of immaterial raw materials (information) and giving them the necessary added value to transform them into knowledge- and skill-based tools. This industry, based on mental activity and applying to all production sectors, will constantly expand in new directions which haven't even been invented yet.

"It is essential to see the information society as a cognitive society," stresses Luc Soete, director of the Maastricht Economic Research Institute (MERIT) and president of the *Building the European information society for all* expert group, set up by the European Union. The full significance of the EU's education and training policy, whose central message is lifelong learning, becomes apparent with respect to successful entry into the information society, in particular in terms of employment.

The spectacular growth of multimedia promises many new multidisciplinary jobs (historians, videographists, educationalists, etc.). Illustrated above is "Les très riches heures du Louvre", on 2D and 3D videodisk from Titus Leber.

Employment in services under threat from the computer?

Contrary to popular belief, investments in information technologies have not necessarily led to a major fall in jobs in the services sector. Globally, in a number of representative countries, the opposite has been the case during the years 1980-89. The greater the investment, the higher the increase in employment in the services sector.



Biotechnology in Europe and the United States in 1997

The US biotechnology industry employs nearly 120,000 people. Despite its high scientific and technological potential, and partly due to the difficulties of access to risk capital, Europe today has only around 30,000 posts in this sector. As applications increase in fields as vital as health and the environment, 140,000 jobs could be created throughout the EU over the next few years, provided more financiers can be induced to show an interest in such opportunities. This is why the Commission has set up the Biotechnology and Finance Forum (see p. 21).

	Europe	United States
Number of companies	716	1287
Number of jobs	27.500	118.000
Sales (millions of ECU)	1.721	11.680
Expenditure on R&D (millions of ECU)	1.508	6.320

Source : Ernst & Young - BioBusiness 1997

Research, training, employment

The path leading from research to innovation which, in turn, gives rise to jobs, has traditionally taken very diverse routes. Nevertheless, the interaction between the results of science and technology and changes in society is growing at an ever-increasing rate. The potential applications of biotechnology and new information and communication technologies are limitless, and we have no more than an inkling of what is to come. But these applications only have any meaning in relation to existing social needs - of which there are many - and to those to come.

"Until 1994, European research was primarily concerned with following the developments of what were known as the technologies of the future. But these rapidly became very much technologies of the present," observes Michel Claessens of DG XII's Communication Unit. "The emphasis was then clearly placed on innovation and generic technologies with the potential to result in the development of goods and services for the market. The Fifth Framework Programme adds a new strategic dimension by focusing research on the needs of the citizen and support for European policy. If you innovate in terms of quality of life you also create jobs. In this context, it is to the Union's credit to have charged a single Commissioner, Edith Cresson, with the responsibility for research, innovation and training. Because research is only able to create jobs when it takes place in a climate which is favourable to innovation."

Refusing technological determinism

During this period of change, as the century draws to a close, it is easy to understand how many Europeans fear for the future of employment, which they see as threatened by technological development - a development which some view as having a life of its own. Do we therefore have no choice but to yield to the external forces of a "progress" which imposes its rhythms and rules on society as a whole? Luc Soete is firmly opposed to such a passive view. "We take issue with the technological determinism of much of the political message of the experts," he explains. "Technical innovation, whether driven by scientific discoveries or generated by demand, comes from within the economic and social system, and is not merely an adjustment to changes caused by external forces." He believes that, "The development of technological capacities implies a real process of complex endogenous change. A change negotiated and discussed within organisations and throughout society as a whole."

And in this complex debate, in which science, technology and employment meet - and not only implicitly - social innovation cannot be merely the poor relation of economic innovation. ■

1,000 workers in 1986; 2,900 today. The Odense (DK) shipyards are now among the most productive in Europe - after having opted for the development of robotics through active participation in many Esprit and Brite-EuRam projects.

Generation Europe

Last October, approximately one hundred young participants in educational and scientific programmes launched and supported by the European Union met in Brussels. They were invited to discuss the next generation of Community measures to promote mobility and knowledge. We turn the spotlight on a pioneering meeting that will definitely be followed up.

"In your own country, it's a bit like being on an island and being unable to build bridges to other continents," said Anne Grete Straume, a Norwegian meteorologist, on placement at the JRC in Ispra. "At home, teachers are responsible for links with abroad. Elsewhere, we have direct contact with other scientists and researchers. Contact is tangible, quite different from contacts on the Internet."

Think, change

This Scandinavian girl was among the one hundred or so young grant-holders invited by Edith Cresson, Commissioner responsible for research, innovation, education, training and youth, to the Youth Meeting in Brussels on 7 and 8 October. Beforehand, a survey had been carried out among 200 young people who had lived abroad while participating in these programmes. For 82% of them, the experience was a good one, 83% thought it would give them a career advantage, and 78% felt a little more "European" than before.

The objective of this pioneering meeting was not just to hear praise, but to enable the participants to take critical stock of their experience, to provoke discussion on the organisation and content of the programmes in which they were involved, and, in doing so, become involved in the next generation of Community programmes for young people [1]. Three thematic workshops *(Research and Innovation; Education and Training, Youth for Europe/European Voluntary Service)* prepared the discussion with Edith Cresson that rounded off the two-day event.

Edith Cresson, during the Youth Meeting dialogue-discussion: "It is about working with people from another country and feeling as involved as they are."

Marie Curie's "grandchildren"

Research and Innovation brought together around forty young scientists. "It's a fantastic opportunity to be able to work abroad, meet people from different cultures and traditions, be involved in trans-European research, and practise languages," said Maurice Whelan, an Irish mechanical engineer at the JRC, summing up a broadly shared feeling. "Personally, my main contact is with scientists from Central and Eastern Europe who have a different philosophy and approach to their work. This leads to exchanges that are very interesting for both parties."

Can exchanges and openness lead to new career opportunities? "I think it does give you an advantage in finding a job," said Liesbeth Rijnen, a Dutch biologist. "I do hope so," added Dimitrios Simwonis, a Greek chemical engineer on a training placement at a German research institute. "Industry does not yet seem to set much store by researchers, even though research is an investment in the future... But, the most important thing is that I do my doctorate at an excellent institute. Then we'll see..."

This philosophy of personal development is not underestimated by Edith Cresson: "The programmes for young people above all enable them to broaden their horizons, experience something new, and do something they would not otherwise have done. It is not about going on holiday; it is about working with people from another country and feeling as involved as they are."

Information and status

Over and above the objectives for knowledge and training, Community measures contribute to strengthening other values, such as citizenship, solidarity, and European identity. However, the participants in the meeting stressed the following two obstacles: unequal access to information (depending on country, region, social class – but this will soon be improved by a "Youth" Internet site on the Europa server) and lack of a harmonised social security

(1) The Fifth Framework Programme for RTD is currently being prepared, while the Socrates, Leonardo and Lingua programmes will reach their conclusion at the end of 1999.

Two days of discussion in workshops, informal meetings, questions to the Commissioner. Just one regret: a lack of time.

and tax status for participants in these programmes.

"This varying status creates problems not just for grant-holders, but also for the companies employing them," believes Marco Russo, an Italian researcher, specialising in materials and working in France. As to the suggestion of establishing direct links with the European Union rather than having to go through national administrations, "It is easier for capital and goods to move than it is for citizens," said Edith Cresson. "Taxation on grants varies from nothing in some countries to 60% in others, and this is a clear obstacle to mobility. Member States are responsible for this problem and it is up to them to solve it – the Commission can only highlight this and try to persuade the Council of Ministers to take the necessary steps."

From fundamentals to innovation

More specific questions were raised in each of the workshops. Scientists were clearly wondering about the links between fundamental and applied research. Frank Gunsing, a Dutch scientist working at CEA (France), raised the following question: "Today's technology is largely based on yesterday's fundamental research. What place does fundamental research hold in European programmes?" Edith Cresson replied, "There is no barrier between fundamental and applied research. Fundamental research has not been left by the wayside, far from it. What Europe lacks is the spirit of enterprise and innovation." For example, in the area of new information technologies, European demand accounts for 41% of products, but Europe manufactures only 16%.

Why? That was the question put by Mark Dowell, a British oceanographer receiving a grant to work at the JRC, who wants his research experience to be put to use in industry and does not know where to turn. "Researchers need the means to apply their findings," he says. Edith Cresson stressed how difficult it was for most of them to leave the university circuit and create a *spin-off*. She also referred to the

Community youth programmes

The EU budget allocated to youth training programmes has increased ten-fold in ten years and now stands at ECU 350 million annually.

Research

Since 1995, the *Training and Mobility of Researchers* programme has, thanks to Marie Curie grants, enabled 2,000 young scientists to work in another country, with 3,000 new participants expected between now and the end of 1998. Every year, the Young Scientists' Competition gives some 80 young Europeans the chance to test their projects against each other (see box).

Various grants are awarded under the EU's specific research programmes(1) and 150 grant-holders preparing their doctorate are hosted every year by the seven institutes of the Joint Research Centre (JCR). *The Innovation* programme offers young researchers and engineers the opportunity to work in European SMEs.

Education and training

170,000 students in secondary and higher education are following – or have followed – part of their course abroad thanks to the Socrates programme. 80,000 of them were able to perfect a language through *Lingua*. 27,000 students from Central and Eastern Europe obtained a scholarship to go to university in one of the Member States of the European Union thanks to *Tempus*. 50,000 young people have received vocational training or completed an apprenticeship through *Leonardo da Vinci*.

Meetings and cooperation

70,000 participants – half of whom come from underprivileged backgrounds – have taken part in transnational socio-cultural projects for young people and society in general thanks to *Youth for Europe*. The pilot project launched this year, the *European Voluntary Service*, involves 2,500 young people carrying out work for the general good, such as environmental protection, renovation of underprivileged areas, and social work, outside their country of origin.

(1) These programmes, to which the EU allocated almost ECU 3 000 million in 1996, in support of 10,000 projects, lead to the direct creation of almost 25,000 research posts every year.

124 Europeans involved in different Community youth programmes - Brussels, October 1997 .

two-sided lack of understanding, among investors, who are reluctant to take risks in this area, and researchers who lack any training in management and marketing. However, she finished on a more optimistic note, mentioning the new possibilities, made available by the Amsterdam Summit, for unlocking venture capital for innovative SMEs from the European Investment Fund. Christian Tils, a young Dutchman, former grant holder at the JRC, also suggested a programme to set up a network for the exchange of skills and experience among young scientists wishing to start their own company.

Europe "in the cradle"

Other ideas are directed towards much younger Europeans. Frédérique Tabarant, a French ecophysiologist (Institute for Remote Applications at the JRC), suggests the establishment of holiday centres or school projects with a European dimension. Netd@ys (see page 11) provide him with an answer. "The idea of Europe is still abstract and people feel excluded. A deeper cultural understanding thanks to exchanges based on respect and open-mindedness would help to build up this feeling," added Christina Moutsou, a Greek sociologist.

There were two broadly shared sentiments at the end of the two days. First of all, there was great satisfaction at having had the opportunity to meet, review, discuss, establish contact, share experiences, and express their opinions. However, participants were equally unsatisfied at how little time there was to discuss and become more familiar with European measures for young people – and in general – and to provide new food for thought. Edith Cresson therefore promised to repeat this type of meeting, but with a less packed agenda. ■

European Union Contest for Young Scientists

Researchers aged between 16 and 22 years old. Projects in the field of the environment, new materials, software...

The success of the ninth *European Union Contest for Young Scientists* – an annual initiative of the European Training and Mobility of Researchers programme – confirms its objectives: identifying skills, strengthening vocations, and intensifying scientific culture throughout Europe.

This year, the 80 winners of the national competitions organised in 24 countries (1), with some 30,000 schoolchildren and students competing, provided the preselection for the European final held in Milan from 9-14 September 1997.

"The participants proved that science and technology are a highly creative and passionate activity. This form of curiosity and determination is the driving force for discoveries that will benefit tomorrow's society," stressed Sue Kingsman, Fellow of Trinity College, Oxford, and chairman of the jury.

Among the winners: Eike Hügner, determined to pursue her career as a researcher, developed a highly conductive and stable polymer – two properties that are of the greatest interest for microelectronics applications and space technologies. In the "second prize" category was Serguei Idiatoulin, an 18-year-old Russian, who designed a new type of surface coating for solar panels, significantly increasing their capacity for solar-energy collection. The youngest entrants, Erik Van Alphen and Tom Van Diessen, two 16-year-olds from The Netherlands at school in Tilburg, developed a chemical process that significantly enhances the recycling of cardboard/aluminium drinks packaging, which gave them one of the six "third prizes".

