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Magazine for European research

September 99

Young researchers

## The "grandchildren" of Marie Curie



Combating drug abuse in sports

European research is committed to the cause



Development cooperation

When parasites decimate the livestock



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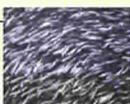
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## Editorial Information

RTD Info is published by the Communication Unit of DG XII.

**Head of Unit:** Jürgen Rosenbaum

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](mailto:michel.claessens@dg12.cec.be)

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

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

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The initial calls for proposals have just closed and the project selection stage has begun. The Fifth Framework Programme is therefore entering its active stage and the Union's new research policy with its increased focus on the needs of society can now take concrete shape.

This programme occupies a unique place in Europe's - if not the world's - scientific and technological landscape. There is no other initiative on this scale, which has chosen to combat through research the vital problems facing Europe and the world today. As science and technology transform society, so society is entitled to influence the course and priorities of research. The Fifth Framework Programme is entirely based on this principle with, among others things, an emphasis on socio-economic objectives, job creation, sustainable development and consideration for major ethical issues.

It is also the first time that 10 Eastern European countries and Cyprus have been able to participate in the framework programme as equal partners alongside the Member States.

In order to explain these new emphases to its research partners the Commission had to radically reorganise its services (each thematic programme at DG XII is now managed by a team of three directors, for example) and launch a major communication drive: the Essen conference, electronic information, project proposer's guide, etc. RTD Info is now making its own modest contribution to this campaign. By giving a higher profile to project results and presenting concise, understandable information on the major themes of European research policy and its results, it is helping to bring Community programmes closer to the people. The fact that RTD Info has doubled its readership over the past two years (there are now more than 500,000 of you) would seem to indicate an interest in this initiative. Our hope is that this interest will be even further boosted by the new spirit driving European research.



# The "grandchildren" of Marie Curie



## Young researchers?

*They are the valuable human capital which Europe intends to provide with the necessary resources to continue its tradition of scientific excellence. Increasingly substantial resources at that, as under the Fifth Framework Programme the Union intends to allocate almost a billion euros in order to promote their training - training in research and through research, based on mobility. The Marie Curie fellowships, already available under previous programmes, are now better targeted in order to promote "made-to-measure" training at European laboratories, encourage mobility for the most experienced, strengthen links between universities and companies, and encourage the scientific and technological potential of Europe's less advanced regions.*

*In the course of the following pages the "grandchildren of Marie Curie" will relate their experiences, while Achilleas Mitsos - director of the Human Potential programme and one of the architects of this strengthened policy for young researchers - explains the underlying philosophy. To conclude, we briefly review the new opportunities now available.*

## New generation of thinkers

*A German doctor carrying out research into immunology in a Greek laboratory, a French environment specialist at York University, a Swedish geologist studying the formation of the Himalayas in Oxford, a British physicist immersed in the field of nanotechnology in Sweden, and an Italian investigating fuzzy logic in Belgium. What do they have in common? Youth. Passion. The Marie Curie label.*

**R**esearch did not wait for Europe to become international, and nor did the laboratories wait to become multicultural. But it is thanks to Europe that the new generation of scientists can work outside their national borders. They are young (around 30 years of age) and have carefully chosen the research sites where

they will complete their training through research. Their projects were rigorously selected by a panel of experts and have been allocated Union support. They are all members of the "Marie Curie" family which today represents a European label of scientific quality.



*Water management policies must take into account the interaction between the activities that are dependent on it. In the Camargue, rice irrigation has a marked influence on the hydrological system and major implications for stock farming and hunting*

## Laure, environmental economist, Rennes-York

Laure Ledoux, 28, an agricultural engineer from the *Ecole Nationale Supérieure Agronomique de Rennes*, currently holds a research post at the CSERGE (Centre for Social and Economic Research on the Global Environment) at the University of East Anglia, at the same time as completing her doctorate at the University of York. Her thesis is on the development of an integrated economic and ecological model for water cycle management in the Mediterranean wetlands of the Camargue. "I had the option of a grant to start a thesis in France, but the scientific team best equipped to support me was in the United Kingdom. But English grants are not open to pre-docs from other European countries and this French financing did not allow me to study abroad."

In 1997, thanks to a Marie Curie fellowship under the Environment and Climate programme, Laure started to work at the University of York. "I was able to benefit from the experience of the host team and found it a very motivating working environment which permitted some very rewarding scientific exchanges." Laure is currently with a multidisciplinary team at the CSERGE where she is studying policies of benefit to conserving biodiversity. "The experience and contacts which resulted from this fellowship had a direct influence on the speed with which I was able to find a research post at one of Europe's most recognized centres for environmental economics - even before I have finished my thesis."

### Select sites

They have all had the opportunity to develop their knowledge in a scientific context appropriate to their research - and which they could not have found in their own country. This transnational training will surely prove to be one of the most significant "added values" that Europe can give to its future scientific elite.

Raffaella Bucefalo Palliani, doctor of geology from the University of Perugia (I), benefited from a Marie Curie fellowship in order to specialise in palynology - the study of pollen fossils - and more specifically the field of dinoflagellates. "This was a relatively new discipline in Italy and I needed the support of a specialised team and well-equipped laboratory. I was able to work with the best Jurassic paleopalynologist in Europe, Jim Riding of the British Geological Survey in Nottingham. The experience of my supervisor was essential to the final success of my project. It was thanks to the international contacts he opened up that I was able to collaborate with top-level scientists."

### Limited funds for the chosen few

This European "elite" also know that the competition is fierce, the opportunities few, the selection rigorous and the future uncertain. Fewer than 30% of fellowship applications submitted to the Commission by young researchers during the Fourth Framework Programme (1994-1998) were accepted. "Researchers are always chasing grants," explains Muriel de la Fargue, a French physicist completing her doctorate at Manchester University. A case of too few international and national credits, too little attention paid to fundamental research, and inequalities between European countries which is reflected in uneven support available to scientists.

*"Differences in research structures in the different countries are one of the elements which weaken Europe. This provides even more justification for the existence of Marie Curie fellowships."  
(Frauke Klingelhofer, geophysicist).*

"Europe does not yet invest sufficiently in research. An initiative to promote research such as the Marie Curie fellowships is very important and it has significantly reduced the "brain-drain" to the United States," believes Edy Bertolissi, an Italian temporarily attached to the IRIDIA (Brussels) where he is pursuing his investigations into fuzzy logic. Jose Pascual, doctor of biology, who has returned to his "base" at the CEBAS-CSIC public research institute in Murcia (E) after a period at Surrey University (UK), sees this action as making it possible to "boost Europe's scientific quality as researchers from different countries are able to interact, share their know-how and help build a stronger European scientific community."

This benefit is also felt by the scientists who welcome the young researchers. Louis Geli, of the Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), is convinced that "Frauke Klingelhofer made a crucial contribution. Without her, I would never have been able to publish the data obtained a few years ago and which





remained unexploited as the right person with the right skills was not available at the right time. Her presence at Brest also certainly helped the cooperation we set up with Geomar, the oceanographic institute based in Kiel, which is where she did her thesis."

### Cultural diversity

So is the wealth of Europe's scientific culture founded - as is its culture in the original meaning of the term - in part on its diversity? "Even inside Europe, there are different 'schools' in different countries, depending on the disciplines," believes Jacques Malavieille, director of the Laboratoire Géophysique et Tectonique at the Montpellier Institute, which is currently host to its second Marie Curie post-doc, Marc-André Gutscher. "The principal contribution of a young researcher from abroad lies in the fact that he has acquired an experience and working methods in other teams which do not generally have the same approach to problems."

This invigorating diversity also extends beyond the frontiers of a continent. "We have around 25 post-docs in our department and half of them are not British. Many of them are from countries outside the European Union and from other continents," notes Charles Perrings, professor of economics and environmental management at York University. "They all make a very interesting contribution and contacts with scientists who worked on their thesis here often give rise to very rewarding research relations."

Whether trans-European or transcontinental, science is clearly international. Christian Bourdillon, a professor at the Laboratoire de Technologie enzymatique at the Université de Technologie de Compiègne (F) - who is pleased to include a Spanish biologist, Antonio Lopez de Lacey, in his team - makes a very pragmatic analysis: "I do not see any fundamental difference, at the scientific level, between cooperation with a European colleague or an American one, for example. On the other hand, collaborating with a European strengthens Europe's sci-

entific potential whereas collaborating with an American increases US dominance."

### Living abroad

The rewards for those who set off to pursue research in other countries often extend beyond the limits of their scientific activities alone. One important motivation is clearly the opportunity to perfect another language. This is perhaps one of the reasons why we find that the United Kingdom is the most popular destination (48% of pre-docs and 32% of post-docs under the Fourth Framework Programme), followed by France (20% and 22%). "I wanted to perfect my French and this fellowship was the chance," explains Frauke Klingelhofer, doctor of geophysics from Kiel University and currently at the IFREMER in Brest. At the per-

sonal level, this stay in France allowed her to compare not only the research system but also school and pre-school infrastructures in the two countries (much better in France, in the opinion of this mother of two). In France, where you can often obtain your doctorate by the age of 30, there are a number of permanent positions open to young scientists (researcher at the CNRS, assistant professor), despite the fierce competition. In Germany, although more funding is available for pre-doctorate and post-doctorate research, there are virtually no permanent research positions below the level of professor. "These differences in structure, which clearly do not exist within the United States, are another factor which weakens European research. This further justifies the existence of the Marie Curie fellowships."



## Roberto, geologist, Uppsala-Oxford



A Swedish geologist, lecturer and researcher at the University of Uppsala, Roberto Weinberg is a specialist in the study of granitic magma. He was able to pursue his work on the development of the tectonic processes in the Himalayas and Tibetan plateau in the company of some of the best experts in the field - at Oxford University's Department of Earth Sciences, where he spent two years.

"In the study of the earth, Europe comes second after the United States. But it could be first, given its scientific tradition, its extensive geological knowledge of the earth's various environments, and its creativity."

Roberto sees the principle weakness of European research as being a lack of funding, combined with "the technocratic attitude of the public authorities which exercise an increasing and pernicious control as part of their utilitarian view. Researchers waste time on trying to raise funds and with the constant assessments. The lecture theatres are overcrowded and it is difficult to maintain standards for the libraries and technological equipment. The first priority for universities should be to create areas where ideas are given free rein. Rather than always counting on short-term results."



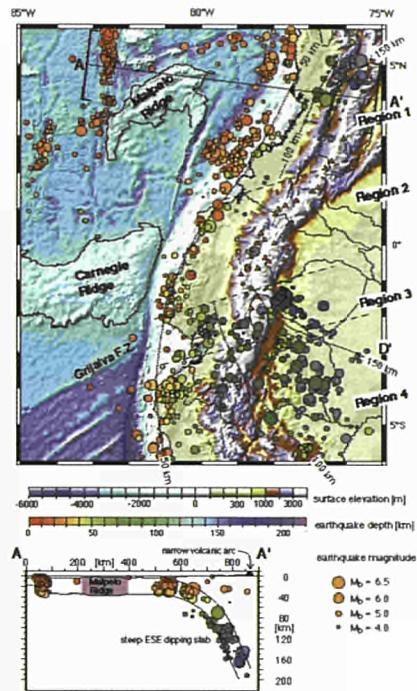
*This rocky cliff presents a "snapshot" of the process - spread over several million years - during which granitic lava (white rocks) penetrated the earth's crust as a result of the pressure created by the collision of the Indian and Eurasian continental shelves*



## Marc-André, geophysicist, Kiel-Montpellier

Marc-André Gutscher was born in the United States (to a German father and French mother). After studying in the States he spent eight years as a researcher at the Goemar Institute in Kiel. A doctor of geophysics, he could have taken a post-doc at Princeton University, but he chose to pursue his studies at the *Laboratoire de Géophysique et Tectonique* at the Montpellier Institute, joining the team of scientists with whom he first came into contact when working on his thesis. He has therefore been able to form an impression of research and scientific culture on both sides of the Atlantic.

"Perhaps the biggest difference between the Anglo-Saxon world and continental Europe lies in the mentality and scientific culture. In the United States you learn back in high school to question what the teacher says and to debate. Even young students are treated as equals at a certain level by their teachers. In the European countries I know - Germany and France - there is much more hierarchy and it is much more difficult to question an idea if it comes from a superior. A university professor would be reluctant to take seriously the comments of a simple pre-doc or even post-doc."



*Topographical and bathymetric map of the Pacific Coast of Colombia and Ecuador showing the seismic activity in the region between 1964 and 1995.*

## Duncan, physicist, Bristol-Gothenburg



At the age of 18, Duncan Sutherland, who was about to start his university studies in physics, attended a summer course at the Weizmann Institute in Israel. At the age of 22, while studying for his doctorate, he took the opportunity of exchange schemes between Japan and the UK to spend three months working at the Showa Denko company in Tokyo. He then went to Sweden, thanks to a British grant, where he decided to remain to take a post-doc (at Chalmers University of Technology, Gothenburg) under the aegis of Marie Curie. His field is nanotechnology.

"I chose this department on the basis of the quality of its researchers' publications and I believe I am working at the best centre in Europe in this field. I would have had to go to the United States or Japan, or perhaps Switzerland, to find an equivalent level of scientific experience. I would not have had the same opportunities in the United Kingdom."

Living 500 km from Stockholm is not a problem for this nomad who spent his childhood living all over the world. A post-doc researcher and teacher working in a team with 12 nationalities, at the age of 29 Duncan Sutherland seems to be on the right path. A path which has taken him to the North and during which he has lost none of his British humour. "I have married a Swedish girl, I have had the chance to learn a Scandinavian language - while regressing in my mother tongue - and my volley ball has improved considerably."



*Image of gold zones measuring 100 nanometers in diameter on a layer of titanium oxide of 8 mm thickness, produced by colloidal lithography.*

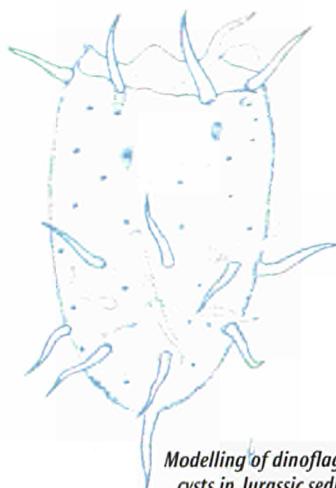


The experience of living and working abroad clearly gives you a different perspective on the world. The vast majority of scientists who are welcomed by their peers to work on joint projects find it a very rewarding experience, both inside and outside the laboratory.

"This stay really opened up my mind by allowing me to discover another culture. I have become more tolerant - which is essential nowadays - and I feel even more European than I did before," (Muriel de la Fargue). "I learned to develop my personality in a new culture," (Jose Pascual). "I spent a lot of time with my supervisor and his family. They introduced me to their friends and allowed me to discover the culture and society of the Nottingham area. As soon as I had made enough progress in English, I was able to strike out on my own," (Raffaella Bucefalo Palliani).

### And after...

As to professional life, Raffaella returned to the Department of Earth Sciences at Perugia University where she is now studying for a post-doc in a very special field



*Modelling of dinoflagellate cysts in Jurassic sediments (research on palynology by Raffaella Bucefalo Palliani).*



where fundamental research meets the interests of industry: "micropaleontological methods are used by the oil industries, in particular in geological explorations to discover hydrocarbon reserves, and the sediment of the Jurassic system is of very great economic importance". Jose Pascual returned to the CEBAS-CSIC in Murcia where he is now a researcher. Still unravelling the mysteries of the earth's crust, Roberto Weinberg is currently in Brazil where he is working on a project set up by Uppsala University (where he teaches) and Pernambuco University.

Although these have all returned to their country of origin, a Marie Curie fellowship does not always lead to certainties, even if you do return the wiser from your experiences. Laure Ledoux, president of the Marie Curie Association (see box p.10), has a lot of faith in the relations which can be established, through this association, between young researchers and Marie Curie fellows, the former being able to help the latter find professional opportunities.

The profession of researcher is anything but safe and secure. Marc-André Gutscher and Frauke Klingelhoefer would like to stay in France but their "Marie Curie" ends in six months. Marc-André was to have participated in an oceanography mission which has been postponed for a year - and where will he be in a year?

Catherine Mériaux, who is also drawing close to the end of her fellowship at the DAMTP Institute of Theoretical Geophysics in Cambridge, is developing models of fluid dynamics applied to volcanology. She is

preparing to leave for Australia and to do a third post-doc after an unsuccessful application to the CNRS. A seasoned scientist such as Louis Géli is aware of an increasing trend towards this "nomadism" among researchers over recent years. "It is becoming increasingly difficult to employ young researchers (whether nationals or not) in permanent positions. We are seeing the birth of a new generation of travelling researchers - very brilliant and very well-trained post-docs - moving from post to post on 12-month contracts without being able to settle anywhere."

"When you have a very specific profile you often have no alternative but to continue at the laboratory where you did your thesis," points out Catherine. "I personally have the impression that the committees get cold feet when they are faced with an innovative project which they consider to be too risky. I believe fundamental research is stultified for this reason. In research you have to be able to assume the risk that a project may not succeed and for that your decisions must not be based on economic considerations alone. I believe that even a project which ends with so-called negative conclusions nevertheless contributes something - it at least shows that another path must be explored." ■

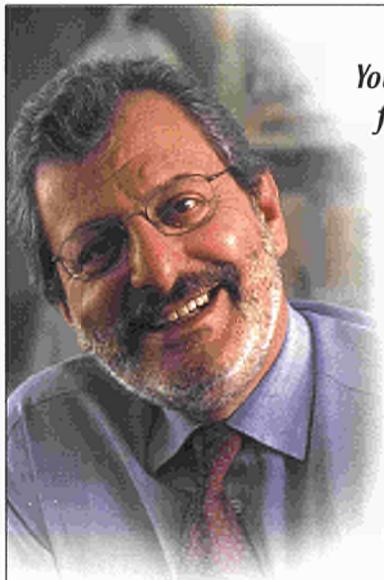


## Edy, electronics engineer, Padua-Brussels

"I wanted to pursue a career in research and to work in the field of intelligent control and fuzzy logic," explains Edy Bertolissi. It was on the Internet that this doctor of industrial automation from the University of Durham scrutinised the level of laboratories likely to accept him. He chose the IRIDIA (ULB/Brussels). "When I arrived I was immediately impressed by the level of the research on artificial intelligence being carried out here." As a member of their team, Edy Bertolissi is able to participate in the vast FAMIMO project, supported by the Esprit programme, which his laboratory coordinates. "The aim is to establish a common European area in order to develop new control systems using the principles of fuzzy logic. Two pilot experiments are being conducted in two totally separate fields: the treatment of waste water and the development of a direct injection system for automobile engines. By working on this project which involves other very high-level laboratories I am able to meet a lot of experts and visit other laboratories. I am always learning something new."



# Realising research potential



*Young researchers are a valuable resource and must be given the means to carry forward the European tradition of scientific excellence. Such is the thinking behind the granting of substantial EU support to help enrich the training of young researchers through mobility. We spoke with Achilleas Mitsos, director of the Human Potential programme and the architect of plans to strengthen and diversify this policy during preparations for the Fifth Framework Programme.*

[Achilleas Mitsos]

“ We want to help young researchers become genuine scientists – people motivated primarily by curiosity. ”

**E**U-funded research programmes are increasingly concerned with the “European added value” which can be given to young researchers, in particular by promoting their mobility. Why is this aspect considered to be so crucial?

**Achilleas Mitsos:** Because the future for any up-and-coming young researcher in a Member State today must necessarily be a European one. More than for his elders, if he is to realise his potential it must be in this wider context. When established scientists from different countries cooperate on a Community project they are being given the opportunity to exchange a know-how which was very often acquired at a time when the concept of a European added value was virtually unheard of. But today’s young researchers have no alternative but to work at a European level. The Human Potential programme wants to give substance to the idea of the Europeanisation of research which will leave its indelible mark on the next generation of scientists. Our aim is to prepare this elite who will bring dynamism to research over coming decades.

## **Personal objectives and fundamental research**

The strategy of the Fifth Framework Programme is explicitly targeted at providing an answer to the challenges facing society. But the Human Potential programme seems to be a haven where a “bottom-up” approach prevails. Young researchers are selected on the basis of the inherent value of their project, irrespective of the discipline.

This openness is a necessary condition when it comes to training scientists. We do not turn to young researchers in order to ask them to play the part of high-level consultants and to find a solution to a particular priority problem. By encouraging their mobility in the European knowledge community, we are seeking to help them become genuine scientists – individuals basically motivated by curiosity who want to ask and find answers to questions that have never been asked before – and to allow them to successfully pursue their own research.

**In this respect, is not the Human Potential programme a kind of port where you can come and anchor all kinds of fundamental research projects?**

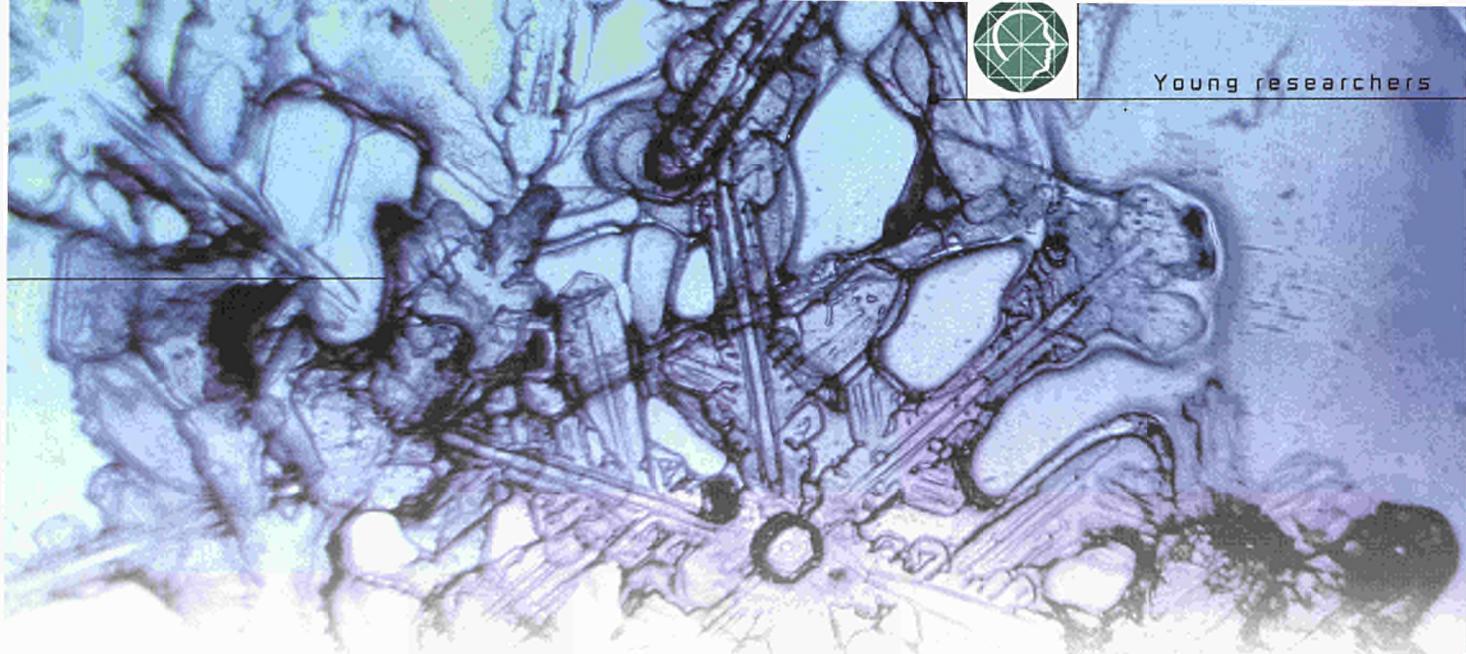
The other European research programmes also support fundamental research – now

brought together under the label of “generic research” – but they are limited by predefined priorities. The openness of the Human Potential programme allows it to welcome networks exploring specialised fields in mathematics, astrophysics and natural sciences, which do not meet the criteria imposed elsewhere. This is a very positive role as, sooner or later, the pure sciences often prove to be a fertile source of innovation and they too need a European dimension. That said, not everything can be reduced to this aspect and the programme is totally open to applied research.

## **Fellowships and networks**

The programme allows young scientists either to submit unsolicited applications for individual fellowships for periods of research in a scientific institution ready to accept them, in which case the grant is paid directly to them, or to be selected by host bodies working within a network. On what basis should the young researcher choose between these two formulas?

I should first like to stress that under the new programme individual fellowships are aimed at young researchers with the necessary research experience. They are generally post-docs or able to demonstrate at least



“ The pure sciences often prove a fertile source of innovation and they too need a European dimension. ”

four years' experience in full-time, post-university research. For these researchers it is often important to be able to work with a high-level individual or team which allows you to progress along a specialised personal path. Of course the assessment takes into account the candidate's qualities, the research subject and the host body.

The formula of host institutions, working within networks and of interest to mixed teams of researchers, is particularly suitable for research topics requiring interdisciplinarity, an increasingly essential element in contemporary science. These networks offer young researchers an interesting opportunity to work alongside specialists in their field, while at the same time incorporating their work in a number of different approaches. For the host bodies these young researchers often prove a valuable addition to their teams. The networks are open to researchers who have not yet completed their doctorate.

The new *Marie Curie training sites* formula is also addressed at students taking a doctorate. This is a complex and interesting initiative, a challenge in a way. For example, this would provide the opportunity for a Portuguese researcher working for a doctorate in the United Kingdom to spend an academic year in France. The French training site will not be a university, but a much smaller unit - a department, a laboratory, a team - which the Commission considers to be a centre of excellence and which is an accredited "Marie Curie training site". The

difficulty will, of course, be to select these centres of excellence as there will no doubt be many applicants.

### ***Regions and industry***

**The programme also introduces new opportunities to support researchers and research institutions in Europe's less-favoured regions, and also for "industrial fellowships".**

In regard to Europe's so-called less-favoured regions - as a Greek, I come from one of them - there is a need to get away from the idea that grant applicants or institutions based there will benefit from a kind of bonus. Such a policy, which could relegate the fundamental quality requirement to second place, is not the most appropriate support for European research. Throughout these regions there are excellent research centres which just need a little helping hand. Consequently, in addition to the return grant introduced earlier, the programme is now introducing "development

host fellowships" which are designed to allow the best scientific institutions in these countries to welcome researchers from abroad. A university seismological research unit located in a less-favoured region, for example, could benefit from the presence, for quite long periods, of the very best European experts in this field. Such an input can have a very positive multiplier effect for a team which possesses excellent know-how but is handicapped by its "regionalism" which puts it rather on the periphery of the major centres of scientific activity.

There is also a need to avoid this same "bonus" approach for industry fellowships. These were initiated under the Third Framework Programme and then abandoned because the ponderous selection process was a disappointment to companies. We are now relaunching this approach, still at a pilot stage, leaving a large measure of autonomy to companies to choose their fellows, while at the same time respecting the rules of the game - European call, mobility, objective selection, etc. It is too early to predict whether or not this will prove successful, but the interest shown by industry is certainly very encouraging. ■



# Fellowships and networks, the latest vintage

*"The right person in the right place." This is the strategy underlying the Marie Curie fellowships under the Fifth Framework Programme. We take a look at the new opportunities for the upcoming generation of young scientists.*

**W**e have drawn on the experience of previous programmes to widen the categories of fellowships while at the same time adapting them to more precisely targeted needs," explains Barry McSweeney, who is responsible for the Marie Curie fellowships under the Human Potential programme. 14,399 projects were assessed under the Fourth Framework Programme (1994-1998), 3,207 of them being selected for a Marie Curie fellowships. This number is now set to more than double.

With a budget of around a billion euros, the Union is considerably increasing its support for young researchers. The various fellowships are available under a number of thematic programmes, although most of them are offered by the Human Potential programme (400 million euros, compared with 270 million under the previous framework programme). This programme is responsible for coordinating all the Marie Curie fellowships which must respect the same rules (evaluation, financing, duration, etc.). The projects can be in any scientific discipline: proposals submitted in response to calls by the Human Potential programme can be in any field of research, whereas those under the thematic programmes must be within the particular field of action.

(1) In fact 3800 fellowship years will be available, but researchers will on average pursue their work over two years. The table on page 12 details the possibilities open to pre-docs and post-docs respectively.

## Dual approach

There are two principal categories of support for mobility and training: support granted in response to individual applications submitted by the researchers themselves, called individual fellowships, return fellowships and experienced researcher fellowships; and support granted to institutions that submit research projects open to young scientists, known as industry host fellowships, development host fellowships, and Marie Curie training site fellowships (see table p. 13).

"Most support is granted through **individual fellowships**, involving around 2,000 researchers.<sup>(1)</sup> In this category we wanted to favour those who already have experience. This is a means by which Europe can give

the opportunity for the future scientific elite to benefit from the excellence of its poles of research."

## Regions and companies

Another key word in the strategy of training through research is transfer. This has a dual dimension: the transfer of know-how and technology from the most successful regions to the less-favoured regions on the one hand, and transfers from industry to university and university to industry on the other.

Actions targeted at the less-favoured regions already existed under the previous framework programme in the form of **return fellowships**. These allow researchers who have benefited from a Marie Curie fellowship to apply for additional support to enable

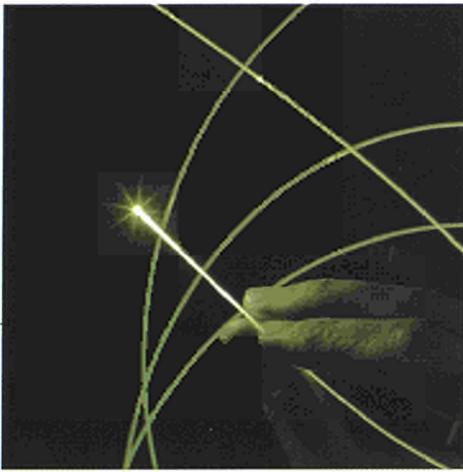
## The Marie Curie Fellowship Association

This association is open to researchers who have received or are receiving a Marie Curie fellowship. Present membership is over 1,400. About 40 coordinators are active in 14 countries at national and regional level. Its main objectives are to create a network between these scientists, facilitate an interface between the world of research and of industry, and give the label a higher profile. Its principal means are the organisation of debates, workshops, conferences, and the dissemination of information.