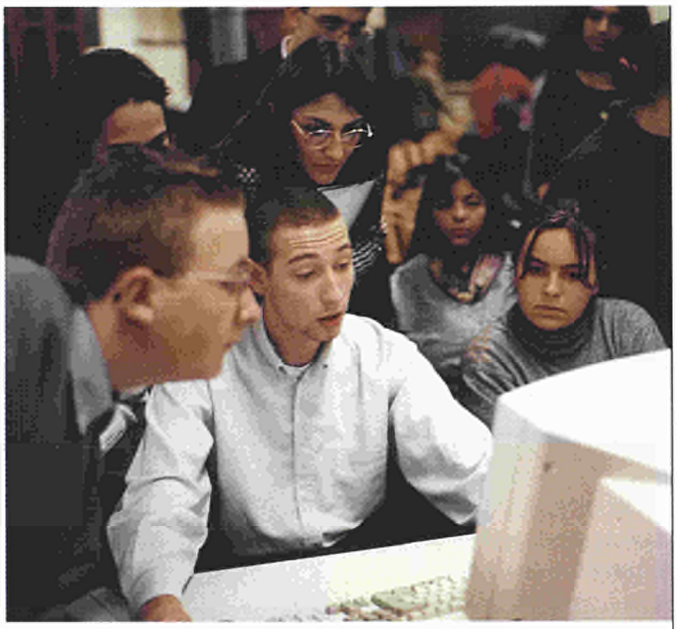
These examples are notable for their "realism" and the way in which they lend themselves to industrial applications. The competition can also prove to be an excellent springboard into patents and innovation. The winner of the 1996 contest, Tobias Kippenberg, a German then aged 19, designed a black-ice detection system for motor vehicles based on micro-wave emissions and infra-red rays. One European manufacturer is seriously considering equipping its vehicles with the system.

(1) The fifteen Member States plus: Iceland, Lithuania, Hungary, Norway, Poland, Russia, Switzerland and the Ukraine.

Back to school on-line

10,000 European schools linked up to the Internet for a week and 300 educational projects were launched. The October Netd@ys certainly achieved their objective of promoting awareness of the information society in schools and demonstrating the educational value of the new technologies.

"Getting our schools to join the information society should be everyone's concern. Teachers and parents, the public authorities and businesses should all act to help schools acquire and quickly master information and communication technologies. The use of information technology and multimedia in school is a crucial factor in ensuring equal opportunity," stated Edith Cresson when launching operation Netd@ys. Across Europe from 18 to 25 October, and with the European Commission's backing, the Netd@ys placed the focus firmly on three key concepts: networking, exchange, and private/public partnership.



"Educational tools such as the Internet and multimedia can also improve the standing of the teachers who use them."

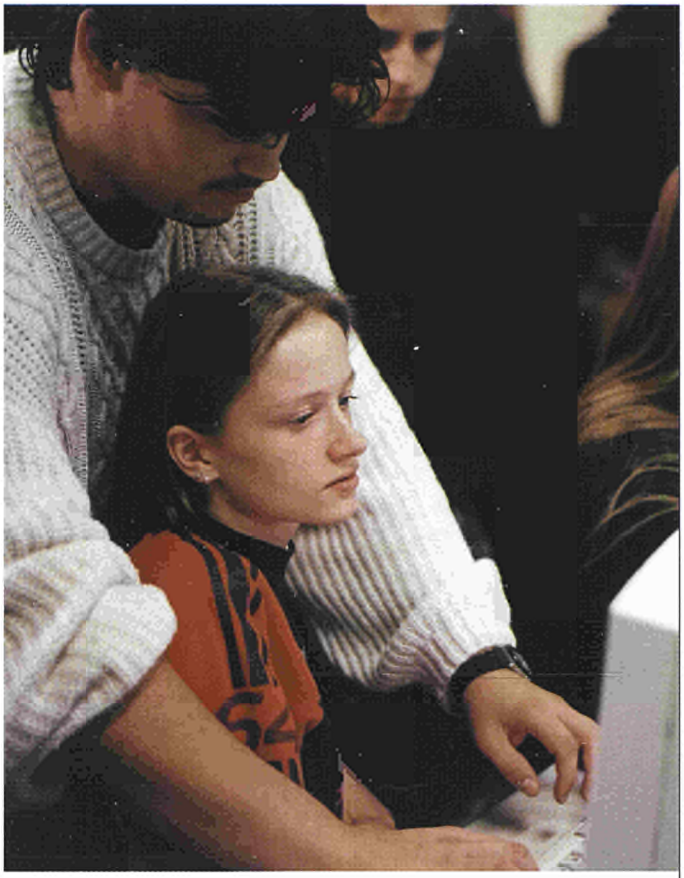
Surfing in class

Ferry De Rijke, responsible for implementing the Dutch New Information Technologies (NIT) plan, stresses "the importance of the school's role in preparing the citizens of the future for a more active democracy in which everyone is able to gain access to and correctly evaluate information." Dominique Geyssens, who runs the information technology programme at the Frans Fisher Institute (Brussels) - one of the 10,000 participating schools - makes no secret of his enthusiasm: "The inter- and intra-networking of the school is finally a reality. It is the backbone of our educational project." On the launch day - attended by Jacques Santer and Edith Cresson - these Brussels schoolchildren were able to learn how to communicate and work via electronic mail with pupils at the Poitiers Académie and Luxembourg Athénée. With the former they compiled an electronic journal containing news about their schools, and with the latter they conducted a cross-border chemistry experiment, the results of which will be exchanged and compared on the Net. The pupils were unable to conceal their excitement, despite their first rather tentative steps. An hour later, they were surfing the Web with confidence.

The attitude of the teachers sometimes seems more mixed. "Teacher-free classrooms are not something we are going to see overnight," believes Finnish Education Minister Olli-Pekka Heinonen. "Training teachers in the New Information Technologies is a priority, as their role is going to change enormously." Internet training days were held all over Europe during the Netd@ys, in order to allow teachers to master this new tool. Over 10 weeks, a total of 2,800 teachers from more than 700 schools attended the introductory NIT courses organised by Ronald Janssens, manager of the Belgian company SMASH and leader of the Digi Kids project. A real success when you consider that 80% of them initially described themselves as "computer illiterate" and often feared the day when they would find themselves in a class of pupils knowing more than they did. "The Netd@ys will allow teachers and pupils to open up to other cultures and values, and to share their own school experience with an international audience," believes Demetrios Sampson, a Greek multimedia consultant.

More active learning

We are ultimately going to see a new and more active educational approach. In addition to traditional tools, the NIT make it possible to learn how to use the potential offered by multimedia, and to develop and experience the notion of networking. These technologies facilitate the exchange of ideas not only between pupils but also between teachers in different situations. Pupils can interact with other classes elsewhere in the world or simply communicate inside their own school. "We are going to use our Web site in order to present some of the pupils' project work," explains Jean-Pierre Bartholeyns, the head of



"To philosophise is to learn to think about things which you do not usually think about."

☞

a reputedly *difficult school*. "It's a way of motivating them and providing them with a sense of their own worth compared to those who live in more favoured environments."

Outside these urban centres, the Internet is perhaps particularly useful in broadening horizons. In the French *Alpes maritimes*, people are now speaking of the "networked school". "Geographically dispersed classes are linked by means of a data transmission network and connection to a host computer, which is the heart of the educational project," explains André Renard, national education inspector in Grasse. One of these projects is the editing of the weekly publication, Lundimat. "Teachers have observed an improved mastery of the written language among pupils and an aptitude for team work," he continues.

But it is perhaps rather too soon to make a more general assessment of the impact of this new education. In addition to the connection and information, teachers realise the importance of the development and dissemination of appropriate educational content. "It is by circulating examples of *pioneering* schools that the others can define their expectations," continues Ronald Janssens. "Educational projects must mature. Both teachers and pupils are still learning the ropes," concludes Jean-Pierre Bartholeyns. ■

The Internet Philosophy Hotel

The philosophical societies which flourished in 19th century Europe are perhaps set to experience a renaissance. At least that is the aim of one Netd@ys project. At the *Philosophy Hotel* children aged from 10 to 14 are able to communicate in cyberspace. "The pilot classes, located in five EU countries, are very enthusiastic," declares Jean-Marie Delmotte, project manager at Averbode Publishers (B). "The thematic discussions in the various *rooms* have got off to a good start during the first two weeks." Currently on the agenda are: "Is it possible to know everything?", "The number 0", and "A table is a table". Everyone writes and receives the others' contributions in his or her own language, the site managers handling the translations. "We have been pleasantly surprised at the quality of the debate," says webmaster Richard Anthon, himself a philosopher. The message from one class speaks volumes: "To philosophise is to learn how to think about things which you do not usually think about, and to learn to debate." "This exchange is an incredible experience for the children," stresses Anthon. "They discover other cultures, other languages and, above all, they experience openness and tolerance."

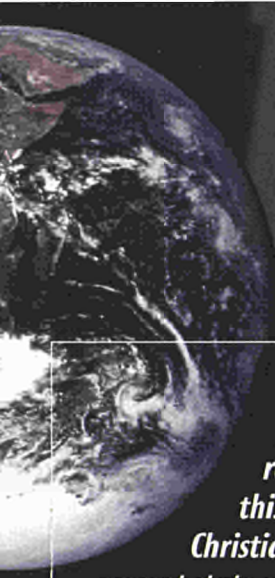
New Information Technologies and the under-25's

An extensive opinion poll carried out at the request of the European Commission (DG XXII) has just compiled a "portrait" of young people at this turn of the century. 9,400 citizens aged between 15 and 24 in the 15 countries of the European Union were asked about their concerns, their hopes, and their prospects for the future. When asked about the areas in which Europe has a priority role to play, 75.7% replied - as could have been expected - employment. Environmental protection came second (60.2%) and research and development in the new information technologies (NIT) third (54.4%), followed by education and training (45.6%).

Their expectations were confirmed when they were questioned further about employment. In reply to the question: "What are the most useful skills for finding a job?", familiarity with the NIT came fourth (32.3%), after general education (42.0%), language skills (40.4%) and communication skills (37.6%).

Although young Europeans are aware of the importance of the new technologies, most of them undoubtedly suffer from a lack of access to it. One interviewee in two (53.7%) does not use a PC, E-mail, CD-Rom or surf on the Internet "at least once a week." Of the "active" half, use of the NIT is usually limited to using a PC (4.4%). 14.2% of them use a CD-Rom and 6.6% have Internet access. It is in the Netherlands and Denmark that most young people have access to a computer (67%), while the Internet scores best in Sweden (31.8%) and Finland (28.3%). CD-Rom's are also most widely used among Scandinavian youth. The proportion of young people with no access to these systems is highest in Greece (77%), Spain (63%) and France (60%).

* This survey can be consulted in full on the Internet: http://europa.eu.int/comm/dg22/youth/youth.html



A European effort to heal the world

Europe's research effort in the environmental field is considerable. When the Union supports the global adoption of much stricter regulations and objectives to preserve the environment, it does so on the basis of scientific studies and facts, at the same time incorporating this knowledge in an increasingly wide range of sciences and technologies for the environment. Christian Patermann, Director of DG XII's Environment and Climate Programme, takes a look at the present state of play.

> "One of the reasons why Europe is at the forefront of technological issues is that it has a very rich and varied scientific potential."
>
> [Christian Patermann, Director of DG XII's Environment & Climate Programme]

Why is it that Europe is such an active supporter of environmental causes?

Christian Patermann: It has good reason to be. The European Union consists of some of the world's most urbanised countries and therefore has to face up to some very worrying realities.

But if Europe is in the vanguard on environmental issues is because it has a very rich and diverse scientific potential. Its researchers have played a leading role at world level in developing the knowledge which is now available in this field. When we first started talking about a hole in the ozone layer or the greenhouse effect, about 12 years ago now, science was clearly unable to make any categorical statements on these threats due to a lack of knowledge and understanding of the extraordinarily complex mechanisms involved in the physics and chemistry of the atmosphere. Since then, there has been a wide-ranging consensus in Europe in favour of a major research effort in order to get to grips with these problems.

From the global approach to realistic scenarios

What has been the role in this field of the research financed by the European Union's programmes ?

Since the Fourth Framework Programme, the Environment & Climate Programme has certainly become the principal stimulating element behind this scientific effort. The airborne missions to analyse and observe the growing hole in the ozone layer in the polar regions, which have received very considerable Commission support, provided us with a great deal of new information. All these data and results show that global change is most certainly something to be taken very seriously indeed.

But it is now time to move from a global approach towards increasingly operational models on a regional scale, models able to describe the realistic scenarios which result from human activity. You do not have much chance of convincing people to take concrete steps if you present them with a concept as abstract as global change. People are going to listen much more carefully if you have a model setting out the local causes and effects of climate change, destruction of the ozone layer, damage to ecosystems, etc., and if you come up with responses to these threats.

Could you give us an example of this kind of scenario ?

We know, for example, the precise causes of the increasing desertification threatening the Mediterranean Basin, and the mechanisms which cause an increase in the minimum altitude at which snow falls in the Alps, something which could affect a large part of the region's tourist economy. The results of scientific research can thus lead to proposals for concrete measures with measurable effects.