"We would like to represent the fellows in public scientific debates and organise meetings on interdisciplinary subjects in order to capitalise on their work," explains the association's young president, Laure Ledoux. "The Union has funded 700 researchers over recent years. They represent a very important human and scientific capital and I believe most of them have the ability and initiative to make use of it."

[www.mariecurie.org](http://www.mariecurie.org)





them to continue their work in their country of origin - an effective means of combating the "brain-drain" in these regions.

These applications for return fellowships are submitted by the researchers. An innovation under the new framework programme is the **development host fellowships**. These can be proposed by research groups (institutional or private) located in less-favoured regions who are seeking to strengthen their team.

Another category of host fellowship involves **companies**. They can submit research projects to the Commission which include young researchers they have selected themselves, with the undertaking of providing them with training (see box).

### *Reserved for the youngest*

Compensation for the fact that individual fellowships are now reserved solely for post-docs is provided by an important innovation, also based on the principle of host institutions, and open to young scientists working towards their doctorate. The new mechanism of **Marie Curie training sites** allows research institutions to serve as a host for young people working for a doctorate in their speciality. More than 350 sites should be able to accept about thousands fellows under this scheme.

Another option open to young researchers is to join a **network**. These networks providing training through research allow young researchers to improve their knowledge and establish new contacts by joining international and usually multidisciplinary research teams. Support of this kind is particularly suitable



*Michaela Dietsch, a German scientist working on the development of a hepatitis C vaccine at the Hellenic Pasteur Institute, Athens.*

## Michaela, biochemist, Essen-Athens

Michaela Dietsch, a German biochemist, is one of the 11 post-docs receiving a European grant who joined the EUNIDI (1) network. She is working on the development of a hepatitis C vaccine at the Hellenic Pasteur Institute in Athens.

"I was aware when I chose Greece that it is not one of the most scientifically developed regions, but the director of research, Penelope Mavromara, is such an inspiration to work with. There are some excellent researchers in this country, it is just that there are not enough of them as there are only a few research posts to fill."

Michaela speaks Greek ("although it is frustrating not to be able to speak it well enough yet to communicate all my ideas") and this experience of life in southern Europe is not just bringing scientific rewards. "Living and working abroad is the best possible way of understanding a different people than your own, through their history, culture and identity. You can learn a great deal from them."

Her next aim is to apply for a Marie Curie return fellowship in order to rejoin a group at the John Radcliffe Hospital (Oxford University), while continuing to work in close cooperation with the Hellenic Pasteur Institute. "I would then like to continue with research for another two or three years before completing my training in internal medicine or dermatology, probably in the United Kingdom or Germany."

*(1)European Union Network for Investigation of Dendritic Cell Immunotherapy of Induction of Anti-viral and Anti-tumor Immunotherapy and Transplantation Tolerance.*



## Patrick, a geologist, Dublin-Marseilles-Dublin

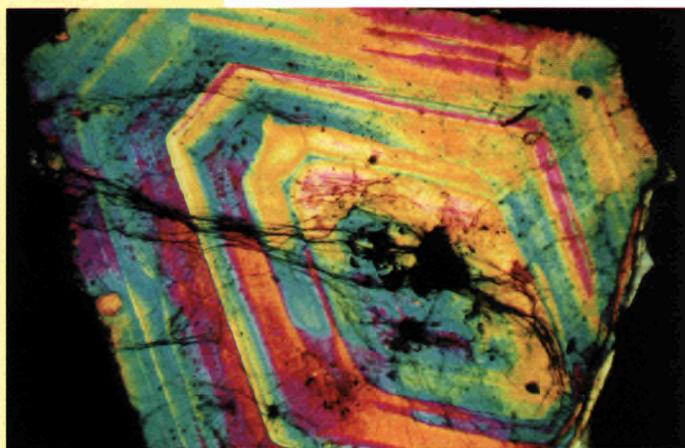
Patrick Roycroft is fighting for a scientific theory that could overturn established thinking in the earth sciences. His geology thesis, submitted at University College Dublin in 1995, was on the subject of phenomena of inclusion, growth and corrosion of the crystalline textures of mica muscovite in the natural granite of the earth's crust. His research opens the way to a new approach to granite formations which departs from current theories which explain their origin in terms of processes of magmatic fusion.

"My Marie Curie fellowship allowed me to spend nearly two years at the Centre de recherche sur les mécanismes de croissance cristalline in Marseilles, France, where I was able to considerably improve my knowledge of crystallography in order to develop this alternative approach." Patrick is currently on a return fellowship which is enabling him to continue his research in his country of origin. "As a result, I can start working again with Padhraig Kennan, who supervised my thesis. He is a worldwide authority in the field of granitic geology."

But the fellowship only lasts for a limited period. What then? "There are very few openings in fundamental research in geology - and I am not just talking about Ireland. Even if I wanted to go abroad again, to the United States or elsewhere, it would not be easy. I believe the constant priority given to applied research poses a serious threat to scientific creativity. Trying to understand the mechanisms at work in the history of the earth's crust is not of secondary importance. Who knows what this knowledge could mean to man in the future?"

for projects in new fields where there is joint international research of a high standard, often involving universities, research centres and companies. A training network must include at least five entities and young researchers apply directly to the network for a position.

"This system has worked well over recent years," believes Manuela Soares, who manages this sector within the Human Potential



*Leinster granite from south-east Ireland: a polarised light photograph of the zoned structure of mica muscovite*

## Marie Curie individual fellowships (Applications submitted by researchers)

| Type and maximum period                         | Beneficiaries  | Estimated number of fellowships              |        |
|---|--|--|--------|
|   |  | Programmes                                   | Number |
| Individual fellowships<br>24 months             | Post-docs or researchers with at least 4 years' experience (max. age 35)                       | Human Potential                              | 3600   |
|   |  | Quality of Life                              | 1200   |
|   |  | Energy, environment, sustainable development | 120    |
|   |  | Nuclear energy                               | 70     |
| Return fellowships<br>12 months                 | Researchers from a less-favoured region having received a Marie Curie fellowship               | Human Potential                              | 200    |
|   |  | Quality of Life                              | 60     |
|   |  | Energy, environment, sustainable development | 10     |
|   |  | Nuclear energy                               | 10     |
| Experienced researcher fellowships<br>12 months | Researchers with at least 10 years' experience (post-doctorates) or at least 14 years (others) | Human Potential                              | 120    |
|   |  | Quality of Life                              | 110    |
|   |  | Competitive and sustainable growth           | 20     |
|   |  | Energy, environment, sustainable development | 20     |
|   |  | Nuclear energy                               | 10     |

Further information?  
[www.cordis.lu/improving/](http://www.cordis.lu/improving/)



programme. "The philosophy remains the same, but in terms of the evaluation, the training aspects will be examined even more rigorously than before, on the basis of very detailed criteria."

Under the previous framework programme the networks were mainly of interest to post-docs, but they are now equally accessible to pre-docs. With a budget allocation of 450 million euros for this specific action, it should be able to fund around 4000 fellows. "We plan to support about 350 networks, involving more than 2000 research teams. A large part of these networks consist of scientists at universities or research centres, as the research subjects are at the frontier of fundamental research. But all scientific areas of quality will be encouraged and research networks principally involving companies will also be supported." ■



## The example of Unilever

The Unilever Research Centre at Colworth House (UK) is one of Europe's leading laboratories in the field of food research and innovation. Unilever Research Colworth is one of the central R&D facilities of an industrial empire with some 300 subsidiaries in more than 80 countries. It employs almost 1,000 staff (in microbiology,

molecular biology, immunology, physical chemistry, etc) and supports innovation for Unilever Companies worldwide.

The concept of "training through research" is a laboratory tradition at Colworth House. In 1991 the Laboratory was awarded the prestigious British label of Investor in People. It was also one of the limited number of industrial R&D locations to be accredited under the Third Framework Programme as a post-doctoral training site. "The Marie Curie Fellowships are a very positive experience for us", explains Jim Leslie, External Research Manager. "One of the EU post-docs whose first experience of Unilever was through that programme went on to join Unilever, and has rapidly advanced to an important role in Unilever Research. These young researchers bring enthusiasm, creativity and a personal initiative to the teams. For a company like Unilever which produces for the global market place, the cultural diversity of its researchers helps it to take account of the diversity of markets".

The Company has refined its approach to research training and continuous personal growth over the years in order to offer the very best conditions. Fellows receive guidance and advice and are assessed within teams working on real projects. There are also many specific courses they can benefit from. "Colworth has applied for accreditation as an industrial research site under the new Human Potential programme. We believe it is an excellent idea to relaunch such a scheme which builds new bridges between Europe's universities and industry mainly at the post-doc level. The Marie Curie training site opportunity should be very attractive to post-graduates".

**Contacts** | Barry McSweeney  
Manuela Soares  
Improving@dg12.cec.be  
Fax: +32-299 44 62

## Marie Curie host fellowships

(Applications submitted by research institutes and industry which subsequently select beneficiaries)

| Type and maximum period                                     | Applicant bodies<br>Beneficiaries   | Estimated number of fellowships (in "fellowship-years") |        |
|---|---|---|--------|
|   |   | Programme   | Number |
| Industry host fellowships<br>24 months (a)<br>36 months (b) | Companies active in research<br>a. Graduates with no doctorate project<br>b. Post-docs (max. age 35)                  | Human Potential   | 1200   |
|   |   | Quality of Life   | 480    |
|   |   | Information society                                     | 770    |
|   |   | Competitive and sustainable growth                      | 240    |
|   |   | Energy, environment and sustainable growth              | 120    |
| Development host fellowships<br>24 months                   | Research groups attached to universities, research centres or companies located in less-favoured regions<br>Post-docs | Human Potential (80 institutions)                       | 500    |
|   |   | Energy, environment, sustainable development            | 40     |
| Marie Curie training sites<br>12 months                     | Research groups attached to universities, research centres or companies<br>Pre-docs                                   | Human Potential (380 sites)                             | 3000   |
|   |   | Quality of Life   | 450    |
|   |   | Energy, environment, sustainable development            | 140    |

Further information? [www.cordis.lu/improving/](http://www.cordis.lu/improving/)

# European research is committed to the cause

*What new techniques can be developed in order to combat the alarming increase in drug abuse in sports? The IOC's Medical Commission and managers of European research programmes have decided to join forces in developing at least one dependable weapon in the fight against doping: effective and reliable testing.*

**T**he public is aware of the scale of the problem. The unfolding legal drama which has been buffeting the world of cycling since the 1998 Tour de France serves as an almost daily reminder of its seriousness. Behind these newspaper headlines lies a cancer which threatens to eat away at the very soul of competitive sport. The culprit? The growing and systematic abuse of progress in medicine and pharmacology. Amphetamines, anabolic steroids, growth hormones, EPOs... the list of complex, difficult to detect, but increasingly powerful and dangerous substances is growing all the time.

## Science on the offensive

The services of science have now been enlisted in combating this scourge. Advanced research must provide new means of detecting the increasing number of molecules available on the market for doping agents. The campaign to stem the rising tide of EPOs - for which there is only a very imperfect and imprecise indicator (hematocrit levels in the blood) - is now under way. The converging results of a number of scientific studies being conducted in Europe and elsewhere suggests that a more precise and reliable detection technique may be within reach.

Once the tools are developed, their use then poses the problem of the quality and

**“The athletes... pay the price for the dangers of drug abuse and have to live with increasingly rigorous testing systems.”**

[Prince Alexandre de Mérode]



*Many scientific studies are working towards more precise and reliable detection of doping agents.*

standardisation of measurements. It is in this field that we are now seeing effective cooperation between the Medical Commission of the International Olympic Committee (MCIIOC) - the international body charged with coordinating activities to combat drug abuse in sports - and the decision-makers behind the European Union's research policy.

"By its very nature," explains Prince Alexandre de Mérode, president of the

MCIIOC, "Europe is a powerful force in coordinating and standardising the scientific and regulatory approach to the detection and control of doping agents. The progress the European Union can achieve in this field will help establish an international reference system. This is why we view this partnership, whereby the cost of the IOC's research is shared equally, as extremely beneficial."

## An open debate

For almost a year, the MCIIOC and the European Union were jointly engaged in a wide-ranging exploratory and consultative mission with a view to harmonising scientific procedures for dope testing. A large part of this dialogue concerned the networks of analysis laboratories and made it possible to identify the main lines of potential EU support in this field.

"In order to realistically tackle the many facets of the testing problem, we felt it necessary to widen the debate to include all those involved in the fight against drug abuse in sport," explains Eddie Maier, of DGXII, who is responsible for the partnership with the IOC on this project.

An initial working group brought together the political and sports authorities responsible for regulating anti-doping measures, that is the national Olympic Committees and the public authorities

responsible for sport and health. Operating under the auspices of the IOC, the approach was clearly international – as it needed to be, since the globalisation of sport means that any campaign against drug abuse must extend beyond the frontiers of Europe. A second group brought together experts in combating fraud in various fields in order to consider the scope for transferring know-how and technologies (see box *Developing a European reference system*).

### **Knowledge, transparency ... and policy**

For the third stage, the approach involved representatives from the world of sport itself: athletes, trainers and medics. "The first to be concerned should be the athletes and competitors themselves, because they are the ones who pay the price for the dangers of drug abuse and have to live with increasingly rigorous testing systems. Unfortunately, it is difficult to involve high-level athletes – with a few exceptions, when their career is drawing to an end for example," says Alexandre de Mérode. "On the other hand, their support staff – the trainers and the doctors – are a key target for us and they really must be involved in the policy of prevention and detection."

In addition to the need to strengthen anti-doping policy, making it reliable and effective, these debates have also highlighted the crucial importance of information and training. "This is the primary requirement of the sports world and an area where the EU can play a useful role," concludes Eddie Maier. "This need for knowledge and transparency in connection with the scientific aspects of doping and its eradication also goes beyond the sphere of high-level sports competition. It is of interest to magistrates and lawyers, for example, who conduct criminal investigations in this area, and the journalists who report on these events. It is also of interest to anyone involved in training the athletes of the future." ■

Contact | Eddie Maier, DG XII  
E-mail: eddie.maier@dg12.cec.be

## **An ethical man**

For more than 20 years, Prince Alexandre de Mérode, a former sportsman and faithful defender of the Olympic ideal, has been untiringly engaged in his capacity as president of the IOC Medical Commission, a body which he helped to found, in a relentless campaign against drug abuse in sport. "When we first introduced systematic testing at sports events, people used to say that we were going too far and exaggerating the scale of the problem. Today, the true scale of the problem is all too apparent. We now tend to be criticised for not doing enough."

His activities are focused on three main goals: protecting athletes' health, ensuring they all have the same chance of success in sports events, and defending medical and sporting ethics. He believes there is a need to eliminate one of the fundamental reasons for the increase in doping: the power and all-pervading influence of money which drives the sporting world – including support staff and sponsors – to cheat by using chemicals to artificially boost performance.

In this respect, the problem of drug abuse in sport is a reflection of society in general. "A book describing 500 drugs designed to boost your performance is currently chalking up record sales in the bookshops. This is a book aimed at the general public – at businessmen, politicians, artists, people in all jobs and professions, who take drugs in order to be the best, but are never tested."

In this context, the heritage of Pierre de Coubertin, based on honest self-improvement, should remain the goal of all sportsmen. "I believe, too, that athletes should be addressed in a manner which is not just repressive. Scientific means other than drugs are available in order to help them beat records and compete at the highest possible level. There has been remarkable progress in achieving a healthy biophysiology of the body, for example, and major advances in equipment which is able to boost performance and safety."

The MCIIOC Internet site: [www.nodoping.org](http://www.nodoping.org)



*Prince Alexandre de Mérode,  
president of the IOC Medical  
Commission.*

## **Developing a European reference system**

Contacts with representatives of European analysis laboratories have led to the identification of many research needs in the field of metrology, such as the need to harmonise measurement methods, establish performance standards, provide laboratories with certified reference substances and materials, and develop mobile laboratories.

To this end, a major structural objective will be the creation of a central reference laboratory, responsible for developing synergies between the various institutions involved in antidoping analysis; interlaboratory testing; developing and implementing tools for quality control; ensuring the development of codes of good practice; managing common databases; and acting as an interface between the pharmaceutical industry, medical research, and the politicians and athletes engaged in the fight against drug abuse in sport.

A needs assessment will be at the basis of the call for proposals to be launched as part of the *Measurements and testing* generic research under the *Competitive and sustainable growth* programme

E-mail: [growth@dg12.cec.be](mailto:growth@dg12.cec.be)

# News in Brief

## Evaluation of the 1994-1998 framework programme

*1998 marked the end of the Fourth Framework Programme. Published by the Commission in June, the 1999 Annual Report on the RTD Activities of the European Union makes a quantitative and qualitative assessment of the dynamic provided by common policy in the field of science and technology over the past four years.*

In 1998, the remaining funds available under the Fourth Framework Programme – about 2.8 billion euros – were used to support 6,200 new projects. Shared-cost research actions, which represented 60% of them,<sup>(1)</sup> received 90% of the funding. This new crop of research projects involving 28,000 partners brings the final number of projects implemented between 1994 and 1998<sup>(2)</sup> to 22,000. A more detailed analysis of the 1998 results confirms the trends already apparent in Community research under the Fourth Framework Programme.

■ **Selection rate.** The "targeting" of calls for proposals is continuing to improve: the selection rate for projects submitted, already up from 26% in 1996 to 30% in 1997, is now 37%.

■ **Network effect.** The amount of EU financial support for research projects – an average of 660,000 euros per shared-cost action – rose by more than 20% compared with 1997. This trend reflects a desire to concentrate resources on larger projects and is evident from the increased number of partners (an average of six in 1998). This has strengthened

the network effect: last year the some 21,000 research bodies involved in shared-cost actions alone represented cooperation links between approximately 90,000 researchers throughout the Union.

■ **Participation of companies.** Nearly 40% of the partners in research projects launched in 1998 are industrial partners. Although large companies continue to account for a substantial share<sup>(3)</sup> – 14% of participations and 19% of financial contributions – efforts to increasingly involve SMEs have brought results. Last year they accounted for 25% of participants – compared with just 18% under the Third Framework Programme 1990-1994. A total of 14,500 SMEs participated in the Fourth Framework Programme. More than half of these made use of measures specifically designed to promote the participation of small businesses, either in the form of exploratory grants (20%) or by benefiting from cooperative research (35%).

■ **Training-Mobility.** In 1998, Marie Curie fellowships under the Training and Mobility of Researchers programme financed the equivalent of 1,100 full-time posts for pre- or post-

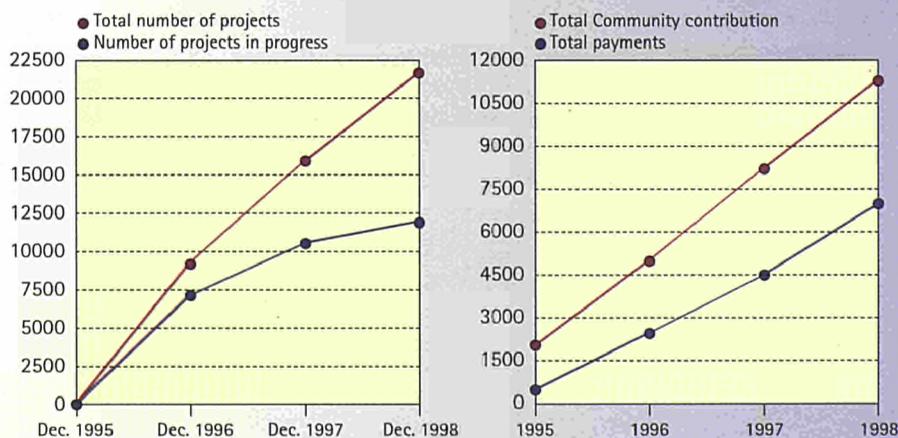
docs at research institutions outside their Member State of origin. In addition, support was also granted to 950 other young researchers participating in the research-through-training networks, while other Marie Curie fellowships were granted directly by specific thematic programmes.

■ **Regions.** 15% of research partners in projects launched last year are located in less-favoured European regions ("objective 1" of EU structural policy) and representatives from these regions are involved in 40% of all projects.

The report on common research policy activities in 1998 also looks at the new orientations agreed during preparations for the Fifth Framework Programme (1999-2002) which was a notable activity during the year. The report can be consulted on the Europa server or obtained from DG XII's Communication Unit.

europa.eu.int/comm/dg12/report99.html  
E-mail: info@dg12.ceec.be  
Fax: +32-2-29 58220.

## The dynamic of the Fourth Framework Programme



(1) The other projects were support for 250 concerted actions and 2,200 preparation, accompaniment and support actions.

(2) About 12,000 projects were still under way at the end of 1998.

(3) In the information technology (representing 40% of participations), communication (35%), transport (24%), and industrial and materials technologies (20%) sectors in particular.

## Mad cow disease : the first reliable detection tests

The news came at the end of June and it is important: three post-mortem detection tests – able to identify whether or not a slaughtered animal is infected with bovine spongiform encephalopathy (BSE) or if it is healthy – proved 100% reliable. This major step forward in the fight against mad cow disease follows a European Commission initiative, in May 1998, to launch a comparative evaluation programme of detection methods.<sup>(1)</sup> Following a call for proposals, four tests submitted by different research centres – Enfer Technology Ltd (IRL), Prionics AG (CH), CEA (F) and Wallac Ltd (UK) – were subject to an independent in-depth study at the Joint Research Centre's Institute for Reference Materials and Measurements.

The tests were carried out on 1,400 brain and spinal cord samples, half of them taken from contaminated cattle (supplied by the Central Veterinary Laboratory of the United Kingdom) and the other half from guaranteed healthy cattle (from a New Zealand herd totally isolated from the European epidemic).

Three of the research centres – Enfer, Prionics and CEA – passed the examination with total success. The French test is best at detecting prions with the lowest concentrations, but it is slower (24 hours). The Enfer test is the fastest (4 hours).

The satisfactory results of this assessment were approved by the Scientific Steering Committee which assists the Commission in protecting the health of consumers. It never-

theless stresses that this first positive step is not yet an operational tool as the tests are not yet able to detect whether or not an animal is incubating BSE.

[europa.eu.int/comm/dg24/health/afh/index\\_en.html](http://europa.eu.int/comm/dg24/health/afh/index_en.html)

*(1) This programme, which received financing of a million euros, was managed by the Directorate-General for Consumer Policy and Consumer Health Protection (DG XXIV).*

## The new look transatlantic research

Scientific co-operation between the United States and Europe goes back at least 150 years. Too often, however, this has consisted of discoveries being made in Europe but exploited in the USA. But now a new type of co-operation is growing – co-operation for mutual benefit – typified by the agreement between the European Union and the United States on co-operation in science and technology which came into force in October 1998.

On 21 and 22 June 1999, the European Commission, in collaboration with the German Presidency of the EU, organised the second New Vistas in Transatlantic S&T Cooperation conference in Stuttgart (D). The conference, which brought together 260 representatives from the two continents, aimed at promoting and strengthening cooperation in a number of strategic areas under the terms of the agreement.

As one keynote speaker said, companies now have no alternative to globalisation, but transatlantic co-operation in research is vital, too. In science, as in industry, partners may be highly competent, but with their different

strengths and weaknesses they are even better together. And when it comes to research, the US's strengths lie precisely in the areas of EU weakness – and vice versa – thus making co-operation extremely beneficial for both continents.

In addition, most of the major scientific projects of the age, such as the construction of the international space station and super particle accelerators, are possible only on the basis of international cooperation – and transatlantic cooperation in particular. The same is true when meeting the challenges of global climate change and emerging diseases. The Europe-USA agreement is not aimed at replacing the very extensive bilateral cooperation between individual Member States and the US, but rather at providing a complementary dimension. It has already resulted in scientific and technological exchanges in a number of fields including materials, endocrine-disrupting chemicals, language engineering and man-machine interfaces, climate prediction, biotechnology, metrology, transport technologies and energy.

The agreement seeks to stimulate a much more active cooperation based on new initiatives: projects jointly supported by the EU's Fifth Framework Programme and leading US scientific and technological agencies, the creation of structures for the sharing of data and results, the exchange of scientists, etc. The conference's parallel sessions addressed the following research areas: sustainable and efficient use of energy; biotechnology for a clean environment; cross-cutting technologies and functional materials; chemicals and structural materials; food safety – microbial food poisoning; computational neuroscience and neuroinformatics; critical infrastructure protection and tele-learning. Many fields for future cooperation were identified.

There is much to look forward to. As conference delegates were reminded, Henry Ford once said, "Coming together is a beginning; keeping together is progress; working together is success."

[www.cordis.lu/inco2/](http://www.cordis.lu/inco2/)

# Calls for proposals: overview

| Deadlines  | 1999  |      |      |      | 2000 |      |     |      |     |      |
|--|-------|------|------|------|------|------|-----|------|-----|------|
| <b>QUALITY OF LIFE AND MANAGEMENT OF LIVING RESOURCES (www.cordis.lu/life)</b> |       |      |      |      |      |      |     |      |     |      |
| KEY ACTIONS <sup>(1)</sup>   | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR | APR. | MAY | JUNE |
| Food, nutrition and health   |       | 4    |      |      |      |      |     |      |     |      |
| Control of infectious diseases   |       | 11   |      |      |      |      |     |      |     |      |
| The "cell factory"   |       | 18   |      |      |      |      |     |      |     |      |
| Environment and health   |       |      |      |      |      |      |     |      |     |      |
| Sustainable agriculture, fisheries and forestry                                |       | 11   |      |      |      |      |     |      |     |      |
| The ageing population and disabilities   |       |      |      |      |      |      |     |      |     |      |
| Generic research   |       | 11   |      |      |      |      |     |      |     |      |
| OPEN CALLS <sup>(1)</sup>  | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR | APR. | MAY | JUNE |
| Training: Marie Curie individual fellowships                                   |       |      | 3    |      |      |      |     | 12   |     |      |
| Research training networks   |       | 11   |      |      |      | 1    |     |      |     |      |
| SME Measures (exploratory awards / cooperative research)                       | 15    |      |      |      | 12   |      |     | 26   |     |      |
| Accompanying measures  |       | 11   |      |      |      | 10   |     |      |     |      |
| Support for research infrastructure  |       | 11   |      |      |      | 10   |     |      |     |      |

(1) Call published on 6/3/99

| <b>USER-FRIENDLY INFORMATION SOCIETY (www.cordis.lu/ist)</b>            |       |                      |      |      |                     |      |     |      |     |      |
|---|-------|----------------------|------|------|---------------------|------|-----|------|-----|------|
| KEY ACTIONS   | SEPT. | OCT.                 | NOV. | DEC. | JAN. <sup>(1)</sup> | FEB. | MAR | APR. | MAY | JUNE |
| Systems and services for the citizen                                    |       |                      |      |      | 15                  |      |     |      |     |      |
| New methods of work and electronic commerce                             |       |                      |      |      | 15                  |      |     |      |     |      |
| Multimedia content and tools  |       |                      |      |      | 15                  |      |     |      |     |      |
| Essential technologies and infrastructures                              |       |                      |      |      | 15                  |      |     |      |     |      |
| Cross-programme themes  |       |                      |      |      | 15                  |      |     |      |     |      |
| Future and emerging technologies <sup>(2)</sup>                         |       |                      |      |      | 15                  |      |     |      |     |      |
| Research networking   |       |                      |      |      | 15                  |      |     |      |     |      |
| OPEN CALLS  | SEPT. | OCT.                 | NOV. | DEC. | JAN.                | FEB. | MAR | APR. | MAY | JUNE |
| Future and emerging technologies <sup>(3) (4) (5)</sup>                 |       | Open until 15/9/2000 |      |      |                     |      |     |      |     |      |
| Support measures <sup>(4) (5)</sup>                                     |       | Open until 15/9/2000 |      |      |                     |      |     |      |     |      |
| SME Measures (exploratory awards / cooperative research) <sup>(5)</sup> | 15    |                      |      |      | 12                  |      |     | 26   |     |      |
| Intelligent manufacturing systems <sup>(6)</sup>                        |       |                      |      | 15   |                     |      |     | 1    |     |      |

(1) Call scheduled on 15/9/1999 - (2) Proactive initiatives - (3) Open sector - (4) Evaluation at least every 3 months - (5) Call published on 19/3/99 -

(6) Call published on 16/3/99.

| <b>COMPETITIVE AND SUSTAINABLE GROWTH (www.cordis.lu/growth)</b> |       |                  |                   |                   |      |      |     |      |     |      |
|--|-------|------------------|-------------------|-------------------|------|------|-----|------|-----|------|
| KEY ACTIONS <sup>(1)</sup>                                       | SEPT. | OCT.             | NOV.              | DEC.              | JAN. | FEB. | MAR | APR. | MAY | JUNE |
| Innovative products, processes and organisation                  |       |                  |                   |                   |      |      |     |      |     |      |
| Sustainable mobility and intermodality                           |       | 1 <sup>(2)</sup> |                   |                   |      |      |     |      |     |      |
| Land transport and marine technologies                           |       |                  |                   |                   |      |      |     |      |     |      |
| New perspectives for aeronautics                                 |       |                  |                   |                   |      |      |     |      |     |      |
| Measurements and testing research <sup>(3)</sup>                 |       |                  |                   | 15 <sup>(3)</sup> |      |      |     |      |     |      |
| Support for research infrastructure                              |       |                  | 15 <sup>(2)</sup> |                   |      |      |     |      |     |      |
| Accompanying measures  |       |                  | 15 <sup>(2)</sup> |                   |      |      |     |      |     |      |
| OPEN CALLS <sup>(1)</sup>  | SEPT. | OCT.             | NOV.              | DEC.              | JAN. | FEB. | MAR | APR. | MAY | JUNE |
| Training: Marie Curie individual fellowships                     |       |                  | 19                |                   |      |      | 22  |      |     |      |
| SME Measures (exploratory awards / cooperative research)         | 15    |                  |                   |                   | 12   |      |     | 26   |     |      |
| Accompanying measures  |       |                  | 15                |                   |      |      | 15  |      |     |      |
| Intelligent manufacturing systems                                |       |                  |                   | 15                |      |      |     | 1    |     |      |

(1) Unless otherwise specified, call published on 16/3/99 - (2) Targeted call published on 30/6/99 - (3) Call published on 15/7/99

| <b>ENERGY, ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT (www.cordis.lu/eesd)</b> |       |                     |      |      |                     |                     |     |      |     |      |
|--|-------|---------------------|------|------|---------------------|---------------------|-----|------|-----|------|
| KEY ACTIONS <sup>(1)</sup>   | SEPT. | OCT. <sup>(1)</sup> | NOV. | DEC. | JAN. <sup>(2)</sup> | FEB. <sup>(3)</sup> | MAR | APR. | MAY | JUNE |
| Sustainable management and quality of water                                  |       |                     |      |      | 17                  | 15                  |     |      |     |      |
| Global change, climate and biodiversity                                      |       |                     |      |      | 17                  | 15                  |     |      |     |      |
| Sustainable marine ecosystems  |       |                     |      |      | 17                  | 15                  |     |      |     |      |
| The city of tomorrow and cultural heritage                                   |       |                     |      |      | 17                  | 15                  |     |      |     |      |
| Cleaner energy systems, including renewables                                 |       | 4                   |      |      |                     |                     |     |      |     |      |
| Economic and efficient energy for a competitive Europe                       |       | 4                   |      |      |                     |                     |     |      |     |      |
| Support for research infrastructures   |       |                     |      |      |                     |                     |     |      |     |      |

(1) Call published on 20/3/99 - (2) Call scheduled on 15/10/99 - (3) Call scheduled on 16/11/99.