Another very significant example is the effects of the increased growth in the world's air traffic, with major routes increasingly passing through the northern hemisphere. Aircraft exhaust gases contain sulphur and nitrogen oxides. We now know the role played by sulphurous and nitrous compounds in the chemical reactions which take place in atmospheric clouds. If this phenomenon increases it will add to both global warming and the hole in the ozone layer.

If we want to continue to increase air traffic, the aviation industry must develop new technologies which can reduce emissions of these pollutants to an absolute minimum. Research into climate change therefore leads to new technologies which are essential to the health and survival of our planet.

Interdisciplinary projects

What is the principal added value of research carried out at the European level?

At the scientific level, the problems of the environment are extraordinarily complex. Unlike other disciplines, which are more able to confine themselves to a specialised field, research in this case only has any meaning if it encompasses a whole range of aspects. It not only has to take into account the biological, chemical, and physical interactions which ensure the balance of ecosystems, but also the human interactions which are influenced by social, economic, and political behaviour.

It is in this field that European initiatives perhaps play their most useful role. The Union has a huge diversity of scientific cultures and its research activities, financed by the Commission, are designed specifically to incorporate the multiple approaches within interdisciplinary projects.

The very names of the actions targeted under the Fifth Framework Programme - such as *The City of Tomorrow, Management and Quality of Water*, or *Environment and Health* - are indicative of this new way of approaching problems by bringing together the exact sciences and human sciences.

"In future attention is going to increasingly focus on econology." Christian Patermann (centre) talks with Michel Claessens (left) and Otto von Schwerin (right) of DG XII's Communication Unit, and Julia Acevedo (scientific officer with the E&C programme).

The concept of econology

What specifically does environmental research offer citizens, businesses, and the political decision-makers?

Its principal role is to clarify and coordinate the scientific bases of environmental policy, both inside Europe and internationally. When speaking of pollution it is important to know what you are measuring, how you measure it, and what the real dangers are. The environment is an area where there is often a great deal of subjectivity. Scientists need references and comparable indicators. Citizens, political decision-makers, and businesses need reliable and transparent information. At this level, European research provides an essential added value. It makes it possible to establish links between researchers and this helps create a common European language. On this basis it is then possible to harmonise methodologies and establish reliable ecological evaluations.

But there is also another field in which European research achieves important results. Over the past two decades environmental issues have become a priority concern. But in the future attention is going to increasingly focus on what I call *econology* - a concept which combines ecology and economy with technological resources. Europe has so far positioned itself well in this respect. Recent statistics show that, on the world market for environmental technologies, Germany, Italy and France are together gaining market shares which clearly outstrip those of the USA and Japan combined. With the increase in the world population and growing awareness of the pollution problems linked to the rapid growth of the emerging economies, the economic implications are enormous.

What is the role of European RTD in this field ?

Technologies for the environment were initially conceived as remedies for purifying contaminated air, water or soil. Today, the most interesting approach is that of prevention. The environment must be integrated into technological developments as a whole. Right from the design stage of an industrial product or process you must be thinking about how you can employ the minimum of resources such as water or energy, produce minimum waste, and recycle everything possible. Companies must think in terms of the life cycle of their products and the ecological effects of their activities. Such an approach is not only responsible, it is also economical! To do this, they need scientific and methodological bases.

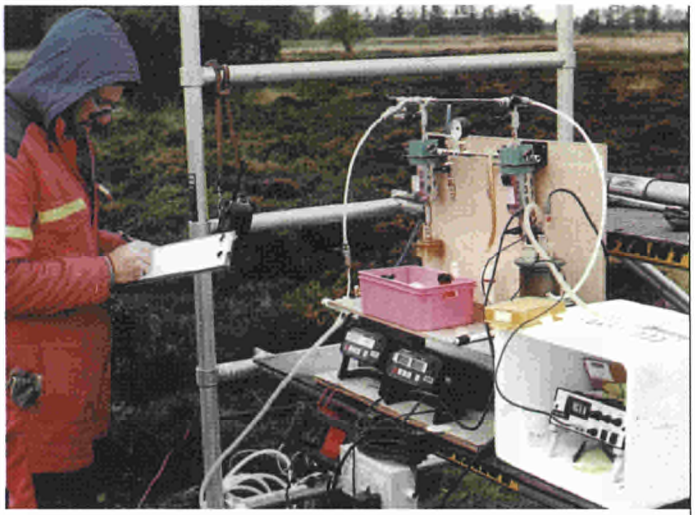
The principal targets of this research are certainly SMEs, as major companies have their own teams able to meet these demands and they know that the annual publication of a transparent ecology report can work wonders for their brand image. As to the SMEs, they are searching for technological niches and constitute a considerable reservoir of creativity. They are a fundamental vector of growth and innovation in the field of environmental technologies. That is why their increased involvement in Community research actions into these technologies is so crucially important. ■

Technologies for monitoring, protecting and restoring

To help eliminate - or at least reduce to a minimum - damage to the environment and health. That is the aim of European research into lasting technological solutions which incorporate both better prevention and a minimisation of pollution.

An increasing number of projects include the active involvement of the industrial world which is closely interested in opportunities for innovation and the growing demand for clean technologies. Many studies with European backing are also helping to draw up a normative framework as a basis for new environmental regulations.

Research is being conducted into a wide range of subjects, some examples of which are set out below.



Technology for monitoring the dispersion of pollutants in the atmosphere.

Preventing and minimising pollution

■ **Water.** Monitoring the presence, composition and toxicity of pollutants in the total water cycle; biological and physico-chemical processes to restore the quality of waste water ("extractive separation" membranes, electrochemical processes, etc.)

■ **Air.** Prevention and reduction of harmful emissions from various types of transport and industrial activities.

■ **Waste.** Reinforcement of recycling technologies, in particular for the separation and recovery of various types of plastic materials; improvement and innovation in the processing and destruction of dangerous waste by thermal, chemical or microbiological means; evaluation, management and processing of contaminated sites (tips, industrial sites, etc.).

■ **Clean technologies.** Systematic taking into account of product and process life cycles, including in particular the replacement of undesirable compounds in certain industries (leather, paint, surface treatment, etc.) [1]; development of biosensors: this new sophisticated and promising method of environmental monitoring permits very early detection of the exact causes of pollution (pesticides, organic pollutants, heavy metals, other microbial contaminants, etc.)

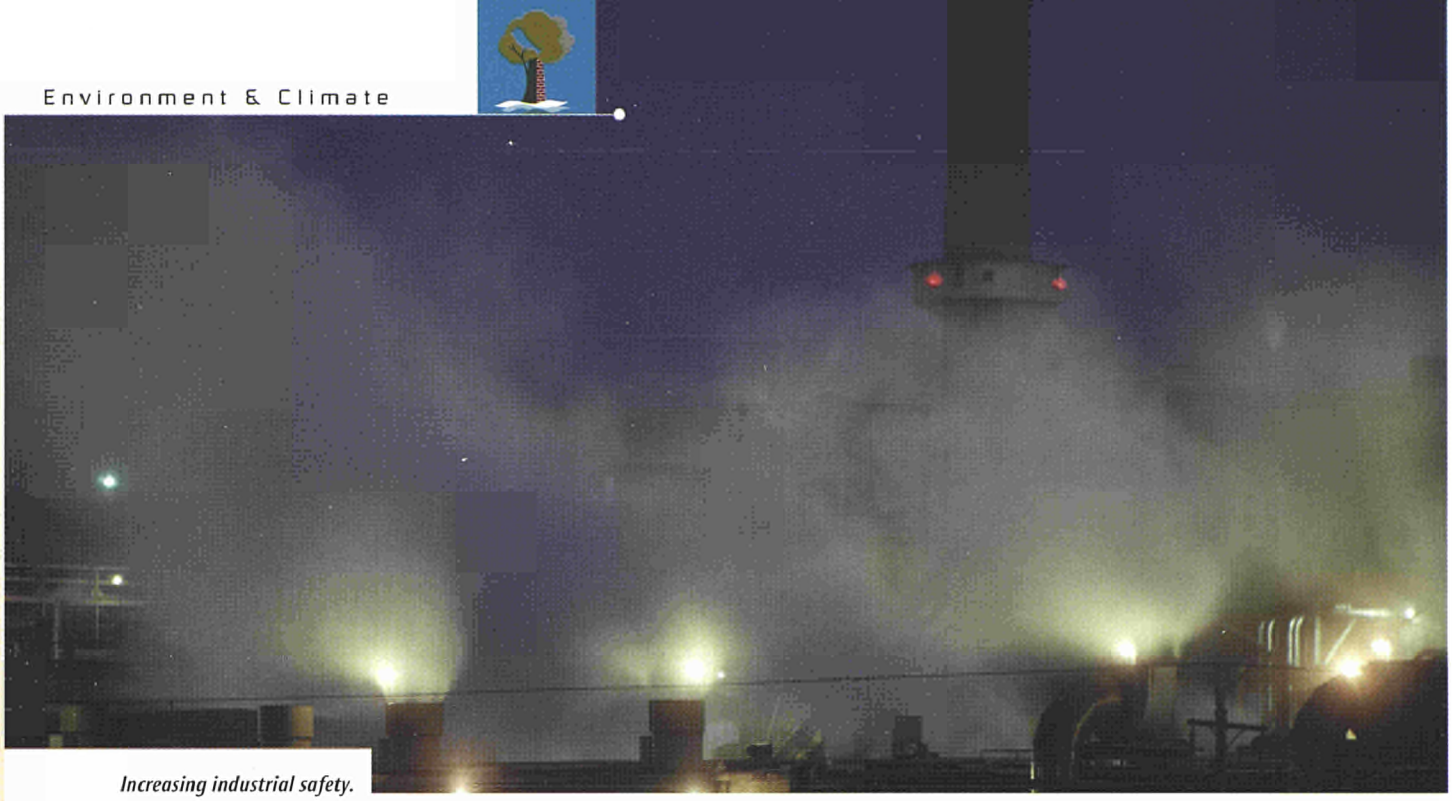
Cultural heritage: Europe leads the field

Since 1986, Member States have been pooling efforts and resources in a Community programme in order to understand better the causes and effects of a generalised process which is causing a great deal of concern, and to remedy the situation. The process in question is the deterioration of our cultural heritage - both in Europe and worldwide - in all its forms (architecture, works and objects of art, ancient books, etc.). This initiative, which is the most ambitious of its kind anywhere in the world, is investigating

☞

Halting the deterioration of cultural heritage.

(1) A coordinated action has also set up a "European network for strategic life cycle assessment" (LCANET), which is particularly concerned with defining new avenues for research in this key crucial area



Increasing industrial safety.

scientific and technological aspects with a view to developing:

- tools to evaluate damage to the cultural environment (in particular the impact of the urban environment, mass tourism, the effects of the inappropriate use of certain treatments - biocide, waterproofing, etc.);
- new technologies for the conservation, protection and restoration of cultural heritage - a sector with great potential for the creation of employment and tourism.

In addition to the interest and very significant involvement in these projects of museums and other bodies involved in this area, the growing involvement of businesses - including many SMEs - indicates the economic significance of technologies for heritage conservation.

Industrial safety

For the last 17 years the EU has possessed significant powers in the area of industrial safety and has conducted research in the field. Industrial risks require a three-pronged European research approach:

- innovation in prevention technologies and in reducing industrial accidents;
- an on-going study of the physico-chemical properties of the principal discharges of dangerous substances (especially in case of fire);
- the development of risk evaluation and management methods.

Human health is at stake

All the Member States are facing a critical problem: how to create the technologies and procedures to assess the impact of environmental deterioration on human beings. European research in this area is being conducted at three levels:

- the development of tools to measure the effects of exposure to toxic chemical substances ("bio-surveillance");
- the defining of testing methods and devices for detecting health problems caused by pollution (in particular respiratory, immune and endocrinal problems);
- the development of the technical means for effective epidemiological monitoring

Natural risks

The technologies developed make it possible to forecast, prevent and reduce the risks of floods, earthquakes and forest fires.

- flood monitoring and alarm systems;
- the development of techniques and models for observing and analysing deformations in areas of high seismic activity;
- the development of integrated systems for forest fire management and to improve fire response times. ■

Forecasting the risks of natural disasters to reduce the dangers.

Climate, atmosphere, biosphere... How are they changing ?

Understanding the phenomena, refining the forecasts, measuring the global change resulting from human activities - the Environment & Climate Programme makes a major contribution to supporting cooperation between European centres of excellence in this field of research.

1 Climate: a greenhouse-effect warning

Since 1995 the IPCC (Intergovernmental Panel on Climate Change) has been categoric: human activities - and in particular carbon dioxide (CO_2), methane (CH_4) and nitrogen oxide (NO_x) emissions - are increasing the concentration of greenhouse gases in the atmosphere and resulting in probable global warming. This warning is based on the many data and results gathered by European researchers, together with the increasingly accurate forecasting models.