Deadlines in the first quarter of 2000 that are yet to be published.

## Legends

**S** Submission deadlines (for specific research actions)

**B** Batch evaluation dates (for open calls)

| Deadlines  | 1999  |      |      |      | 2000 |      |      |      |     |      |
|--|-------|------|------|------|------|------|------|------|-----|------|
|  | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE |
| <b>OPEN CALLS</b> <sup>(1)</sup>                         |       |      |      |      |      |      |      |      |     |      |
| Generic research   |       |      |      |      | 17   |      |      | 16   |     |      |
| Training: Marie Curie individual fellowships             | 8     |      |      |      |      |      |      |      |     |      |
| SME Measures (exploratory awards / cooperative research) | 15    |      |      |      | 12   |      |      | 26   |     |      |
| Accompanying measures                                    |       |      |      |      |      | 15   |      |      |     |      |

(1) Call published on 20/3/99.

### NUCLEAR ENERGY ([www.cordis.lu/fp5-euratom](http://www.cordis.lu/fp5-euratom))

| KEY ACTIONS                                  | 1999  |      |      |      | 2000 |      |      |      |     |      |
|--|-------|------|------|------|------|------|------|------|-----|------|
|  | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE |
| <b>OPEN CALLS</b> <sup>(1)</sup>             |       |      |      |      |      |      |      |      |     |      |
| Nuclear fission                              |       | 4    |      |      |      |      |      |      |     |      |
| Generic research                             |       | 4    |      |      |      |      |      |      |     |      |
| Support for research infrastructures         |       | 4    |      |      |      |      |      |      |     |      |
| Training: Marie Curie individual fellowships |       |      |      |      | 12   |      |      |      |     |      |
| Other training actions <sup>(2)</sup>        |       | 4    |      |      |      |      | 27   |      |     |      |
| Accompanying measures                        |       | 4    |      |      |      |      | 27   |      |     |      |

(1) Call published on 20/3/99 - (2) Special courses, research training networks, cooperation with countries outside the EU.

### INTERNATIONAL COOPERATION ([www.cordis.lu/inco2](http://www.cordis.lu/inco2))

| CALLS BY COUNTRY GROUPS                      | 1999                 |                   |      |      | 2000 |      |      |      |     |      |
|--|----------------------|-------------------|------|------|------|------|------|------|-----|------|
|  | SEPT. <sup>(1)</sup> | OCT.              | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE |
| States in pre-accession phase <sup>(1)</sup> |                      | 15 <sup>(2)</sup> |      |      |      |      |      |      |     |      |
| Copernicus 2 <sup>(3)</sup>                  | 16                   |                   |      |      |      |      |      |      |     |      |
| Mediterranean partners (INCO-MED)            | 15                   |                   |      |      |      |      |      |      |     |      |
| Developing countries (INCO-DEV)              | 15                   |                   |      |      |      |      |      |      |     |      |
| <b>OPEN CALLS</b>                            |                      |                   |      |      |      |      |      |      |     |      |
| Accompanying measures <sup>(4)</sup>         |                      |                   |      | 16   |      |      | 16   |      |     |      |
| Fellowships for Japan                        |                      |                   |      |      |      |      | 1    |      |     |      |

(1) Call published on 27/3/99. - (2) Call published on 15/6/99 - (3) New Independent States (NIS - former USSR) and other non-applicant Central and Eastern European countries - (4) Calls published on 27/3/99 except for group of emerging economies and industrialised countries for which a call will be published soon.

### INNOVATION / PARTICIPATION OF SMES ([www.cordis.lu/innovation-smes](http://www.cordis.lu/innovation-smes))

| OPEN CALLS  | 1999  |      |      |      | 2000 |      |      |      |     |      |
|---|-------|------|------|------|------|------|------|------|-----|------|
|   | SEPT. | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JULY |
| SME Measures (exploratory awards / cooperative research) <sup>(2)</sup> | 15    |      |      |      | 12   |      |      | 26   |     |      |
| Economic and technological intelligence projects <sup>(3)</sup>         |       |      | 2    |      |      |      | 2    |      |     | 2    |
| Innovation projects   |       |      |      |      |      |      |      |      |     |      |
| Promotion of innovative enterprises <sup>(4)</sup>                      | 15    |      |      |      |      |      |      |      |     |      |
| Innovation Relay Centres (IRC) <sup>(4)</sup>                           | 20    |      |      |      |      |      |      |      |     |      |

(1) Several calls for proposals and calls for specific promotion and encouragement actions were published during March, and more will be published during 1999: refer to work programme - (2) Call published on 1/4/99 - (3) Accompanying measures - (4) Calls published on 15/6/99.

### HUMAN POTENTIAL ([www.cordis.lu/improving](http://www.cordis.lu/improving))

| OPEN CALLS  | 1999              |                    |      |                   | 2000 |                   |                   |                   |     |                   |
|---|-------------------|--------------------|------|-------------------|------|-------------------|-------------------|-------------------|-----|-------------------|
|   | SEPT.             | OCT.               | NOV. | DEC.              | JAN. | FEB.              | MAR.              | APR.              | MAY | JUNE              |
| <b>KEY ACTION</b>   |                   |                    |      |                   |      |                   |                   |                   |     |                   |
| Research training network                                     |                   |                    |      |                   |      |                   |                   |                   |     |                   |
| Marie Curie individual fellowships <sup>(1) (2)</sup>         |                   |                    |      |                   |      |                   | 15                |                   |     |                   |
| Marie Curie industry host fellowships                         |                   |                    |      |                   |      |                   |                   |                   |     | 15 <sup>(8)</sup> |
| Marie Curie development host fellowships                      |                   | 13 <sup>(3)</sup>  |      |                   |      |                   |                   |                   |     |                   |
| Marie Curie training sites                                    |                   | 13 <sup>(3)</sup>  |      |                   |      |                   |                   |                   |     |                   |
| Research infrastructure: cooperative networks                 |                   |                    |      |                   |      | 15 <sup>(4)</sup> |                   |                   |     |                   |
| Research infrastructure: exploratory workshops                |                   |                    |      |                   |      | 15 <sup>(4)</sup> |                   |                   |     |                   |
| High-level scientific conferences                             |                   |                    |      |                   |      | 1                 |                   |                   |     |                   |
| Awards for first-class research                               |                   |                    |      | 31 <sup>(5)</sup> |      |                   |                   |                   |     |                   |
| Raising public awareness of science and technology            |                   |                    |      |                   |      |                   |                   | 15 <sup>(6)</sup> |     |                   |
| S&T policy strategy: studies <sup>(1)</sup>                   |                   | open till 2/6/2000 |      |                   |      |                   |                   |                   |     |                   |
| Accompanying measures for the programme                       | 10 <sup>(7)</sup> |                    |      |                   |      |                   |                   |                   |     |                   |
| Common basis for S&T and Innovation indicators <sup>(9)</sup> |                   |                    |      |                   |      |                   |                   |                   |     |                   |
| Improving the socio-economic knowledge base                   |                   |                    |      |                   |      |                   | 15 <sup>(4)</sup> |                   |     |                   |

(1) Call published on 2/3/99, unless indicated otherwise - (2) Individual fellowships, return fellowships, experienced researcher fellowships - (3) Call published on 11/6/99 - (4) Call scheduled for 15/11/99 - (5) Call scheduled for 30/9/99 - (6) Call scheduled for 15/1/2000 - (7) Open call published on 16/6/99, deadline on 28/6/2002 - (8) Call scheduled for 15/2/2000 - (9) Call for tender published on 15/6/99.

## European research policy

### The DG XII brainstorming

The Fifth Framework Programme's new approach has profoundly the structures of policy for supporting European research and for several months now DG XII has been engaged in adapting its methods of organisation, management and provision of information in connection with the various programmes (see box). Last June, 600 of its scientific and administrative staff attended a seminar in order to clearly identify the implications of these changes.

A wide range of subjects was discussed at the brainstorming session, also attended by participants from universities and industry. What do the Member States, European Parliament and the general public expect from Community S&T policy? How can this policy be related to other European policies (in the field of the environment, industry, transport, external relations, employment)? How to improve rela-

tions with research partners? How to make the best possible use of the (limited) resources available to the Commission's services?

The participants agreed that the day permitted a useful insight into the objectives for the next four years, at a time when the big rush of the selection procedure following calls for proposals under the new framework programme was just beginning.

### Images

■ *The Fifth Framework Programme* – Video presenting the new orientations and priorities of the Fifth Framework Programme 1999-2002.

■ *Technology and employment* – Strengthening the link between technological progress and employment through various examples of European projects

■ Both videos are available in FR, EN, DE from DG XII's Communication Unit  
Info@dg12.cec.be

### DG XII: a new joint management of the thematic programmes

In order to ensure the best possible implementation of the three thematic programmes for which it is responsible, DG XII has set up a triple management structure for each of them:

■ The first directorate will encompass horizontal coordination with other programmes, the secretariats of the consultative groups

and committees, and financial and administrative aspects.

■ The other two will manage the units in charge of the various fields of research.

■ The organisational chart of this management structure for the three thematic programmes is as follows:

|   | Coordination         | Thematic units (I)                 | Thematic units (II)                     |
|---|----------------------|------------------------------------|---|
| Quality of life                                 | Bruno HANSEN         | Rainer GEROLD <sup>(1)</sup>       | Peter KIND (acting) <sup>(2)</sup>      |
| Competitive and sustainable growth              | Arturo GARCÍA ARROYO | Ezio ANDRETA <sup>(3)</sup>        | (post to be filled) <sup>(4)</sup>      |
| Energy, environment and sustainable development | Umberto FINZI        | Christian PATERMANN <sup>(5)</sup> | Jean-François MARCHIPONT <sup>(6)</sup> |

(1) Health, food and environment - Agriculture, agribusiness, fisheries, forestry - "Cell factory"

(2) Infectious diseases - Ageing population - Generic activities, infrastructure

(3) Products, processes, organisations - Materials

(4) Aeronautics - Inland transport and marine technologies - Measurements and testing, infrastructure

(5) Biodiversity and global change - Water management and quality - Marine ecosystems, infrastructure - City of tomorrow and cultural heritage

(6) Clean energy systems - Improvement of energy efficiency - Safety and management of the fissile fuel cycle, radiation protection - Joint development of fusion - Fusion association agreements

### Read the FAQs

The DG XII site on the Europa server offers a new guide for all those seeking clear and concise answers to questions on how the Fifth Framework Programme operates. This new information tool designed for everyone in the research world consists of 100 "frequently asked questions" (FAQs) covering just about everything a potential participant could want to know

[europa.eu.int/comm/dg12/faq.html](http://europa.eu.int/comm/dg12/faq.html)



### QUALITY OF LIFE LIVING RESOURCES

life@dg12.cec.be

### Diary

■ *Strategies for development of biotechnology* - 27-28/9/99 - Bergen (N)

■ *Speciality chemicals for the 21st century* - 16-17/9/99 - Valbonne (F) - Organised by IENICA (Interactive European Network for Industrial Crops and their Applications)  
aia3300@aol.com

■ *International conference on biopolymer technology* - 28-30/9/99 - Coimbra (P)

■ *Improved traditional foods for the next century* - 28-29/10/99 - Valencia (E) - Report on research under the FAIR programme  
[www.iata.csic.es/tradfoods](http://www.iata.csic.es/tradfoods)

■ *Europa Health Forum Gastein* - Health & social security - 6-9/10/99 - Bad Hofgastein (D)  
[www.ehfg.org](http://www.ehfg.org)

■ *Europa Bio'99 - Biotechnology for economic growth and improved quality of life* - 16-19/11/99 - Munich (D)  
[www.europa-bio.be](http://www.europa-bio.be)

### Publications

■ *Recommendations for the management of HIV-infected women and their infants* - A European Consensus - (28p) - EUR 18851

■ *Research in Bioethics: AIDS* - Ethics, justice and European Policy (234 p) - EUR 17789

■ *Looking at the biotechnology consumer* - (47p) -

■ *Strategies for communication on food biotechnology* - (80p) - EUR 18600

■ *Cultural and social attitudes to biotechnology* - (174p) - EUR 18491

■ *Position of trade unions and employers regarding genetic tests.*

- *Renewable Biomaterials* – EUR 18304
- *Biomass and Bioenergy* – EUR 18303
- *Food safety, Diet and Health, an overview of research across Europe* – EUR 18493



## INFORMATION SOCIETY

ist@cec.be

### Diary

- *TELEWORK'99* – 22-24/9/99 – Aarhus (DK)  
www.telework99.dk
- *Second International Workshop on Intelligent Manufacturing Systems 1999* – 24-25/9/99 – Leuven (B)  
www.mech.kuleuven.ac.be/pma/project/imswg/ljms99/
- *IST'99 Conference and Exhibition* – Exploring the Information Society – 22-24/11/99 – Helsinki (FI) – The annual meeting of programme IST.  
www.ist99.fi/first.html
- *Online Educa Berlin 199* – 24-26/11/99 – Berlin (D)  
www.online-educa.com



## ENERGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

eesd@dg12.cec.be

### Diary

- *Environmental Car Day* – 15/9/99 – Stockholm (S) – With an important presentation of the ZEUS (Zero and low emission vehicle in urban society) European project.
- *Fifth European Workshop on Stratospheric Ozone* – 27/9-1/10/99 – St. Jean de Luz (F) – Lessons learned from the THESEO project measurements.  
www.ozone-sec.ch.cam.ac.uk/
- *Sustainable management and quality of water* – 11-12/11/99 – Erfurt (D) – Organised by the Innovation Relay Centre in southern Germany  
www.thati.de
- *Euradwaste'99* – Radioactive waste management, disposal and decommissioning – 15-18/11/99 – Luxembourg (L)  
www.cordis.lu/fp5-euratom/src/ev-eurad.htm
- *First International Environmental Technology Conference for Sustainable Development of the EU Accession Countries* – 18/11/99 –

## Earthquake forecast

At a conference on seismology held in Iceland last June, researchers from the PRENLAB European project presented the bases for a promising scientific method which made it possible, in November 1998, to issue a warning of an imminent earthquake measuring 5 on the Richter scale. Their prediction proved true: three days later an earthquake occurred just 2km from the site of the seismological observations.

Budapest (H)

edward@mail.inext.hu

- *Young Scientists Conference on Marine Ecosystem Perspectives* – 20-24/11/99 – Gilleleje (DK)  
www.ices.dk/symposia/young.htm
- *FISA'99* – EU research in reactor safety – 29/11-1/12/99 – Luxembourg (L)  
Georges.van-goethem@dg12.cec.be
- *ELOISE – European Land-Ocean Interaction Studies* – 3rd Open Science Meeting – 1-4/12/99 – Noordwijkerhout (NL)  
europa.eu.int/comm/dg12/eloise/eloise-c99.html

### Publications

- *Radiation and Thyroid Cancer* – Report on the conference held at Cambridge University (UK) in July 1998  
eesd@dg12.cec.be
- *Nuclear in a changing world* – Report on the seminar held in November 1998 in Brussels (B)  
alejandro.zurita@dg12.cec.be



## INTERNATIONAL COOPERATION

inco@dg12.cec.be

### Internet

- *Research partners from the candidate countries* – The list of scientific and technological organisations which already participated in European projects under the Fourth Framework Programme.  
cordis.lu/fp5/src/fp4-cand.htm

### Publication

- *European research open to the world* – Report by the INCO programme under the Fourth Framework Programme 1994-1998 – EUR 18767



## INNOVATION PARTICIPATION OF SMES

innovation@lux.dg13.cec.be  
sme@dg12.cec.be

### Diary

- *Patinnova'99 and EPIDOS Conference* – 18-20 et 20-22/10/99 – Halkidiki (GR) – Latest developments in the field of information on patents  
www.european-patent-office.org/epidos/conf/pat\_eac99/index.htm



## JOINT RESEARCH CENTRE

gisele.vanwert@jrc.cec.be

### Publications

- *IPTS Report # 35* – Special issue : Standardisation and RTD  
www.jrc.es/iptsreport/vol35/french/
- *Annual Report 1998* – EUR 18704 EN



### Death of Paolo Fasella

Paolo Fasella died suddenly on 11 June. A doctor and biologist with a passion for science, he was Director-General of DG XII between 1981 and 1995. For 14 years, under the mandate of five different Commissioners, he helped generate growth and dynamism in research activities supported by the Union. Those who worked with him will remember him not only for his professional abilities but also for his sensitivity, generosity and readiness to listen.

# Artificial liver: a clinico-logistic demonstration

*An external biotechnological system could compensate for liver failure in patients awaiting a transplant. New to clinical practice and requiring special logistic and economic organisation, this new method of treatment is currently the subject of a European demonstration project.*

**S**evere liver failure following viral hepatitis, parasitic illnesses and cancer can often prove fatal. This is because the liver is a key organ responsible for many of the body's vital functions.

In certain cases of serious illness it is certainly possible to obtain a spontaneous recovery of the liver functions following partial surgical removal of the liver. But if the liver damage proves irreversible, the only answer is a transplant. This often means a race against time to find a donor organ, with many patients dying before a transplant is possible.

At present, there is no traditional treatment administered directly to the patient which can compensate for the metabolic failures of a seriously diseased liver. Specialists are therefore turning their attention to the use of an external system. This inno-

vation is in some ways comparable to the artificial kidney: the patient's blood passes through an external biotechnological system which can replace the failed liver functions for a limited period.

## *The emergency liver*

Research based on this model carried out over a number of years by scientists at Berlin University's surgery and transplant unit has resulted in the development of a bioreactor containing a concentrated culture of metabolically active pig liver cells which are able to fulfil a temporary role as a kind of "emergency liver". The patient's plasma and blood cells are separated in an external circuit, with the plasma being directed to the bioreactor which performs the normal liver functions in general, and detoxification in particular.

The plasma and blood cells are then recombined and re-injected into the patient.

The principal technological innovation of the bioreactor developed by the researchers in Berlin lies in the organisation of the culture medium of pig liver cells in a three-dimensional structure. This configuration, which in a way simulates the structure of the blood flow circuits in the liver tissues, allows cells to survive for several weeks while at the same time optimising their morphological and functional parameters (supplying nutrients, eliminating toxic waste, efficient oxygenation). Experiments on animals showed the technique to be both effective and safe and the go-ahead was given for the first clinical trials on humans.

## *Convincing the doctors...*

It was at this stage of the research that the specialists in Berlin decided to team up with three European centres of excellence in the field of liver transplants - in Birmingham (UK), Barcelona (E) and Strasbourg (F) - in order to develop an economical, clinical demonstration project establishing the effectiveness of the technology. "This radically new extracorporeal process can only be successfully disseminated if we immediately focus on the potential of an area such as Europe. And the first

essential step is to convince hospital specialists of its benefits," explains Mark Smith, one of the project organisers at Berlin University. "In addition to considerably reducing the risk of death while awaiting a transplant, the support provided to the patient's body for his convalescence significantly decreases the impact and cost of the post-operative stage. Moreover, apart from its role as a stop-gap measure while awaiting an organ for transplant - with all the immunosuppressive treatment this involves - this technique actually reduces the need for such an operation. It increases the chances of success in cases where the doctors decide to pin their hopes on the natural regeneration of liver tissues."

At the end of January 1999, eight seriously ill patients awaiting a transplant benefited from this "bio-artificial liver" treatment, over periods ranging from 7 to 46 hours depending on the case. The liver functions of all patients were successfully stabilised and the patients were able to await a transplant under optimal conditions. The transplants subsequently went ahead successfully. Twenty-four additional trials are now planned.

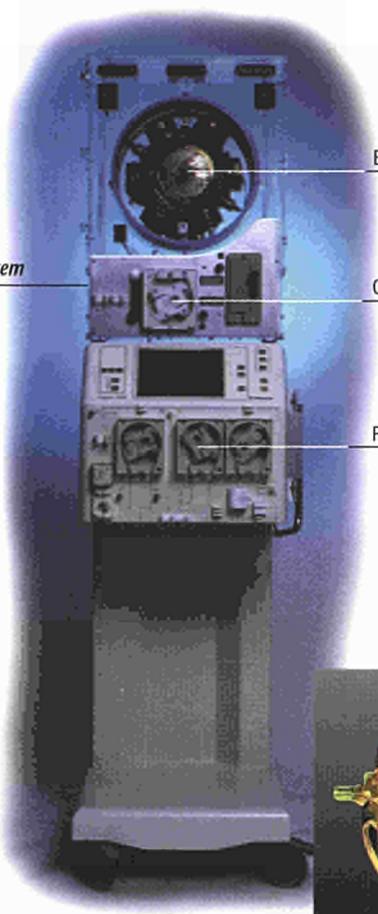
## *...and industry*

"One of the distinguishing features of this treatment is the need to develop a very specific

## Demonstration Projects

The concept was introduced in the three Life Sciences Programmes (Biotech, Flair and Biomed) by the European Union's Fourth Framework Programme. Since "seeing is believing", these demonstration projects were supported when the uncertainties and risks associated with innovation might discourage potential users from adopting a newly developed technology. The objective of the 70 projects currently ongoing (40 Biotech, 16 Biomed, 14 Flair) is to prove the technical feasibility of a new technology together with its possible economic advantages under realistic conditions.

[europa.eu.int/comm/dg12/life1.html](http://europa.eu.int/comm/dg12/life1.html)

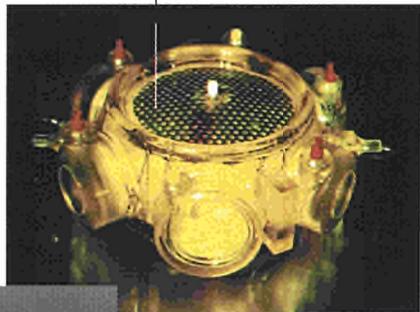


Liver Support system

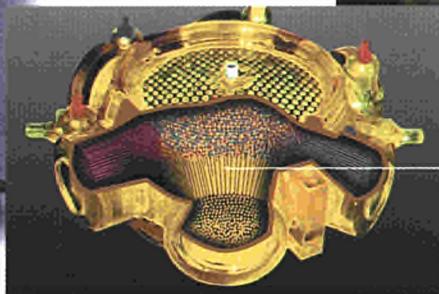
Bioreactor with biological active cells

Cell perfusion unit

Plasma separation unit



Bioreactor



Artificial capillary system

logistic approach," explains Dr Smith. "It is not just a matter of validating the technology but of making really sure that, on the European scale, all the available resources are being used in order to allow it to be implemented – for the technology to be transferred to the market and clinical practice."

Functional bioreactors must be available and transmitted to transplant centres very promptly. At the same time, we are dealing with living cells and it takes some time to prepare them for use, which means having the functional systems on permanent stand-by at the Berlin resource centre. Close cooperation between scientists at the centre and hospital specialists in charge of patients enables the bioreactors to be quickly transported by air to the various European clinics as soon as they make a request.

"We not only have to show the effectiveness of the treatment as such, but also that the proposed economic and logistic solution can be applied effectively and profitably," Dr Smith points out. "The demonstration extends beyond the specific case of treating liver failure and in fact covers the development of all new extracorporeal treatment based on living-cell engineering." This is a second aim of the project, namely to persuade the medical equipment and biotechnology engineering industries that this

new form of treatment justifies the high level of investment in its development and marketing. There are about 100 specialised intensive care units in Europe currently carrying out about 1,000 transplant operations every year.

This new system using pig liver cells is also certain to raise a number of ethical questions. Furthermore, the use of animal cells in treating human patients poses a legal problem in some countries. Although we are dealing with an external artificial organ, the recent declaration by the Council of Europe proposing a moratorium on xenographs seems to be causing concern to members of certain medical ethics committees. If the use of animal cells were to be banned, however, there would be no problem in using human cells, the use of which has already yielded promising results. ■

**Contacts**

**Dr. J. Gerlach, Dr B. Busse, Dr M. Smith**

Klinik für Allgemein-, Viszeral- und Transplantationschirurgie  
Humboldt-Universität zu Berlin (D)  
E-mail: mark.smith@charite.de

**Contact DG XII**

Quality of life and management of living resources programme  
E-mail: life@dg12.cec.be  
www.cordis.lu/life  
E-mail: viviane.thevenin@dg12.cec.be  
E-mail: philippe.jehenson@dg12.cec.be

# Ichthyology and conserving marine biodiversity

*Ichthyology - the zoology of fish - remains a field where our knowledge is often sorely lacking. The reproduction cycle and "recruitment" process of hake is one such example. Yet this knowledge is crucially important if we are going to be able to stop the over-fishing of this important resource in the north-west Mediterranean.*

In the western Mediterranean the continental shelf <sup>(1)</sup> is generally narrow, except in the *Golfe du Lion*. This limits the fishing areas for species which live and reproduce close to the seabed. The fleets from nearby ports - for the most part consisting of small vessels - catch many species here, hake being the most important. In terms of volume and revenue, hake is the principal resource of the fishing sector in the north-west Mediterranean.

"Hake stocks are under great pressure and current measures to conserve them are clearly insufficient," explains Jordi Leonart, of the *Instituto de Ciencias del Mar* in Barcelona (E). "As this inshore fishing is mainly in the territorial waters of the neighbouring Member States, they each have their own regulations and, unlike in the Atlantic, there is no quota on catches as part of the policy of Blue Europe."

## The Mediterranean exception

Since 1994 a number of common conservation regulations for the Mediterranean have nevertheless imposed restrictive norms in terms of the fishing methods used, in particular the minimum mesh size for bottom trawling nets (40 mm) and minimum size of the fish that can be sold, in the case of hake set at 20 cm. "But these two limits are a Mediterranean exception. The minimum mesh size is twice as big in the Atlantic - and even more in certain zones. The same is true of the catch size. The result is that, in the Mediterranean, hake catches consist of large numbers of young and very small fish. We are facing what is known as *growth* over-fishing which is in danger of depleting the resource by placing an unsustainable pressure on juvenile populations."



Unloading an ichthyoplankton (eggs and larvae) catching device during a sampling exercise in the Mediterranean.

Ichthyologists also believe that this imbalance is contrary to a rational economic calculation for the fisheries sector. "When you catch too many small fish, the weight/volume ratio falls and the revenue is less. Some fishermen have realised this. They have abandoned the bottom trawl in favour of the gill net and the trawl line, two techniques which favour catches of a higher weight. But the simultaneous use of these two techniques poses a serious danger. If we continue to put pressure on juveniles while putting more pressure on the adults - in other words if we do not reduce the total fishing - we are not only going to have growth over-fishing but *recruitment* <sup>(2)</sup> over-fishing too, and that will jeopardise the stock's reproductive capacity."

## Common fisheries policy

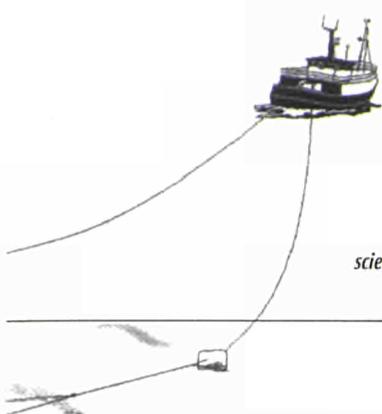
Coordinated by DG XII, the management of research in the field of fisheries and aquaculture is carried out by DG XIV, responsible for the common fisheries policy.

## Mare incognita

The race to conserve resources is also facing a serious scientific obstacle: life on the seabed remains largely *terra incognita*. Although there have been many studies of the dynamics of fish populations in this region, serious gaps in our knowledge remain. The European research project conducted by Spanish, French and Italian partners and coordinated by Jordi Leonart, <sup>(3)</sup> with the support of the European FAIR programme, is therefore conducting a series of observations and studies on the process of reproduction and recruitment in the hake banks of the north-west Mediterranean.