The effects of global warming are, however, very difficult to predict accurately. They could include a rise in sea levels, changing rainfall patterns, an impact on vegetation, or upsets to the world's ecosystems. The impact of such changes - especially in socio-economic terms - will depend on specific regional conditions. In Europe, certain regions are already appearing more vulnerable to extreme climatic events - such as floods and drought - which are tending to become more frequent.

The SESAME campaign. European scientists have been analysing the widening hole in the ozone layer above the Arctic for the past decade.

An infinitely complex mechanism

Projects financed by the EU are concerned with the interactions between the atmosphere, the ocean and the continents, the detection of indicators of global change, and the importance of causes which can be linked to human activities.

A number of fundamental problems are the subject of particular attention.

■ **The global carbon cycle.** The analysis of the global carbon cycle reactions - of which our knowledge remains limited - is essential to our understanding of the build up of carbonaceous greenhouse gases. The use of new measuring techniques has made it possible to demonstrate the important role - to date under-estimated - played by the world's oceans in absorbing anthropogenic CO_2 emissions.

■ **Methane.** Studies are being carried out on the level of methane concentrations, considered to be the second most significant gas which could be playing a part in global warming. Giving priority to reducing methane emissions could be a very useful preventive measure due to its "brief" life in the atmosphere (±15 years, compared to ±200 years for CO_2). Researchers have already identified and quantified the major sources of methane emissions resulting from human activities (waste burial, intensive farming methods, the use of solid fuels in an urban environment, leaks in natural gas operating and transport systems, etc.).

■ **The lessons of history.** An understanding of past climate change is an important field of research ☞

Are sea levels already rising ?

A number of projects conducted under the Environment and Climate Programme have reached the same conclusion: sea levels are rising along Europe's coastlines at an average rate of between 1 and 1.5 millimetres a year. Although this may be partly due to certain vertical tectonic movements affecting the sea beds, researchers working on a European project have shown that the melting of glaciers - caused by regional and/or global climate warming - is also contributing to this rise in sea levels. European scientists have put forward a series of proposals for observation and analysis strategies of the extremely complex mechanisms affecting variations in sea level - variations which could represent a grave threat to populated coastal areas.

The worrying desertification of the Mediterranean Basin.

☞ when refining present forecasting models. The study of ice fields in Greenland showed that the region has experienced some very unstable climates in the past, including one warming of 20°C in a single century. Other research projects are being carried out in Antarctica to check these observations.

Developing better forecasting models

The development of global forecasting models incorporating all the data and knowledge at our disposal is crucially important. But Europe's scientists are also trying to develop forecasting tools at regional and local levels. We can learn a great deal from these more precise scenarios which further refine global forecasts.

■ **Is there a "brake" on the Gulf Stream?** The study of currents in the North Atlantic has highlighted the potentially contrasting effects of the "warming" scenario. The melting of the Arctic ice fields could act against the incoming flow of the warm Gulf Stream currents (responsible for the temperate climate of a large part of western Europe). This cooling would therefore possibly offset the effects of global warming, but with uncertain consequences.

■ **The Alps without snow?** Detailed regional scenarios also look at the impact of global change on water resources and hydrological basins. In the Alps "reservoir" we could see increased rainfall at the expense of snowfall, thus changing the behaviour of rivers, which depend on these snowfalls, such as serious winter flooding and much less water flowing during the dry periods.

■ **Increased Mediterranean desertification?** The worrying increase in the desertification of the Mediterranean Basin - even on the European side - has been the subject of European research for more than a decade. The prospect of climate change, demographic pressure and the increased and often irrational use of natural resources is threatening to lead to more serious water shortages, erosion, and a reduction in agricultural potential. The danger of such a development warrants major scientific efforts to analyse the impact and develop prevention strategies.

2. Stratosphere: confirming the presence of an "ozone hole" in the Arctic

The most worrying sign of changes to the earth's atmosphere came in the 1980s when a hole in the ozone layer was observed in the stratosphere. This phenomenon, which is attributable to the many chemical pollutants emitted by human activity - in particular chlorine and bromine derivatives - could destroy the earth's shield which is essential in protecting living organisms from the sun's UV rays. Since 1989, the European Commission has supported and coordinated the intense international research efforts in the northern hemisphere in order to quantify this ozone depletion, understand the causes and assess the consequences. More than 300 scientists from 20 countries participated in the EASOE (1991-92), SESAME (1994-95) and APE (1996-1997) campaigns. This research involved the use, at very high altitude[1], of sophisticated scientific instrumentation. Their results indicate that the thickness of the ozone layer over the Arctic has decreased by up to an alarming 40% in just three years.

3. Troposphere: air pollution

The other site of observation and research in the atmosphere is the troposphere, i.e. the layer which we breathe - and which we pollute. Once again ozone is a central problem, but this time due to its concentration, which is reaching excessive levels with increasing frequency, and the serious

The reaction of plant life

What impact could global warming have on forests and agriculture? Plants play a vital role in the carbon cycle and are a major factor, not only in absorbing CO_2 through daytime photosynthesis, but also as a source of their emissions during nocturnal respiration. To what extent could they therefore counter climate change?
It is also likely that global warming will increase the rate of growth of plants - with varying consequences depending on the species and the ecosystems. Some agricultural crops will have an increased yield while others will become less productive; changes in land use may result, notably the diversification of farming in northern regions.

consequences this brings for health, in particular by attacking the respiratory tracts. On average, ozone levels seem to have doubled since the beginning of the century. Concentration peaks (not solely confined to urban areas) are caused by the photo-oxidation of various gases from vehicle exhausts and industry when exposed to the sun's rays.

Several research projects backed by the Commission are studying - by means of aerial and satellite observation to a height of 12,000 metres - the complex mechanisms at work in this photo-oxidation process in Europe's troposphere. The aim is to propose concrete solutions which would make it possible to modify these emissions in order to reduce pollution. Thanks to the EUPHORE photoreactor, a particularly sophisticated European installation built in Spain, research is being carried out, in natural conditions, on alternative fuels which would reduce the contribution of vehicle emissions to ozone production [2].

4. Biosphere: ecosystems under threat

Many European research projects are devoted to the effects of large-scale environmental change on the biosphere.

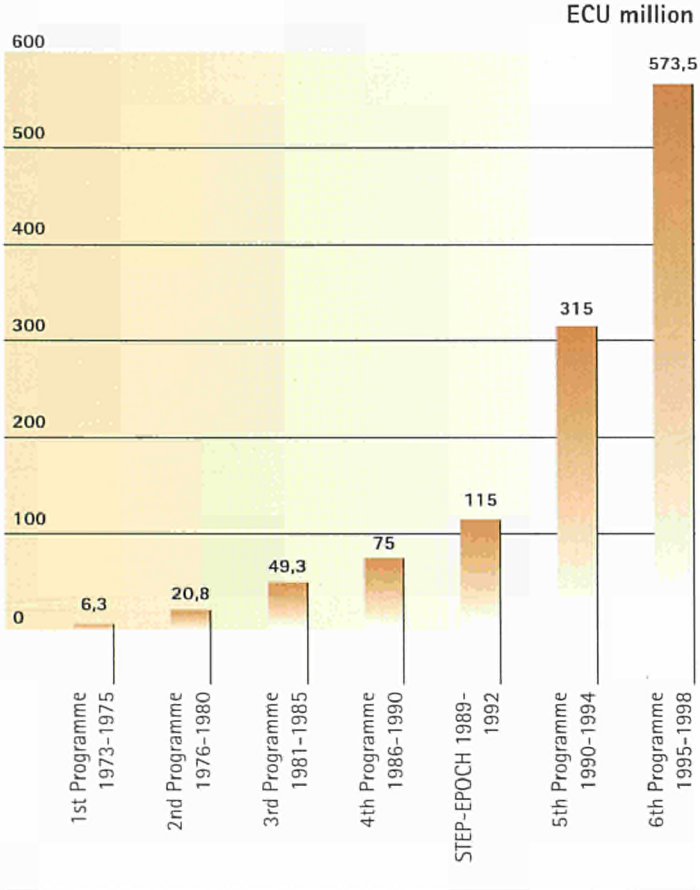
■ **Aquatic ecosystems.** Human activities are seriously harming the global balance of the water cycle and could ultimately result in an unacceptable deterioration in the quality of life. The culprits: over-fertilisation of soils, pollution with harmful substances, the conversion of humid areas for agriculture, urbanisation and industrialisation, increasingly large-scale extraction of groundwater, changes to the water course, etc. In order to protect and respect essential ecosystems, researchers from the WATER thematic network are exploring the biogeochemical processes and cycles which maintain their structure and functioning.

■ **Land ecosystems.** TERI, a vast network of European multidisciplinary research projects, is seeking to encompass the full diversity of Europe's ecosystems. The aim is to identify and analyse their functional equilibria and development - in particular in connection with global change. Some of the threatened sites are specially targeted, such as mountainous regions or areas affected by fire.

■ **Coastal ecosystems.** The study of the continent/ocean interface is the subject of very specific research by the ELOISE network. As the site of very important interactions between marine waters and the discharge of the continent's waste water combined with sediments carried by rivers, coastal areas have a major environmental impact. The influence of human activities is particularly felt in these areas and the problem of rising sea levels also places it in the "front line".

At the same time as focusing on ecosystems, an essential aspect of European environmental research is the study and preservation of the biodiversity in all its forms (plant, animal, microbiological). Another factor is also the impact of increasing UV-B rays (due to a thinning of the stratospheric ozone layer) not only on human health but also on the living world as a whole. ■

Budget for the European Union's environmental research programmes (1973-1998)



(1) In addition to balloon measurements, in early 1997 the APE campaign carried out analyses of the polar stratosphere using instruments on board a converted Russian spy plane, flying at nearly 22,000 metres (see RTD Info n°15).

(2) See RTD Info n°15.

News in Brief

European RTD policy

Fifth Framework Programme: preparations are going well - On 5 November the Commission submitted a detailed proposal to the Council of Ministers and European Parliament for the scientific and technological content of the three major thematic programmes (The living world and the ecosystem, Creating a user-friendly information society, Competitive and sustainable growth) and the three horizontal programmes (International cooperation, Innovation and participation of SMEs, Human potential). The overall budget is ECU 16 300 million. Compared to the Fourth Framework Programme, this represents a 3% growth in the European research budget as a proportion of the EU's GDP.
Parliament is due to give its opinion before the end of 1997, the Council's common position is expected for mid-February 1998, and the Framework Programme should be adopted in the spring, with the final decision on the content of specific actions coming after the summer of 1998. The first calls for proposals can then be launched, allowing the first projects to start up at the beginning of 1999. *(PR : 26/9/97 - 5/11/97)*

An extra ECU 115 million for high-priority research in 1998 - Following an agreement of 23 September between the European Parliament and the Council, the overall budget for the Fourth Framework Programme for RTD has been increased by ECU 115 million. These extra funds will go to help high-priority research into transmissible spongiform encephalopathy (ECU 35 million), aeronautics (20 million), anti-personnel land mines (15 million), educational multimedia software (12 million), transport intermodality and interoperability (12 million), water resources management (12 million), and renewable energies (9 million). *(PR : 26/9/97)*

Programme addresses on EUROPA

The Europa World Wide Web addresses given for the various programmes referred to in the following two pages should all be prefixed with the address of the DG XII site, which has recently been changed (the /en/ has been deleted) :

http://europa.eu.int/comm/dg12/

Access to DG XII press releases

Information ending with the reference (PR + date) is also available in the form of press releases at:

http://europa.eu.int/comm/dg12/press.html.

Press releases may also be obtained from the Communication Unit - Fax: +32-2-295.82.20.

Publications

All publications listed where the title is followed by an **asterisk** (*) must be **bought**. They may be ordered from the Office for Official Publications of the European Communities - Fax: +352-48.85.73. Other publications may be obtained from the programmes concerned.

Publications - Annual report on the EU's RTD activities - 1997 - Commission document COM(97) 373 - At the end of 1996, more than 9,000 EU-funded research projects were running. During the same year, some 6,000 RTD projects involving 25,000 partners received total Community financing of around ECU 3 000 million. The data gathered since the start of the Fourth Framework Programme show that 40% of participants in shared-cost research projects are enterprises, half of which are SMEs - which means that SME participation has doubled. The report also looks at the principal scientific and technological results achieved under the various programmes. (PR : 13/11/97).
Contact : Communication Unit - DG XII - Fax: +32-2-295.82.20 - E-mail: info-dg12@dg12.cec.be

■ *Research and development - 1997 Annual Statistics - EUROSTAT (*)* - ISBN 92-827-1326-6. This publication looks at R&D trends in Europe. In 1995 total R&D expenditure came to ECU 124 billion, or 1.98% of the EU's GDP. Expenditure by enterprises accounted for 60% of this amount, with the balance shared equally between higher education and the state. A total of 2.1 million scientific, technical and other personnel were employed in research, or 1.26% of the working population. 34,000 patents were registered in 1995 (5% more than in 1994 and 12% more than in 1989). The European average is 90 patents per 1 million inhabitants, with Sweden (195), Germany (169) and Finland (166) leading the field.

Video - Inventing Tomorrow (*) - On sale at the Office of Publications ("information multipliers", such as journalists and teachers, can obtain a free copy by making a written request, explaining how they intend to use the video, to Mr Claessens at the DG XII Communication Unit). This 42-minute video presents a number of RTD projects supported by the EU, illustrating the importance of European cooperation in the face of scientific and technological challenges and confirming that the priorities of the Fifth Framework Programme are designed specifically to tackle the major problems of our time.

Industrial and materials technologies

Fax: *+32-2-295.80.46 / 296.70.23*
E-mail: *imt-helpdesk@dg12.cec.be*
WWW: *br-eur1.html*

Results of the 3rd BRITE-EURAM call for proposals (closed on 30/4/97) - 64 projects concerned with means of transport will share a budget of ECU 150 million, and 91 fundamental research projects are to receive ECU 83 million. Of the more than 1,200 partners, 51% are industrial participants (66% for the transport projects), of which 40% are SMEs. *(PR : 10/10/97)*

Publications - *Brite-EuRam - A decade of developing competitiveness (*)* - EUR 17647 - ISBN 92-828-1580-3 - On the occasion of the 10th anniversary of BRITE-EURAM, a report on the progress achieved by European industrial research and the challenges it still faces.

■ *Brite-EuRam : a measurable impact (*)* - EUR 1779 - ISBN 92-828-0837-8 - Fifth evaluation of the technological and commercial results obtained by the 131 projects launched under BRITE-EURAM II and completed in 1994.

■ *Industrial Technologies : Making an Impact - Examples of successful projects (*)*- EUR 17750 - ISBN 92-827-9980-8 - Brochure describing 50 BRITE-EURAM projects, classified according to field of application (environment, medicine and health, agriculture and food, industrial processes, new products and materials, transport).

Standards, measurements and testing

Fax: *+32-2-295.80.72*

Publication - Standards, Measurements and Testing : Examples of successful projects - ISBN 92-827-9980-8 - Set of 20 descriptive sheets on

SMT projects, classified according to field of application (environment, medicine and health, agriculture and food, industrial processes).

Environment and climate

Fax: *+32-2-299.57.55*
E-mai: *environ-infodesk@dg12.cec.be*
WWW: *envir1.html*

Results of 2nd call for proposals (closed on 15/1/97) - 306 research proposals, covering all programme areas, will receive a total budget of ECU 205 million. *(PR : 17/7/97)*
For your diary - 1st European Commission Conference on Research for the protection of cultural heritage: opportunities for European enterprises - 18-19/12/97 - Rome (I) - Contact DG XII: J. Acevedo
■ *Euroclivar workshop on climate change detection and attribution* - 9-12/3/98 - Bracknell (UK) - Contact DG XII: I. Troen .
■ *Les systèmes fluviaux anthropisés* - 25-27/3/98 - Paris (F) - Contact DG XII: H. Barth.
■ VIIth International Congress on Ecology "New tasks for ecologists after Rio 1992" - 19-25/7/98 - Florence (I) - Contact DG XII: H. Barth.

Marine science and technologies

Fax: +32-2-296.30.24
E-mail: mast-info@dg12.cec.be
WWW: marine1.html

Results of the 2nd MAST call for proposals (closed on 15/10/96 and 15/1/97) - 56 research projects to improve the protection and management of the world's oceans are to share Community funding of ECU 76 million. *(PR : 26/6/97)*
For your diary - 3rd European Marine Science and Technology Conference - 23-27/5/98 - Lisbon - Contact DG XII: K.-G. Barthel.
■ *Expo '98 : "The oceans: a heritage for the future"*- Lisbon - Contact DG XII: M. Weydert. http://www.expo98.pt/en/

Publication - *Five Year Assessment of the Specific Programme Marine Science and Technologies* - 1997 - EUR 17590 EN - ISBN 92-828-0618-9

Biotechnology

Fax: *+32-2-299.18.60*
E-mail: *life-biotech@dg12.cec.be*
WWW: *biot1.html*

Creation of the Biotechnology and Finance Forum - Set up by the Biotechnology programme and the European Association of Security Dealers (which founded the EASDAQ, a European securities market for innovative small businesses), this forum will develop various activities with the aim of fostering closer relations between the scientific and industrial community and the world of finance - and venture capital in particular - in order to promote the development of Europe's biotechnology industry. One of the first events organised by the Biotechnology and Finance Forum is a conference (April 1998) and publication of a survey on the financial needs of the "biotechnology sphere" in Europe. *(PR : 20/10/97)*

Agriculture and fisheries

Fax: *+32-2-296.43.22*
WWW: *agro1.html*

Results of the 5th call for proposals (closed on 20/3/97) - 132 projects in the fields of agro-industry, agriculture and fisheries have been approved for Community funding of ECU 95 million.
Publication: Crops for industry and energy in Europe - ISBN 92-827-2415-6 - E-mail: life-fair@dg12.cec.be
For your diary - Impact of Food on Health: Current Research in Europe - 8-10/1/98 - London - Contact DG XII: A. Luchetti

Non-nuclear energy (Joule)

Fax: *+32-2-295.06.56*
WWW: *joule1.html*

For your diary - *Workshops for Marie Curie fellows conducting research under the JOULE programme* - Wind power - April 1998 (date to be confirmed) - Cork (IRL) - Rational use of energy in buildings - 16-19/7/98 - London (GB) - Contact DG XII: Barry Robertson - Fax: +32-2-299.36.94 - E-mail: barry.robertson@dg12.cec.be
■ *Conference on Renewable Energies Technologies and Strategies in Central and Eastern European Countries* - Vienna - 25-27/5/1998 - Contact : Irmela BRACH - Fax: +32-2-296. 68. 92. - E-mail: irmela.brach@dg12.cec.be
■ *Biomass for Energy and Industry Conference* - Würzberg - 8-11/6/1998 - Contact: Mr. Manuel SANCHEZ - Fax: +32-2-296. 06. 21. - E-mail: manuel.sanchez@dg12.cec.be

Non-nuclear energy (Thermie)

Fax: *+32-2-295.05.77*

Publication - *1997-1998 information brochure on demonstration actions in the field of non-nuclear energy* - Contact DG XVII: M. W. Folkertsma

Nuclear fusion

Fax: *+32-2-296.42.52*
WWW: *fusion1.html*

Record results for the JET - The JET experimental reactor in Abingdon (UK), the pride of European fusion research, has embarked on a new series of tests in producing fusion energy with a deuterium-tritium mix. Two world records have already been set. First, the obtaining of fusion power in excess of 12 megawatts (11 MJ of fusion energy) - 6 times the record already set by JET in 1991 with the same reactor. Second, the obtaining of a fusion power/injected power ratio of 50% - twice the value previously obtained. *(PR : 23/9/97)*

For your diary - *Upcoming dates for Fusion Expo* - 15/1-28/2/98 - Rome (I); March-April 1998 - Barcelona (E).

CD-ROM - How to explain to a wider audience the importance for the future of mastering nuclear fusion energy? This interactive CD-ROM explains the basic mechanisms of fusion energy production and the physics of plasmas, also reporting on the results obtained, in particular thanks to EU research. This tool, of special interest to teachers and managers of museums and scientific exhibitions, is available from :
Edith Grüter, CRPP-Ecole Polytechnique Fédérale de Lausanne (CH)
Fax: +41-21-693.3751 - E-mail: secretar@crpp.epff.ch

Dissemination and exploitation of results

Fax: *+352-4011-62248*
E-mail: *helpdesk@cordis.lu*
WWW: *http://www.cordis.lu/*

New RAPIDUS service on CORDIS - Thanks to this new function of the CORDIS Web site, users can now save their information search profiles for CORDIS data bases. They will be automatically notified by E-mail when new information corresponding to their search is added to the database in question.

Training and mobility of researchers

Fax: *+32-2-296.32.70*
E-mail: *tmr-info@dg12.cec.be*
WWW: *tmr1.html*
http://www.cordis.lu/tmr/home.html

Results of 2nd call for proposals for Research-Training Networks (closed on 3/2/97) - 147 network proposals, linking 1,100 teams responsible for training 2,000 post-doctorate students, will receive an overall budget of ECU 190 million. This brings the number of networks currently funded to 241 *(PR : 25/7/97)*.

Publication: Research Training Networks 1995/1996 - A comprehensive review of the activities carried out within the networks which received researchers with support from the TMR programme - Contact: Andrea Dahmen.

Ongoing/Upcoming calls for proposals

(as of January 1998)

Programme (and main contacts)	Publication	Deadlines	Areas (and specific contacts)
INFORMATION TECHNOLOGIES (ESPRIT) **Contact:** Gerda Colling Fax: +32-2-296.83.88 E-mail: esprit@dg13.cec.be http://www.cordis.lu/esprit/home.html	15.4.97	21.1.98 (*) 31.3.98 (**)	Open call: Intelligent Manufacturing Systems (jointly with the ESPRIT programme). CONTACT: IMS Secretariat - Fax: +32-2-299.45.72 (*) deadline for submission of outline proposals (**) deadline for submission of full proposals
	16.9.97	16.2.98	Single-step evaluation scheme: long-term research (intelligent information interfaces initiative).
	16.9.97	17.3.98	Continuous call. • Activities applicable to all domains: SME cooperative research in IT, networks of excellence, user groups and working groups, concerted actions, dissemination and awareness actions, demonstration actions and analysis of possible socio-economic consequences. • Software technologies; technology for components and subsystems; open microprocessors systems initiative; high performance computing and networking; technologies for business processes; integration in manufacturing.
	31.10.97	2.2.98	Concurrent engineering in aeronautics (jointly with the Brite-EuRam programme)
INDUSTRIAL & MATERIALS TECHNOLOGIES **Contact:** Fax: +32-2-295.80.46 / 296.70.23 E-mail: imt-helpdesk@dg12.cec.be	15.4.97	21.1.98 (*) 31.3.98 (**)	Open call: Intelligent Manufacturing Systems (jointly with the ESPRIT programme). *CONTACT: see Esprit programme above*
	31.10.97	2.2.98	Concurrent engineering in aeronautics (jointly with the ESPRIT programme)
	31.10.97	2.2.98	Open call "Environment-Water" (jointly with the Environment & Climate programme)
	15.12.95	20.5.98	Open call for support & accompanying measures.
STANDARDS, MEASUREMENTS & TESTING **Contact:** Wiktor Raldow Fax: +32-2-295.80.72	15.6.95	30.7.98	Open call for accompanying measures.
ENVIRONMENT & CLIMATE **Contact:** Fax:+32.2.296.05.88 E-mail: environ-infodesk@dg12.cec.be	31.10.97	2.2.98	Open call "Environment-Water" (jointly with the Industrial & Materials Technologies programme)
MARINE SCIENCE & TECHNOLOGIES **Contact:** Fax: +32-2-296.30.24 E-mail: mast-info@dg12.cec.be	15.3.96	12.6.98	Open call : preparatory accompanying & support measures. Areas: standards for training & work; modelling; ocean data management & quality control for research & operational applications; use of heavy experimental equipment, research vessels & their modular equipment, large computing facilities & other technical resources in the European Economic Area; design of components & systems for heavy advanced equipment; calibration techniques & standards for marine instrumentation & observational equipment.
BIOTECHNOLOGY **Contact:** E-mail: life-biotech@dg12.cec.be	17.12.96	15.3.98 15.9.98	Advanced practical workshops *CONTACT: Andreas Klepsch - Fax: +32-2-299.18.60*
AGRICULTURE & FISHERIES (FAIR) **Contact:** E-mail: life-fair@dg12.cec.be	15.10.97	16.01.98	Targeted call in the following areas(1): - Area 3 - *CONTACT: Alessandra Luchetti - Fax:+32-2-296.43.22* - Area 4 - *CONTACT: Arnaud Borchard - Fax: 32-2-296.30.29* - Area 5 - *CONTACT: Willem Brugge - Fax: +32-2-295.78.62*
NON-NUCLEAR ENERGY (THERMIE component) **Contact:** Wiepke Folkertsma Fax: +32-2-295.05.77	15.9.97	30.1.98	Call for targeted type A demonstration projects (rational use of energy, renewable energies, fossil fuels).
TRANSPORT **Contact:** Paula Mossakowski Fax: +32-2-295.43.49 E-mail: paula.mossakowski@dg7.cec.be	16.12.97	16.3.98	RTD tasks in the strategic, air and road sectors, as well as actions and studies to consolidate results from the Fourth Framework Programme and to prepare the Fifth Framework Programme.
	16.12.97	16.3.98	Intermodal transport : demonstration projects in the areas of intermodal freight and intermodal passenger transport