Two kinds of sampling are currently being carried out in this area. The first is concerned

Contact | Willem Brugge  
 Willem.Brugge@dg14.cec.be  
<http://europa.eu.int/comm/dg14/dg14.html>



*The conservation of resources faces a major scientific obstacle: our very incomplete knowledge of life on the seabed.*

with the ichthyoplankton - the eggs and larvae which initially inhabit waters close to the surface - the second with juvenile hake populations which, as soon as they reach 3 - 10 cm in length, live close to the seabed and become part of the exploitable stock. Samples are taken at depths of 50 - 350 metres at various sites identified as possessing distinct and known ecological conditions such as high density zones. Respecting a common methodology, the various partner laboratories make a comprehensive analysis of the samples collected (size of fish, type of food, etc.), for both the hake and other populations - whether prey or predators - which share their habitat. The aim is to arrive at the most precise understanding possible of the oceanographic and ecological parameters which determine the complete stages in the fertilisation, reproduction and growth cycle of the hake stock.

"We want to arrive at operational conclusions regarding the conditions which could prevent and put an end to the over-fishing of this essential Mediterranean resource, in particular by identifying the fishing periods and zones to be respected in the interests of stock reproduction and replenishment," concludes Jordi Lleonart. "We can then make a better assessment of the validity of the selective measures at present in force (minimum size of catch and trawling net mesh) and recommend changes where necessary. But that is no longer up to the scientists. It will then be the responsibility of the national and European officials and fishing professionals to seek a consensus on fishing policy in the Mediterranean." ■

(1) *The prolongation of continental shelves beneath the sea.*

(2) *The process of incorporating fish of spawning age in the total fish stock.*

(3) *The "Impact of fishery and environment on hake recruitment in north-western Mediterranean" (FAIR-CT97-3522), coordinated by the Instituto de Ciencias del Mar in Barcelona (E), brings together the Institut Mediterrani d'Estudis Avançats (E) in Palma-de-Mallorca, the IFREMER laboratory in Sète (F), the Livorno Centro Interuniversitario di Biologia Marina (I), and the Università degli Studi of Genoa (I).*

**Contact** | Dr Jordi Lleonart  
 Fax: +34 71 401 877  
 E-mail: lleonart@icm.cisc.es

## The sex of the "common dentex"

Apart from the need to conserve fish species in a marine environment, research on the reproductive biology of fish is also one of the keys to the development of aquaculture, in particular by farming new species. The studies carried out under another FAIR project on the reproductive biology of the "common dentex" (*Dentex dentex*) is one such example. There is strong demand for this fish which is caught in the Mediterranean and tropical areas and trials have shown that it could be adapted to aquaculture. However, our knowledge of the conditions required for its reproduction and of its sexual differentiation is limited. British, French and Italian researchers, coordinated by the Crete Institute of Marine Biology (GR),<sup>(1)</sup> are therefore now trying to fill in the gaps.

One of the principal objectives is to control the factors making it possible to optimise reproduction. Breeding tests in the Mediterranean have shown that the spawning season - which in a natural environment runs from March to June - can be successfully altered. By acting on the thermal cycle and seasonal photoperiod, researchers have succeeded in bringing forward or delaying the spawning period by three months (from January to March or from June to August), without any hormonal manipulation. This is a significant achievement as it would make it possible to market these fish over a period of nine months every year. Another important finding of this project has been to determine the optimal balance between the sexes in order to favour spawning, simply by determining the presence of the different steroids produced by males and females in the water of the farming pools.

(1) *Greek, British, French and Finnish partners are working together on the project entitled "Common dentex, a prime new species for aquaculture - Development of methods for reliable egg production" (FAIR CT-95-0407).*

**Contact** | Michaelis Pavlidis,  
 IMBC (GR)  
 Fax: +31 81 241 882  
 E-mail: mpav@imbc.gr

# When parasites decimate the livestock



*A vast network has been harnessed: 44 scientists from 24 laboratories in eight EU countries, nine African and Caribbean countries, and more than 150 associated researchers worldwide. The objective? To combat the many varieties of ticks which plague livestock in tropical and sub-tropical countries, wreaking havoc on the health and economy of affected regions. With its support from the European Union, the ICTTD project is an example of North-South cooperation based on synergy and the exchange of expertise.*

“There was no integrated approach covering all the pathogens and taking into account the socio-economic aspects of the problem.”

[Frans Jongejan]

**T**he damage caused by ticks is a major obstacle to increasing animal production in many developing countries where malnutrition is a major problem, and in Africa in particular. For cattle and small ruminants, the first economic damage caused by these blood-sucking parasites is anaemia in the livestock, accompanied by weight loss which undermines the profitability of stock farming. In addition, the scars left by the bites present another major problem when it comes to using the hides for leather.

But there is worse. The ticks are also responsible for transmitting many diseases, such as theileriosis, babesiosis, anaplasmosis, cowdriosis and dermatophilosis. These exact a heavy toll among farmers in tropical and sub-tropical countries, estimated at several billion euros a year. The problem is further complicated by the fact that there are about 870 different species of parasite and these diseases are all linked to specific species.

The principal weapon in combating this scourge remains the massive use of acaricides. The drawback is that these products are toxic, expensive, and – worryingly – the ticks seem to be developing an increasing resistance to them. How, then, can such an enemy be defeated?



*Approximately 80% of the world's livestock are threatened by infestation with ticks or the diseases they cause. Below, an attack by *rhhipicephalus appendiculatus* in Zambia.*

## A “multi-species” campaign

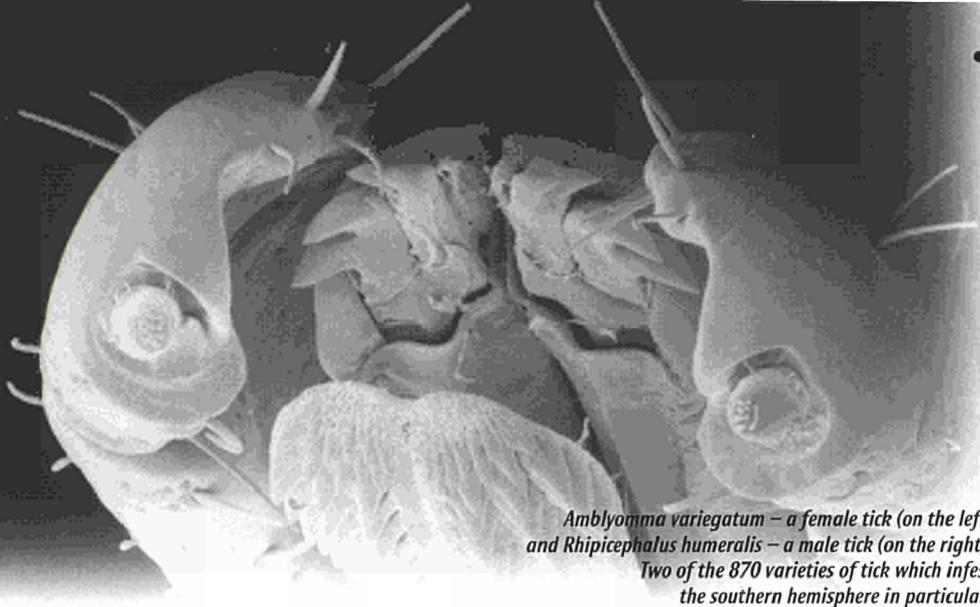
There are many in-depth research programmes on the prevention, detection and treatment of tick-borne diseases worldwide, not least in Europe. Many of these are conducted in partnership with laboratories in the developing countries. “However, due to the many varieties encountered at the local level, most of these studies target the damage caused by a single species of parasite,” explains Frans Jongejan of the Utrecht Faculty of Medicine (NL), who coordinates the ICTTD <sup>(1)</sup> concerted action which was launched in 1996 with the support of the EU's INCO (international cooperation) research programme. “There has been no integrated approach covering all the pathogens and taking systematic account

of socio-economic aspects. Yet such an approach is vital if we are to deal more effectively with the problems of stock farmers who are facing multi-parasitoses in the field. If you develop a vaccine, which protects livestock against a disease transmitted by one species of tick, the farmers still have to use acaricides in order to combat the others. This could even lead to an increase in costs. It is essential for these farmers that we develop new means to wage a ‘multi-species’ campaign against these plagues.”

## Three lines of attack

The ICTTD initiative therefore set itself the task of increasing and stimulating exchange and cooperation between scientists. It is a kind of “network of networks” bringing the very best laboratories at all levels – international, regional and local – into contact with each other and creating synergies which focus on three specific themes.

In terms of prevention, an essential priority is the development of vaccines, creating barriers both to the ticks and the diseases they carry. A number of attenuated vaccines already exist whose effectiveness must be assessed. But the principal objective is to develop new types of “inactivated” recombi-



*Amblyomma variegatum* – a female tick (on the left) and *Rhipicephalus humeralis* – a male tick (on the right). Two of the 870 varieties of tick which infest the southern hemisphere in particular.



nant vaccines using genetic engineering, together with new methods of administering them tailored to stock-farming conditions in developing countries. Another challenge, especially for Africa, is to develop multicomponent vaccines aimed at several diseases and the parasites themselves.

A second crucial field is the perfecting of **screening tests**. The use of recombinant DNA techniques to produce standardised antigens should make it possible to improve the detection of tick-borne diseases. ELISA-type diagnosis tests which are simultaneously applicable to several pathogenic agents have been developed and validated in cooperation with international laboratories and other bodies for subsequent transfer and adaptation to the needs of participating laboratories.

Finally, the ICTTD network coordinates **epidemiological** surveys and the analysis of the **socio-economic** effects of tick-borne diseases. The aim is to help develop optimal strategies for combating these diseases by taking into account the nature of the production systems into which they must be integrated.

### ***From the laboratory to the field***

The exchange of knowledge and expertise is the cornerstone of the ICTTD network which links scientists based in five continents. In particular, it opens up the possibility for researchers to make exchange visits (which must be short, effective and therefore well prepared) in order to better identify expectations in the field and facili-

tate the transfer of scientific and technological expertise.

The screening tests for cowdriosis developed at Utrecht University are one such example. "This development at our laboratory initially brought virtually no response," explains Frans Jongejan. "Now, following information exchanges within the ICTTD, the test is available on request to laboratories in developing countries and we are updated on its effectiveness in the field. If the test proves reliable and practical, the final stage will consist of setting up an African company which is well integrated in the local context and charged with distributing the test in line with local demand." This approach would allow southern countries to benefit actively from new technologies thus driving their own development. ■

(1) *Integrated Control of Ticks and Tick-Borne Diseases*

**Contact** | Frans Jongejan  
E-mail: [f.jongejan@vet.uu.nl](mailto:f.jongejan@vet.uu.nl)  
Fax: +31-30 2540784  
[www.ruu.nl/tropical.ticks](http://www.ruu.nl/tropical.ticks)

## Keeping informed

Three times a year, the ICTTD network publishes its *Newsletter on ticks and tick-borne diseases of livestock in the tropics* (issue two is now available), containing the latest news on research and publications in this field. Its availability on the Internet makes it particularly valuable to researchers in developing countries, who often have problems getting the scientific documentation they need for their work.

There are also other activities designed to encourage contact between researchers and help them keep informed. Last September, for example, the ICTTD held a congress in Antwerp on studies carried out worldwide on the subject of immunology. The international review *Parasitology Today* has published the contributions of experts who attended the event, together with a poster illustrating the different mechanisms by which ticks are able to infect livestock.



# Benzene in the city

**Benzene concentration levels in urban areas reach increasingly high levels the further south you travel in Europe. Such is the finding of a study carried out in six European towns by the Joint Research Centre's ERLAP laboratory. This makes the Commission's recent proposal for an "air quality" directive all the more pertinent. For the first time, the directive would put a limit on the presence of this carcinogenic compound in vehicle exhaust fumes.**

**T**he fight against benzene is about to be launched. Although the quantities of this volatile organic compound emitted by vehicle exhausts are small compared with some other pollutants (its presence is the result of the incomplete combustion of hydrocarbons in combustion engines), it is a known carcinogen and an important risk factor in leukaemia in particular. With no legal limit on benzene concentration levels, there had been few measurements to determine its presence in the air of our towns and cities.

It was to correct this situation that the European Commission's Directorate-General for the Environment (DG XI) asked the European Reference Laboratory for Air Pollution (ERLAP) - a body managed by the Joint Research Centre's Environment Institute at Ispra (I) - to undertake a major

Europe-wide measurement campaign. Known as MACBETH,<sup>(1)</sup> the project was launched in six test cities across Europe from north to south: Copenhagen (DK), Antwerp (B), Rouen (F), Padua (I), Murcia (E) and Athens (GR). A number of national partners were involved in the various countries.<sup>(2)</sup>

## The Radiello sensors

In order to measure pollution levels in urban environments, the ERLAP developed an innovative and particularly cost-efficient sampling technology. Comprehensive air quality measurements traditionally require quite sophisticated automatic devices whose recordings are automatically transmitted in real time for analysis. The high cost of these devices means that they are placed at only a limited number of locations. This limits the scope



*Innovative, very small, inexpensive and easy to install, Radiello sensors register nitrogen oxide levels before being taken to control stations*

for monitoring air quality over large areas.

"In order to overcome this problem," explains Emile De Saeger, the ERLAP director, "we developed ultra-simplified pollution sensors, known as diffusion sensors, which can be used to detect various air pollutants. No bigger than a small test tube (7cm long, 1 cm in diameter), they contain an absorption material which is able to capture the pollutant by means of molecular diffusion. The cost of the Radiello sensor is minimal - about five euros - which means they can be installed over a very wide area. After being left for a few days, the samples are collected and the absorption levels analysed in a laboratory. Genuine pollution maps can then be drawn up."

## In the street, the home and on the person

The Radiello sensors allowed the MACBETH researchers to carry out a triple analysis of benzene pollution in the six European towns. Observable atmospheric concentrations were measured at different locations in the town, in the home and directly on the person in order to measure the exposure of individuals.

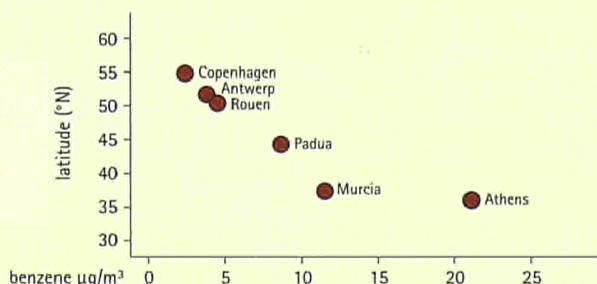
"During the six observation periods, carried out during a five-day period on each occasion, fixed sensors were placed in different urban areas (100 sites per town), in the homes of non-smoking volunteers (50 inhabitants per town) and on the person of these volunteers. We monitored two groups of people. One group consisted of a sample of the population that would normally be subject to only average or low direct exposure to automobile traffic, as they spend a large part of their time indoors, notably students and their teachers. The other group were people whose jobs involve a high risk of exposure, such as bus and taxi drivers and highway maintenance workers.