Programme (and main contacts)	Publication	Deadlines	Areas (and specific contacts)
TARGETED SOCIO-ECONOMIC RESEARCH **Contact:** Stephen Parker Fax: +32-2-296.21.37 E-mail: tser-secr@dg12.cec.be	16.9.97	15.1.98	Science & technology policy options; research into education & training; research into social integration & exclusion (only in certain areas).
INTERNATIONAL COOPERATION **Contact:** E-mail: inco-desk@dg12.cec.be	15.2.95	1.3.98	Grants (Japan, Korea). *CONTACT: Louis Bellemin - Fax: +32-2-296.98.24*
TRAINING & MOBILITY OF RESEARCHERS **Contact:** Jürgen Rosenbaum Fax: +32-2-296.21.33 E-mail: tmr-info@dg12.cec.be http://www.cordis.lu/tmr/home.html	-	-	Marie Curie Research Training Grants (post-graduate, post doctoral & return grants) - See 2nd table below.
	15.12.97	31.3.98	Euroconferences, summer schools & practical training courses.
MEASURES FOR SMEs **Contact:** Giorgio Clarotti Fax: +32-2-295.71.10 E-mail : sme-helpdesk@dg12.cec.be	-	-	Technology stimulation measures for SMEs - Cooperative Research (see next table)

Technology stimulation measures for SMEs:

(Cooperative research)

INDUSTRIAL & MATERIALS TECHNOLOGIES	15.12.94	8.4.98	*CONTACT: Klaus Kögler - Fax: +32-2-299.46.35* *E-mail: imt-helpdesk@dg12.cec.be*
STANDARDS, MEASUREMENTS & TESTING	15.12.94	8.4.98	*CONTACT: Achim Boenke - Fax: +32-2-295.80.72*
ENVIRONMENT & CLIMATE	17.1.95	1.4.98	*CONTACT: Jitka Vennekens - Fax: +32-2-295.20.97*
MARINE SCIENCE & TECHNOLOGIES	15.12.94	8.4.98	*CONTACT: Christos Fragakis - Fax: +32-2-296.30.24* *E-mail: mast-info@dg12.cec.be*
BIOMEDICINE & HEALTH	17.1.95	8.4.98	*CONTACT: Viviane Thevenin - Fax: +32-2-295.53.65*
AGRICULTURE & FISHERIES	15.12.94	8.4.98	*CONTACT[1]: Areas 1,2,3: Xabier Goenaga - Fax: +32-2-296.43.22* *Area 4: Armin Muenzinger - Fax: +32-2-296.30.29* *Area 5: Mario Lopes - Fax: +32-2-295.78.62* *E-mail: life-fair@dg12.cec.be*
NON-NUCLEAR ENERGY (JOULE component) R&D Proj.	15.12.94	8.4.98	*CONTACT: Barry Robertson - Fax: +32-2-299.36.94*

Marie Curie Research Training Grants

Post-graduate, post doctoral & return grants in all areas of the following programme
Information on Internet: http://www.cordis.lu/tmr/home.html

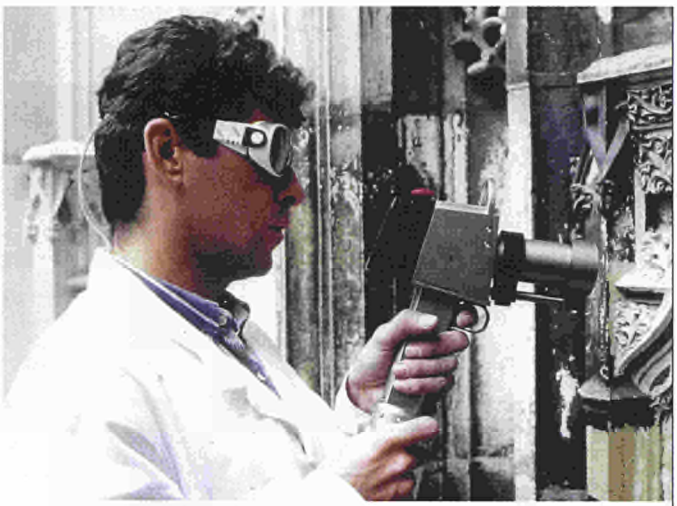
INDUSTRIAL & MATERIALS TECHNOLOGIES	15.12.95	31.1.98	*CONTACT: Fax: +32-2-295.80.46 / 296.70.23 /* *E-mail: imt-helpdesk@dg12.cec.be*
STANDARDS, MEASUREMENTS AND TESTING	15.12.95	15.3.98 15.6.98 1.9.98	*CONTACT: Philippe Quevauviller / Fax: +32-2-295.80.72*
ENVIRONMENT & CLIMATE	15.12.95	20.3.98 20.8.98	*CONTACT: Angel Arribas San Martin /* *E-mail: angel.arribas@dg12.cec.be*
BIOTECHNOLOGY	15.6.96	1.3.98 1.7.98	*CONTACT: Alessio Vassarotti / Fax: +32-2-299.18.60 /* *E-mail: life-biotech@dg12.cec.be*
BIOMEDICINE & HEALTH	17.1.95 17.9.96	31.12.97	*CONTACT: Alain Vanvossel / Fax: +32-2-295.53.65 /* *E-mail: alain.van-vossel@dg12.cec.be*
NON-NUCLEAR ENERGY (JOULE component: R&D Proj.)	15.6.96	1.7.98	*CONTACT: Ingrid Tenten / Fax: +32-2-299.18.47*

(1) Agriculture and fisheries - Area 1: Integrated Production and Processing Chains - Area 2: Scaling-up and Processing Methodologies - Area 3: Generic Science and Advanced Technologies for Nutritious Foods - Area 4: Agriculture, Forestry and Rural Development - Area 5: Fisheries and Aquaculture.

Industrial competitiveness allied to the citizen

A central theme: industrial research in the service of the citizen. Plus three model areas: the urban environment, the factory of the future, and aviation. Such was the framework for the Brite-EuRam conference (Toulouse, 27-30 October) attended by 750 manufacturers, engineers and researchers: three lively days of technical workshops, discussions, round tables and project presentations.

"Too often, the needs of the consumer and the requirements for competitiveness are seen as being mutually exclusive. Nothing could be further from the truth. The most promising markets are precisely those which correspond to existing or potential demand. And within these markets, the most competitive products will be those which are safe, easy to use, and long-lasting - the attributes expected by the user." In her introductory address to the European industrial technologies meeting, Commissioner Edith Cresson set the tone for the whole event.



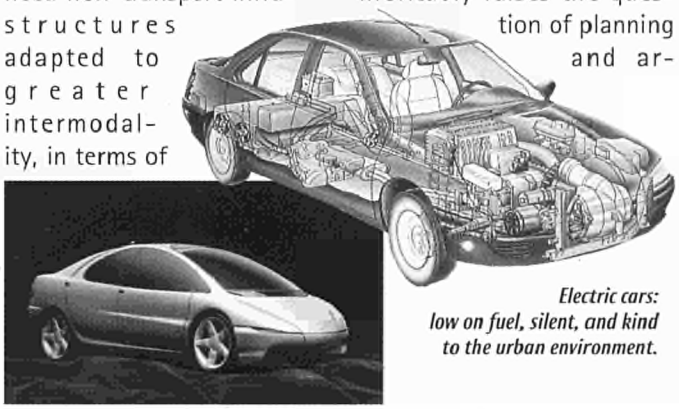
Restoring the cultural heritage in total safety, thanks to laser technology.

Improving the context of urban life

The first subject of the technical workshops was how to improve the quality of life in an urban environment. Comfort, safety, access to facilities and services, air and water quality, reduction of noise disturbance and other forms of pollution. Such are the "demands" being made by the inhabitants of our towns and cities - and more than 80% of Europeans live in an urban environment. The worrying - and inextricably linked - problems of traffic and pollution in particular require solutions involving the design of clean, safe and *intelligent* urban vehicles. The European motor industry represented by Eucar (European council for automotive R&D) presented a number of research projects on electric and low-emission vehicles.

As traffic in our towns reaches saturation point, we need new transport infrastructures adapted to greater intermodality, in terms of passenger and goods transport. A consortium representing managers of the London, Paris, Berlin and Milan underground systems reported on the specific problems of laying new lines in a complex urban environment and repairing old ones - some of them very old indeed.

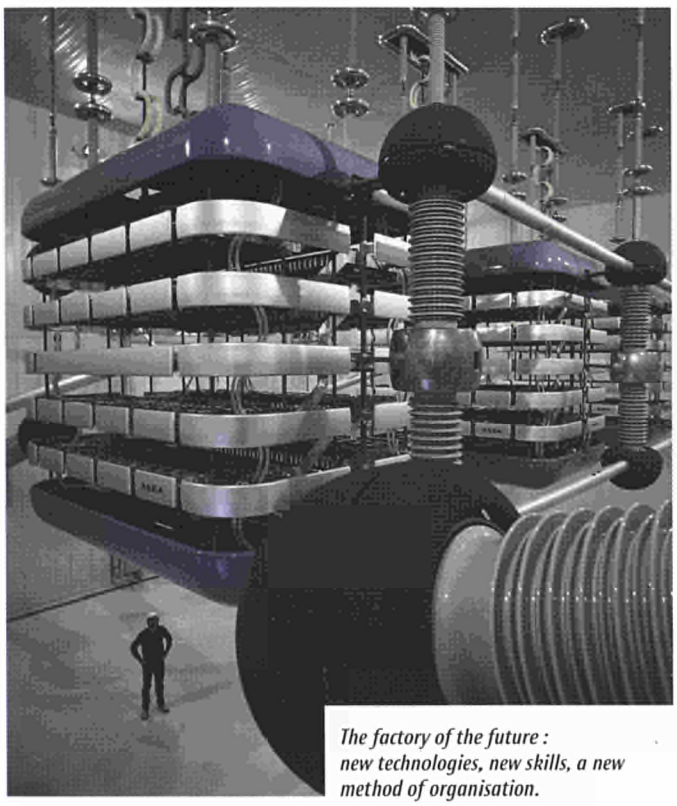
But talk of the town also inevitably raises the question of planning and architecture. The quality of buildings (improvements in materials, quality of indoor air, recyclable materials), the allocation of space (proximity of services) and how to make the most of urban cultural heritage were all at the centre of the discussions.



Electric cars: low on fuel, silent, and kind to the urban environment.

The technique of cleaning historical buildings by laser, for example, makes it possible to remove the dirt without causing the least damage to the monument itself, whatever its state of conservation or fragility. The 250 statues and 500 consoles which adorn Brussels' Grand' Place are at present being cleaned using the Lama laser, making this the first major site to use this innovation supported by Brite-EuRam. The development of this simple, sturdy and reliable device, designed for on-site use and with a laser beam carried by optical fibre, has allowed this technology to become both very accessible and highly competitive. The cost of cleaning is 10 times lower than using traditional micro sand blasting or chemical processes. Historic monuments aside, a European technology transfer project could also lead to new applications of the Lama laser in the field of industrial cleaning.

The Airbus A3XX, the largest and most economical aircraft in the world.



The factory of the future : new technologies, new skills, a new method of organisation.

The factory of the future

In what way will the factory of the future be different from the factory of today? Essentially by combining the needs of competitiveness and sustainability. The new products and processes will be those which minimise emissions and waste, while saving on raw materials and energy. There will be a constant concern to incorporate new technologies and intelligent systems. One example of these benefits of the future was presented in Toulouse: a climbing robot, fitted with pneumatic suction feet and handling arms, able to carry a weight of 50 kg and travel over any kind of surface, in order to carry out inspections in a hazardous environment for example.

Thanks to the new technologies, the very nature of factory work demands new skills and is leading to the creation of new and much more attractive jobs, giving workers a greater sense of worth than jobs in traditional industry. In parallel, the factory of the future is also innovating in organisational terms. All the company's functions are now networked, a move which brings the need for new human skills, investment in material and other resources, and a favourable economic, political and regulatory environment. At the same time, control and standardisation bodies must also take account of consumer expectations.

Micro-engineering and production miniaturisation, simultaneous engineering and multidisciplinary design, simultaneous modelling, rapid prototyping, and intelligent manufacturing systems are just some of the elements in this new global approach which requires increased links between businesses.

Innovation and SMEs

A number of SMEs which have participated in Brite-EuRam projects or benefited from European technology stimulation measures (CRAFT) presented their innovations at this event. One such innovation was the new medical imaging device developed by Biospace, an SME founded by physics Nobel prize-winner, Georges Charpak. This device permits the detection of radioactive tracers (with a sensitivity between 100 and 1000 times greater than traditional systems) for applications in nuclear medicine, such as the identification of brain tumours and real-time observation of the heart.

The aviation stakes

Europe's aviation industry is facing a serious problem of competition posed by mergers taking place in the United States. Since McDonnell-Douglas was taken over by Boeing, Europe's six manufacturers of civilian aircraft have had to compete with a US giant commanding 70% of the market. The industry must therefore restructure and some are even calling for the creation of a single European aviation giant. In terms of the market, demand over the next 20 years should be close to 14,000 aircraft, for an estimated value of ECU 1,000 billion. In terms of R&D, the aviation industry will have to deal with an expected doubling of air traffic over the next 20 years. For that, Europe must modernise and unify its air traffic control systems. One of the responses by Europe's aviation industry is the Airbus A3XX project. With a capacity of

555 passengers, this will be larger and more economical than any other aircraft flying today.

The deregulation of an increasingly competitive air transport also means that manufacturers and airlines must work more closely together, and be quicker and more effective in responding to passenger expectations in terms of safety and comfort (e.g. high-technology seats, interactive leisure activities, and on-board telecommunications). For example, the European Asanca project has succeeded in developing a device which, by emitting a sound 180° out of phase with that of the engines, permits a significant (up to 60 dB) reduction in cabin noise.

Finally, aviation R&D is also concerned with the environment (fuel with reduced emissions, reduction of noise disturbance in the vicinity of airports, etc.) and the quality of passenger infrastructures (accessibility and ease of use of terminals, city-airport transport, transfer from one form of transport to another, etc.). ■

Listening to industry

The Toulouse conference was an opportunity for the European Commission to hear what Europe's manufacturers are expecting from the Fifth Framework Programme. We discuss this with Hervé Pero, DG XII's adviser on industrial technologies and one of the event's principal organisers.

What was the significance of the dialogue at the Toulouse conference?

Hervé Pero : The Commission has direct contacts on a daily basis with many researchers and manufacturers when launching and implementing projects. More specifically, in-depth working sessions - three brainstorming sessions of this kind have been held over the past year - are being held in order to prepare the Fifth Framework Programme. But the Toulouse meeting permitted an open and deliberately informal consultation during which researchers, manufacturers, and also other specialists in the three fields making up the sub-themes of the conference, were able to express their expectations and discuss their opinions. An industrial dynamic to develop products, processes and markets requires an involvement on the part of all those involved.

What is the situation as regards the involvement of SMEs?

Overall participation in Brite-EuRam projects is split pretty well equally between major companies, SMEs, universities and non-university researchers. SMEs therefore account for one half of the industrial participation. In addition, 15% of the Brite-EuRam budget is specifically devoted to CRAFT projects, a tailor-made formula for SMEs. We know that the problems of SMEs are logistic - they are short of time, money, experience and international contacts. Our actions are designed to help them build up their skills, promote an innovation culture, and allow them access to international markets.
In the Fifth Framework Programme we are going to step up technology demonstration and validation measures for their benefit. In order for SMEs to benefit from the results of research, by increasing technology transfers, we must also create networks of technological excellence which must be increasingly organised on a regional basis, offering a point of contact which is close at hand and able to provide businesses with the right answers.

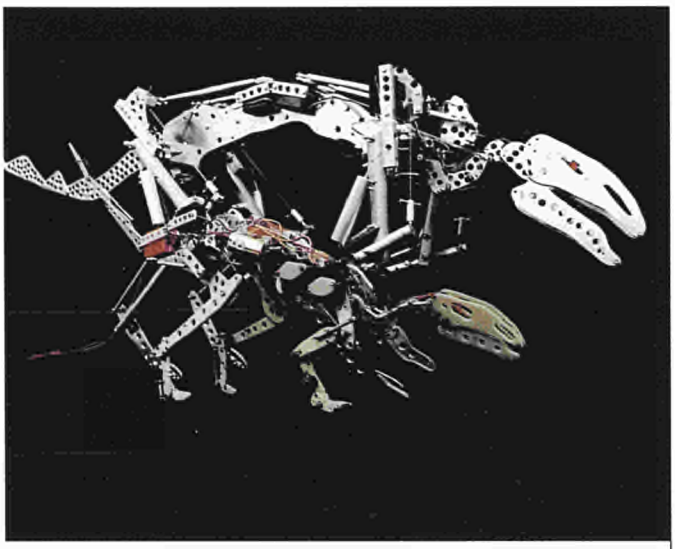
There was a lot of talk over these three days of the new dimensions which the notion of competitiveness must encompass. In this context, should not pre-competition, which is the province of Community research, also evolve?

Pre-competitiveness can correspond to a risk-related notion; pre-competitive research presents a risk which manufacturers would not take without public aid. Nevertheless, the European Commission frequently supports projects which are close to the development stage and for which this risk aspect is less in evidence. It would therefore be preferable, for certain key actions, to refer to the definition - which I believe is more concrete - of pre-competitiveness as being "any research on which competitors agree to cooperate". This is what happens between European aircraft manufacturers when they cooperate on the development of new generation aircraft. Each company subsequently manages its own skills and develops its own products. ■

One robot may hide another

A dinosaur strolling through the Natural Science Museum in Brussels. This unique presentation concluded the first stage of a robotics and cybernetics challenge bringing together the 22 partners in the Palaiomation project. It is a step along the road to creating autonomous robots able to move across devastated and dangerous terrain.

There is nothing cranky about this original prototype. Natural history museums and theme parks - growing in both number and the crowds they attract world-wide - are a prime outlet for new technologies. The United States and Japan dominate the automaton market and are hard at work developing a range of systems based on hydropneumatic technologies, but with very limited performances. The Palaiomation project, on the other hand, sought to draw on a range of hyper-advanced technologies in the field of mechatronics, remote control, and data processing, in order subsequently to achieve a more fundamental goal. The four laboratories (1) which came together within the EARLR (European Association for Research in Legged Robot) and 18 other university and museographical partners successfully conducted this cooperative research (CRAFT) project under the Brite-EuRam programme for technology stimulation measures.



Mechatronics, remote control, and data processing have given birth to Palaiomation, an autonomous robot which heralds even more ambitious projects.

Palaeontology and microelectronics

The structures of the automaton, constructed in very light composite aluminium materials, were designed by CAD, faithfully reproducing the joints and muscular movements identified from fossilised dinosaur skeletons using a laser scanner specially designed for the project. Microprocessors control its movements by sending instructions to miniature electrical control systems, and it is fitted with visual and ultrasonic sensors guaranteeing complete autonomy. Finally, the skin which covers the dinosaur, designed in consultation with palaeontologists, follows the movements of its body, allowing for muscle movements. All of this was achieved at a competitive cost compared to traditional hydropneumatic replicas.

"The museum authorities were sceptical at first," explained Vassilios Papantoniou, manager of the R&D department at the Cybernetic Technology Lab (Brussels) and EARLR secretary. "But they changed their minds when they saw the result. This product, which can be transferred to other types of robot, makes for an interactive animation with a big impact on the general public."

Mine-clearing robots for dangerous terrain

But behind the feats of the Palaiomation lie other ambitions. "This iguanodon represents a technological demonstration stage. We needed this in order to generate some cash flow for a project whose development has been particularly long," continues the EARLR secretary. "This 'spin off' application is in a way a launching pad for gathering the necessary resources to pursue our fundamental objective."

This objective is to produce highly mobile, fully autonomous devices fitted with "legs" rather than wheels, able to move across totally unstructured surfaces, such as disaster areas, which are as dangerous as they are impassable, including minefields, the rubble left by an earthquake, and contaminated industrial sites. "In order to work in these dangerous environments you need 'agile' robots about 3.50 metres in length, with considerable ground clearance, and the ability to move at the same speed as a man, taking steps of about 60 centimetres."

These applications with a high added value, suitable for use in emergency situations, are inevitably very expensive and require a very high level of technology. In these cases the performance must be far superior to that of the iguanodon! ■

(1) The EARLR members are the Paris Robotics Laboratory, the PMA (Production engineering, Machine design and Automation) department of the KULeuven (Belgium), the Information Technology Institute of the University of Salford (United Kingdom) and the Cybernetic Technology Lab (Belgium).

An eye for gold

"High technology allows you to be competitive on world markets." This comment was made by a jewellery designer who, following initial research into the use of laser beams in the precious metals industry supported by the Brite-EuRam programme, went on to specialise in combining new technologies with traditional craft activities.

An internationally renowned designer, Maria Luisa Vitobello has been running DEFOP (Disegno E Fabbricazione Oggetti Preziosi), a craft SME in Milan, for almost 20 years. The objects she produces are notable for the use of a quite rare and very ancient process with its origins in Etruscan art: granulation. This delicate technique which requires the utmost dexterity makes it possible to create highly original pieces of jewellery. "When I started working for the major international brands interested in this technique, I realised that my company's production costs were highly prohibitive, the production capacity derisory, and its flexibility in response to customer demand totally inadequate," explains Maria Luisa Vitobello. "Too many designers and producers in our sector still fail to understand that the new technologies are necessary in order to adapt to the realities of the international market."

Granulation using laser technology.

From the artisanal to the industrial

An entrepreneur through and through, she consequently decided to call into question the traditional ways of working, and embarked on a veritable adventure in technological research. She inquired into the possibilities fast-developing laser techniques could offer for working in precious metals. Progressively, in association with her supplier of precious metals, Valcambi of Switzerland, she stimulated an interest in this idea on the part of the Italian Technological Research Centre, CNRSM [1], the German laser manufacturer Rofin Sinar, and a subsidiary of the Belgian group Siemens, which specialises in microelectronics. She was also the one who brought together all these partners to submit an application for funds to the European Brite-EuRam programme. The reply was positive and ECU 2 million was made available for the project start-up, to be coordinated by the CNRSM.

Three years later, this research, conducted in close cooperation between the user and the technology suppliers, succeeded in marketing a new multifunctional laser device able to cut and pierce precious metals, weld them without adding any external materials, and apply the techniques of granulation and decorative engraving. This system has many benefits compared to the previous mechanical processes: more precise cutting and thus reduced raw material losses, very high cutting speed, and a high-precision device which permits particularly fine geometric figures. Laser welding can also be automated for highly complex tasks and the laser technology makes the whole process exceptionally clean.

Adapting the technologies

The implementation and success of this project also gave Maria Luisa Vitobello some new ideas as she made the most of the sectoral meetings and seminars organised under the Brite-EuRam programme. With logistic support from the Innovation Relay Centre in Milan, FAST [2], in 1995 she raised the ECU 200,000 necessary for a CRAFT cooperative research project. This project brings together SMEs specialising in working with gold, silver and platinum from four countries (Italy, France, United Kingdom, the Netherlands) and the Dutch research institute TINO [3] which is charged with the project's technological development. Its aim is to transfer the arcoplasm welding techniques commonly used in the non-precious metals industry to the field of gold- and silver-working. A prototype, which should soon result in a marketable device, was unveiled in March 1997.

"I am increasingly excited by the impact which technology can have in our professions," explains Maria Luisa Vitobello, who sees herself more as a consultant than a goldsmith and who is a firm believer in "transnational and cross-sector cooperation." ■

(1) Centro Nazionale per la Ricerca sui Materiali, Brindisi
(2) Federazione delle Associazioni Scientifiche e Tecniche
(3) Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek

Contact Maria Luisa Vitobello, DEFOP
Fax : + 39 2 55301118
E-mail : alethna@iol.it

Better targeting of "technology followers"

Tens of thousands of high-technology SMEs (Small and Medium-sized Enterprises) participate in the RTD programmes. But the EU's Economic and Social Committee believes that further encouragement is needed for some 1.5 million SMEs with a latent potential for innovation.

More than 99.8% of European businesses are SMEs - that's about 15 million in all. They provide two-thirds of the jobs and represent two-thirds of the economic activity in the European Union. But it's a diverse group, ranging from artisan bakers to software developers.

Three out of five companies participating in Community RTD programmes are SMEs. This represents a figure of some tens of thousands of businesses, but no more than a minute percentage of SMEs as a whole. The Economic and Social Committee (ESC) believes this is too limited an "elite". Consequently, it suggests that technology stimulation measures aimed at SMEs (exploratory awards, cooperative research) should be better targeted at a group of companies which it identifies as the *technology followers*, i.e. those without their own RTD facilities.

A reservoir of innovation and jobs

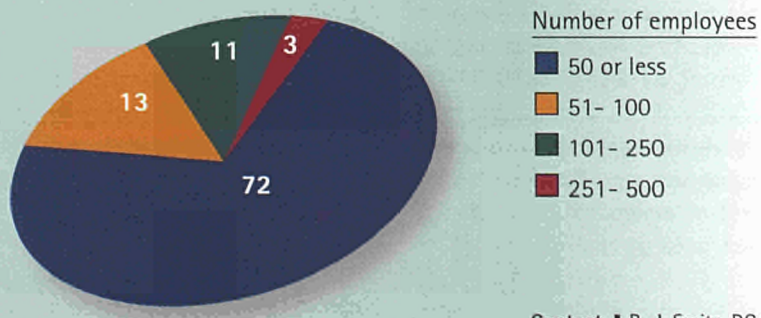
As dynamic members of their sector, the *technology followers* concentrate on new products and processes. But without external support, they lack the resources to undertake the RTD required to innovate themselves. The ESC estimates that some 10% of all SMEs - which means about 1.5 million businesses - are in precisely this situation and thus represent a valuable reservoir of growth and job creation. In addition to strengthening measures of the CRAFT type, as planned under the Fifth Framework Programme, the ESC also proposes launching a "Eureka" programme for cooperative research, creating a specific strand of the Training and Mobility of Researchers programme making it possible for engineers and researchers to spend time working at these SMEs, opening up specific possibilities for their access to the structural funds and financial instruments supporting European joint ventures, simplifying administrative procedures for them, and providing them with legal assistance.

Contact | Henri Malosse, ESC
Fax : +32-2-513.48.93

Report on the "exploratory awards" granted to SMEs

Exploratory awards were set up under the Fourth Framework Programme in order to help SMEs to fund the costs (e.g. feasibility study, search for partners) of preparing a joint or cooperative research proposal in response to the calls for proposals launched under the various specific programmes. As the Fourth Framework Programme nears its end, the open call for applications for such aid has now closed. A total of 1,258 awards have been granted to 2,756 SMEs, 72% of which employed fewer than 50 people and 75% of which had never participated in European research projects. About 20% of these beneficiaries are active in the traditional sectors (agro-industry, construction, mines, textile, wood, etc.). An initial analysis indicates that this award allowed many SMEs to submit collaborative and cooperative research proposals or projects, which were subsequently approved for funding.

Size of SMEs obtaining Exploratory Awards



Contact | R.-J. Smits, DG XII,
Fax +32-2-295.43.61

Serving research and society

The JRC has a number of experimental facilities which are unique in Europe, devoted to developments at the very highest level. In this article we take a closer look at the Petten reactor and the Ispra cyclotron, two installations whose applications relate in particular to the latest developments in nuclear medicine.

More than 6 million treatments, diagnoses, and therapies are carried out every year in nuclear medicine departments world-wide, using material supplied by the Institute for Advanced Materials' (IAM) High Flux Reactor located at the European Commission's Joint Research Centre in Petten, the Netherlands. Designed for research into fusion and nuclear fission, more than a third of the capacity is devoted to radioisotope production, making the Petten JRC Europe's leading radioisotope producer. The "raw material" of nuclear medicine, radioisotopes are particularly effective therapeutic agents (permitting a precise targeting of the tissues to be treated) and very precise instruments of diagnosis.

The cyclotron MC-40, one of the most efficient devices employed by the Institute for Advanced Materials at the Ispra JRC.

From fusion to nuclear medicine

Radioisotope production has become one of the major sources of financing for the High Flux Reactor (HFR), and the contracts signed with a number of pharmaceutical companies generate an annual income of several million ECU. One indication of this increasingly close synergy with industry is the presence, at the Petten site, of a firm specialising in the field of molybdenum-based radioisotopes used as instruments of diagnosis.

"The HFR is also one of the tools in an international project based on a form of radiotherapy practised in just a few centres world-wide. It is a technique based on the capture of neutrons in boron (BNCT - Boron Neutron Capture Therapy) and which is aimed at the selective destruction of malignant cells," explains Raymond Moss, the IAM's scientific manager. "This therapy is still at the testing stage for the treatment of multiform gliobastoma, a very aggressive form of brain cancer which shows little response to traditional treatment."

This European project, the result of 10 years of research, has now entered phase one of clinical trials during which some 40 patients, who have undergone surgery in their own country, will come to the Netherlands to follow a course of radiotherapy. This international medical cooperation could pave the way for the clinical use of this type of equipment at the European level.

Conversion of a cyclotron

The world of medicine is also benefiting from another of the high power devices at the JRC. At the IAM's other site in Ispra, Italy, the "converted" MC-40 cyclotron resembles that of the HFR. As the cyclotron's manager, Marinus Stroosnijder, explained, "The cyclotron, at first dedicated 95% to the Fusion programme, was nearly shut down a few years ago due to lack of funds. But in 1994 we embarked on a new line of research and obtained industrial, biomedical and environmental applications which now provide 85% of our resources."

The cyclotron is now Southern Europe's and North Africa's sole supplier of the iodine isotope I-123, with a maximum half-life of 13 hours. "This radioisotope, used in diagnostics, is very effective as a result of this short half-life which allows us to inject patients with lower doses," continued Marinus Stroosnijder. "The success of this activity is linked to regular, high-quality production, and to logistical considerations such as rapid transportation to hospitals."

In an altogether different field, the cyclotron is also used in materials deterioration studies - one of the IAM's specialities. The technique used, TLA (Thin Layer Activation), permits a very precise measurement of the wear and corrosion of various types of surfaces and is at present the subject of a partnership with the automobile industry.

Although the cyclotron has now found commercial outlets, the cyclotron's manager remains very careful to ensure a balance between all these activities: "We want to fulfil our mission of serving research and society." ■

Contacts | Petten: Raymond L. Moss
Fax : +31 224 561419
Ispra: Marinus Stroosnijder
Fax : +39 332 78 9385

Drug abuse: the need for scientific cooperation

A conference workshop in Zürich (December) formally concluded a five-year COST interdisciplinary research initiative on drug abuse co-funded by the European Commission. What were the issues? What was achieved? And what lies ahead?

The devastating effects of drug abuse are of global concern. Since the end of the eighties the European Union has received a clear mandate in coordinating the efforts of the Member States, to develop common policies to confront this huge problem facing society. One very important aspect is to assess its complexity and to highlight and share the best European answers. This was the objective of an original COST R&D coordination action A-6, launched in 1993 with the support of fifteen COST Member States and the European Commission.

"In the five working groups set up to organise the different topics of research, the aim has been to evaluate existing national and institutional research methodologies and to identify how these could be integrated at the pan-European level," explains Professor Ambros Uchtenhagen, director of the Institut für Suchtforschung (Zürich) who chaired this action programme. "The cooperative, bottom-up approach intrinsic to COST proved an invaluable point of departure."

From prevention to treatment

Three groups focused principally on policy and social aspects. They compared the structure and evolution of the various answers to the drug problem and the interaction - existing or potential - between national and international policies. Analysing the ways the different countries inform and educate the public (schoolchildren and parents in particular) as to the dangers implicit in drug consumption and dependence, the researchers identified a large body of preventive work in this area but also a dearth of relevant studies. One group was charged with the very sensitive task of evaluating action, pinpointing initiatives to counter 'open drug scenes' in urban areas and assessing the interaction between drug policies and drug-related crime.

The two other groups evaluated treatment approaches for drug-dependent persons. The researchers collated and updated inputs from healthcare professionals, administrators and researchers in a bid to establish common denominators and pinpoint psychosocial and pharmacological responses.

An important step for cross-frontier responses

Coordinated research and networking under COST A-6 involved an ongoing series of workshops, seminars and demonstration projects, together with numerous publications. The Action also spawned new multi-country research projects in the fields of epidemiological and clinical study, improved psychiatric treatment for relapse prevention and evaluation in primary prevention. "Over the longer term", says Professor Uchtenhagen, "the principal achievement of COST A-6 (1) lies also in its ability to link concerned professionals from so many countries to share hands-on expertise in the quest for effective cross-frontier responses."

"The ability to link concerned professionals from so many countries to share hands-on expertise in the quest for effective cross-frontier responses."

Although COST A-6 formally expires after the December 1997 conference in Zürich, provision has been made for the continuation of its work by the EMCDDA, which intends to build on the pathfinding contribution made by this 5-year scientific coordination towards eliminating one of the most insidious threats to the fabric of European society. ■

(1) COST A-6 includes participants from fifteen COST Member States, the United Nations Drug Control Program, the World Health Organisation, the Council of Europe (Pompidou Group), the European Association on Substance Abuse Research, and several other European professional associations active in the field. Close links were also forged with the scientific journal *European Addiction Research*, which regularly featured updates on the COST A-6 action.

Contact | Gudrun Maass - DG XII
E-mail : gudrun.maass@dg12.cec.be

Tools for treating drug addiction

This work was complemented by development of instruments for use in treatment evaluation. The principal focus was on the description of treatment needs and services, based on a review of existing approaches and on their applicability in international comparative research. The result was an adaptation of an "Addiction Severity Index" to the European context (EuropASI), detailing descriptions of drug-abusing patients and their problems when entering treatment and of their evolution during and after treatment. The group also worked closely with the European Monitoring Centre on Drugs and Drug Addiction (EMCDDA) to prepare a modular instrument for treatment services.

CG-AB-97-003-EN-C

Bacillus subtilis decoded

A European research project has just finished the complete sequencing of the 4.2 million bases of this bacterium, which is of major scientific and industrial importance. This result, made possible thanks to support from the Biotechnology programme, brings the prospect of a whole new generation of antibiotics.

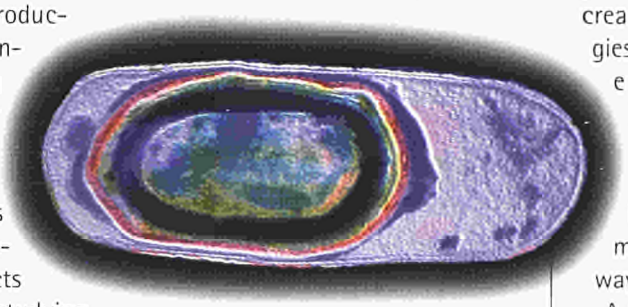
Measuring just a few thousandths of a millimetre in length, *Bacillus subtilis* is totally harmless to man and has in fact long rendered him invaluable services. Its ability to grow *in vitro* and to produce abundant quantities of enzymatic substances is widely used by the food industry, detergent manufacturers and some textile industries. It is an important source for the production of amylase and protease enzymes (the former breaking down starch into simpler carbon chains and the latter hydrolysing proteins).

For the medical world, this harmless microbe which produces proteins with antibiotic effects provides a valuable model for studying very similar pathogenic bacteria such as *B. anthracis* (which causes anthrax, a suppurative and very painful inflammation of the skin) and *B. cereus* (which causes food poisoning). Finally, *B. subtilis* is used as a vector for cell cloning in molecular biology laboratories.

International mobilisation

In many respects this micro-organism is therefore something of a godsend for bio-industrial RTD. When geneticists first embarked on the enterprise of fully decoding certain genomes, about a decade ago, *B. subtilis* was soon identified as a prime candidate.

In 1990, the idea of conducting research into this bacillus took a step closer to becoming a reality when the European Commission agreed to finance a feasibility study. The five laboratories initially working on the project were joined by twenty-three European teams. The two king-pins behind the project, Frank Kunst and Antoine Danchin of the Institut Pasteur, coordinated these research activities for which the Commission provided around ECU 4.9 million in funding under the Biotech 1 and 2 programmes. Valuable assistance also came from Japan where seven research teams carried out some 30% of the decoding. Swiss scientists, two US laboratories and a Korean laboratory were also brought on board. A total of nearly 150 researchers ultimately succeeded in identifying the 4.2 million bases which make up the bacterium's total genome.



Bacillus subtilis at the spore production stage. The oval structure in the centre is the spore, a resistant form of the bacterium.
© Institut Pasteur

Excellent prospects for genetic engineering

All the scientific and industrial applications of *B. subtilis* have previously been based on the trial and error of experimentation. This complete sequencing of its genome will make it possible to identify and understand the action of the some 4,000 coding genes which control the bacterium's functions. "We are now about to enter a new and exciting field of research which is also going to require a great deal of time and effort, because this new stage of gene identification is extremely complex," stresses Frank Kunst. "But, at the end of the day, *B. subtilis* could offer new and particularly interesting possibilities for genetic engineering."

Very promising results have already been achieved in identifying certain genes serving as targets for new therapeutic strategies or determining the production of proteins with antibiotic properties. In this way the bacteria could provide a source of new drugs to replace present antibiotics which are being increasingly resisted by certain pathologies or proving ineffective in combating emerging diseases. The genetic knowledge obtained through research into *B. subtilis* could also improve our knowledge of various illnesses caused by other related micro-organisms and thus pave the way for new forms of treatment.

A group of 16 European laboratories has recently received further funding of ECU 2 million from the Biotech programme in order to conduct a functional analysis of the sequencing results obtained with *B. subtilis*.

The industrial and commercial implications of the research conducted to date is also mobilising a number of European pharmaceutical and biotechnological companies. Nine of them (1) got together in 1994 to set up an "industrial platform" (2) which, together with researchers, is looking at the possibility of patent registration prior to product development.

(1) The platform consists of scientific representatives from Gist Brocades (NL), Glaxo Wellcome (UK), Novo Nordisk (DK), Frimond (B), Hoechst Marion Roussel (F, D), SmithKline Beecham (UK), Dupont de Nemours (F, USA), Genencor (FI, USA) and Hoffmann-La Roche AG (CH).
(2) For further information : http://europa.eu.int/comm/dg12/biotech/ip1.html

Contact Stéphane Hogan, DG XII
Fax : +32-2-299.18.60
E-mail : stephane.hogan@dg12.cec.be