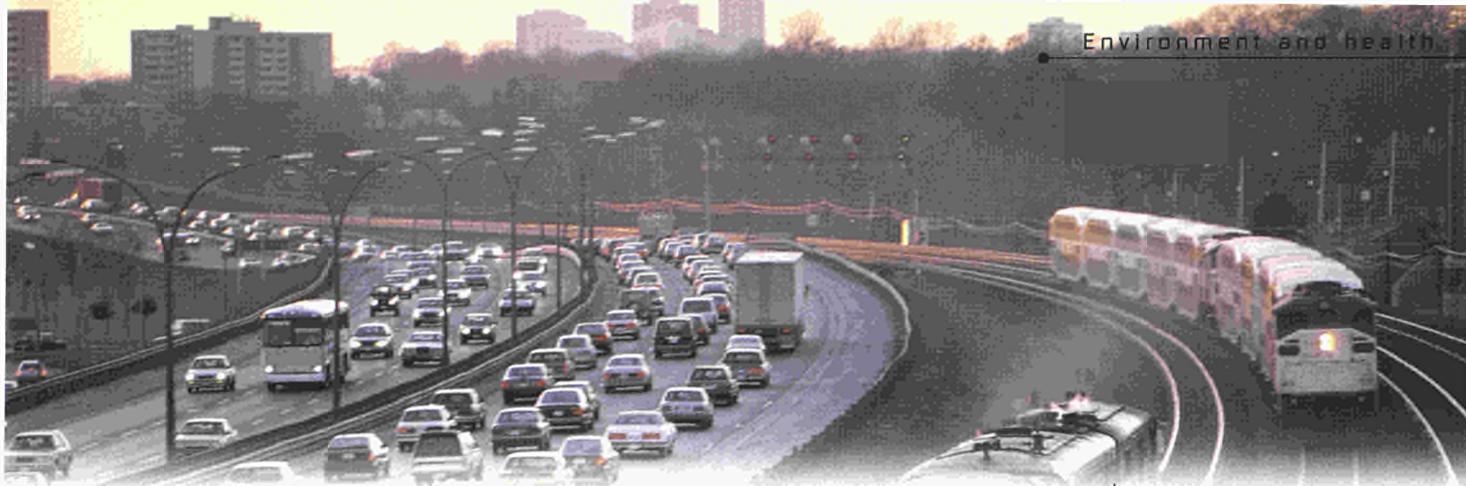
## Inequality of risk exposure

The MACBETH results were presented at the international conference on air quality in Europe,<sup>(3)</sup> held in Venice from 19 to 21 May

## Benzene and latitude

The atmospheric concentrations of benzene due to urban traffic currently range from 3.3  $\mu\text{g}/\text{m}^3$  in Copenhagen to 24.9  $\mu\text{g}/\text{m}^3$  in Athens. The objective set by a proposal for a European directive: 5  $\mu\text{g}/\text{m}^3$  by the year 2010.





1999. They showed the extent to which the people of Europe are far from equal in the face of the benzene threat. Levels range from an average of  $3.3 \mu\text{g}/\text{m}^3$  in Copenhagen to  $24.9 \mu\text{g}/\text{m}^3$  in Athens. There is a clear increase in benzene pollution as you travel southwards across Europe. A number of variables must be taken into account to explain this difference, including, no doubt, traffic density and flows, the influence of climate and weather, lifestyles and the structure of the built urban environment.

There was another clear finding: benzene concentration levels are generally – and paradoxically – higher indoors than outdoors. This is a factor which must certainly be taken into account in future. For the rest, the harmful effects of certain high-risk jobs was confirmed.

### The car and the town called into question

The MACBETH study lends support to the European Commission's policy on air quality. In December 1998, the Commission submitted a new proposal for a directive which, for the first time, will set a benzene concentration limit. The proposed objective is to reach what is seen as a precautionary limit of  $5 \mu\text{g}/\text{m}^3$  urban air by 2010. "Our results show that meeting these concentration levels should not pose major problems in northern Europe," explains Emile De Saeger. "On the other hand, the alarming levels recorded in southern towns mean that a much more strenuous effort is going to be needed there." In this respect, the Commission's proposal includes a plan to assess

progress in implementing the directive in 2004.

What weapons are available to the urban authorities in combating the benzene threat? These naturally relate to the complex debate on the place of cars in towns. Part of the solution can come from improving combustion engine technologies and the reduction of harmful emissions. On the other hand, draconian measures to limit traffic – such as those already applied in large cities such as Paris and Athens when pollution levels peak – have certainly shown their effectiveness. They have also met with a much more positive response among the population than had been expected. In any event, this is an issue which calls for reflection on both dissuasive policies, such as traffic flow measures and perhaps charging for vehicle

*Improving vehicle technology, implementing dissuasive traffic-flow policies in urban areas, promoting alternative transport. These are just some of the weapons against harmful emissions.*

access to towns, and the promotion of alternative means of transport. ■

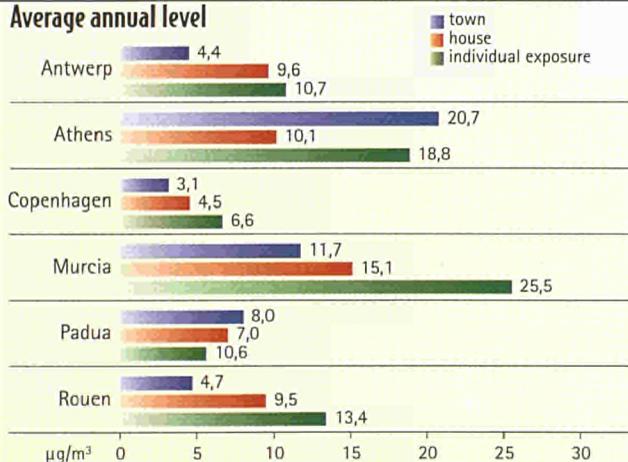
(1) Monitoring of atmospheric concentration of benzene in European towns and homes.

(2) Fondazione Salvatore Maugeri (I), Milaundersøgelser (DK), Universidad de Murcia (E), Vlaamse Instelling voor Technologisch Onderzoek (B), Institut National de l'Environnement et des Risques (F).

(3) "Air quality in Europe: challenges for the 2000s": this conference was jointly organised by DG XI, the JRC and the Fondazione Salvatore Maugeri.

## Benzene in European towns

Average annual level



Contact | Emile De Saeger, ERLAP  
E-mail: emile.de-saeger@jrc.it

## The ERLAP, the reference for air in Europe

Set up jointly by the Directorate-General for the Environment (DG XI) and the Joint Research Centre in 1994, the ERLAP's principal task is to assist the European Commission in drawing up directives on air quality. It also coordinates, at European level, the harmonisation of measures between national control networks for the implementation of all the Community regulations already in force. The ERLAP has advanced instrumentation for analysing the most diverse atmospheric pollutants, including two mobile laboratories. It also carries out pilot studies, such as the one described above on benzene detection.

# Desertification: identifying the symptoms to administer the cure

*The Mediterranean countries are under threat from a creeping desertification. Urgent policies are needed to protect and restore the most seriously affected areas. But what are the criteria to adopt as a basis for drawing up an objective list of priorities for action by the regional land use managers?*

It is in this area that the complex and detailed research carried out under the wide-ranging European project MEDALUS (Mediterranean Desertification and Land Use) is leading to a useful transfer of results by developing a set of desertification indicators. These are providing a precise diagnosis of the present state of the environment to formulate effective recovery strategies.

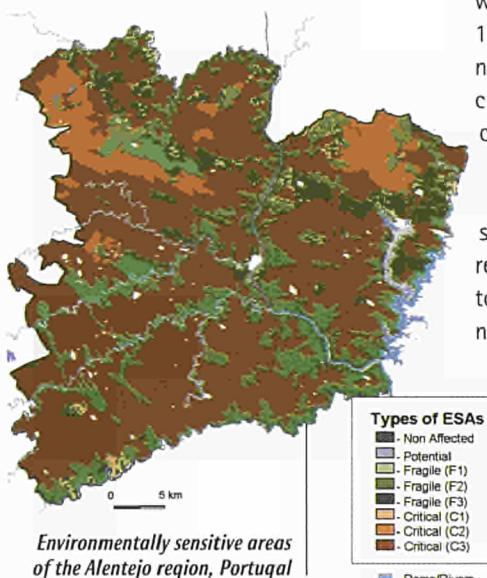
MEDALUS was launched in 1991 and its third phase will end this year. During these eight and a half years, some 50 different research groups have been supported by the EU to investigate a huge range of problems relating to the physical causes and consequences of desertification, degradation and recovery in Mediterranean Europe. At field sites from Portugal to Greece, MEDALUS has monitored physical processes and properties in soil, water and vegetation. Simulation models have been developed to look at scenarios of further degradation and recovery, coupling these with models forecasting long-term climate change.

In four regional target areas - Alentejo in Portugal, the Guadalentín basin in south-east Spain, the Agri basin in southern Italy and on the Greek island of Lesbos - the researchers have also combined physical monitoring and modelling with investigations of past and present land uses. Finally, they have been active on a Mediterranean-wide scale using remote sensing, general circulation models and large-scale physical process models.

## A tool for land use management

"A constant theme running through the project has been the reduction of the many processes and properties of the semi-arid landscape, which govern its sensitivity to

change or indicate its state of degradation, into a handful of the most important ones, the desertification indicators," explains Dr Jane Brandt from King's College, London, project manager of MEDALUS. "The long-term intention in doing this, from the start of the project in 1991, has been to provide the land use managers with tools they might use for exploring the consequences of different land use changes on their environment."



*Environmentally sensitive areas of the Alentejo region, Portugal*

Underpinning all the work on indicators has been the field research programme. A total of 55 different parameters relating to atmospheric, vegetation and land use, soil and surface processes have been routinely monitored at the various sites. This work has been supported in two ways. First, there was the attempt to standardise field methods in these semi-arid, stony environments, by producing a manual of experimental protocols. This manual has since been used at all the field sites, thereby ensuring com-

parable results. A second handbook was also produced which discusses the identification of the critical thresholds of each of the parameters or processes and the derivation of the desertification indicators.

"From this huge base of observations, which in some cases contains seven years of data, we have been able to identify a first set of those parameters which provide the best indicators together with their critical thresholds," says Jane Brandt. "For example, we can say that a soil depth of more than 15 cm is generally essential for the maintenance of perennial vegetation. Vegetation cover is another useful indicator and a cover of more than 40% will virtually eliminate the risk of soil erosion.

"This work does need to be taken further still. We are currently engaged in a major review of all the field protocols with a view to further refining the experimental techniques and removing those which have not been shown to be particularly useful. We also need to continue the work on the critical thresholds, because some have been shown to be variable across the Mediterranean region. For example, while a critical threshold for annual rainfall of 280 mm is a good indicator for desertification on Lesbos, it needs to be lower for the Guadalentín."

## Sub-regional approach

The second area in which MEDALUS has contributed to desertification indicators is on a sub-regional scale thanks to pilot studies of the technique conducted in the four target areas. Here, a reduced set of parameters, derived from the field programme, were combined using a system of differential weighting to derive four quality indicators relating to soil, climate, vegeta-



tion and management. From these, the researchers produced maps of environmental degradation for the Agri basin, the Guadalentin basin, the Alentejo region and for Lesvos.

"In the future, it is our hope to repeat this exercise, a number of times, in other areas of Portugal, Spain, Italy and Greece. In doing so we hope to find out which of the indicators we have developed can be universally applied across the Mediterranean region, and which need to be adapted to suit local conditions. Once this is done they can be used both for long-term monitoring of desertification (or recovery) at key research stations, or used in the management of affected areas."

Finally, MEDALUS has been active on a Mediterranean-wide scale. In this case, the project aimed to produce a regional degradation index for the whole Mediterranean basin. The index finally chosen is the potential for soil erosion, calculated from a physics-based simulation model with inputs of climate, vegetation cover, topography, and soils and geology. This has been used to identify areas with unacceptably high current rates of erosion and also areas with high sensitivity to increased erosion rates given potential changes in climate or land uses.

### Further research

In the immediate future the work is likely to remain in the research domain because there are a number of elements that need addressing in order to improve its spatial resolution. There is also a need to look at the much closer integration of bio-physical and socio-economic indicators. "One way of doing this is to develop function performance indicators," says Jane Brandt.

*The rural exodus is emptying the villages and the abandoned land is no longer cultivated. Man - and his mismanagement of the areas he inhabits - is the main cause of the alarming spread of desertification.*

*Soil formed on shale formations largely degraded by erosion (Sardinia).*



## More than just advancing deserts

Desertification is not only a matter of the process at work on the edges of the world's major deserts which are constantly advancing. It is also occurring increasingly in traditionally populated and cultivated areas throughout the world's arid and semi-arid regions. For scientists, the word desertification means above all the increasing degradation of the soils which govern the delicate balance of ecosystems in these regions where rapid erosion is leaving barren expanses where no vegetation will grow.

This degradation has serious consequences, and in particular on the water cycle. Water resources are drying up and water shortages are now threatening densely populated urban centres. With nothing to restrain it, the run-off following torrential downpours further aggravates the erosion in addition to causing flooding of extreme violence even in the heart of the towns and cities.

Periods of drought, which play a major role

in the process and detection of global warming, are the subject of growing concern. But it is not enough to simply observe the phenomenon. It is in fact man himself - and his mismanagement of the areas he inhabits - which is the main cause of the alarming spread of desertification. The rural exodus is emptying the villages and the abandoned land is no longer cultivated. Vast areas are laid to waste by repeated forest fires, in some cases the situation made worse by the annual influx of tourists. In the more fertile valleys the agriculture is intensive, using large amounts of water, fertilisers and pesticides. Finally, around the major urban areas often anarchic housing and industrial developments have swallowed up large areas of the natural environment.

In order to combat desertification it is first necessary to understand the determining impact of the way a region is managed and administered.



## A global campaign

250 million people live in regions seriously affected by desertification. A billion others – including almost 400 million in Africa – are under threat. The rich countries are also affected with at least 18 industrialised nations facing serious problems. The mobilisation of European research to combat this phenomenon in the Mediterranean countries is part of a global campaign. The problem was identified as an essential priority for international cooperation at the 1992 World Conference on Environment and Development in Rio de Janeiro. In 1994, more than 100 countries

ratified the first *United Nations Convention to Combat Desertification*, which entered into force in 1996. The signatory states undertake to jointly conduct systematic action programmes to push back the frontiers of desertification wherever possible. The rich countries have committed themselves to providing financial and technical assistance to African countries where the process has reached a critical stage.

[www.unccd.ch](http://www.unccd.ch)

"All parts of the landscape perform a function, be it wheat production, soil and water conservation, or bio-diversity maintenance. The desertification of a landscape can be quantitatively measured in terms of its loss of function. For example, should erosion reduce the soil depth to such an extent that cereals can no longer be cultivated, its loss of function can be quantified. Similarly, the sensitivity to loss of function can be quantified. A functional approach also enables areas which are physically or socio-economically dissimilar to be compared."

Indicators of desertification have been the subject of much recent debate worldwide since the new United Nations Convention to Combat Desertification was ratified by more than a hundred countries and entered in force in 1996. "This really is an important starting point," concludes Dr Brandt. "The major limitation to current research on indicators has been the absence of a forum within which to work with managers and to test whether the tools work. However, things are now changing rapidly in the desertification world with the emergence of new bodies specifically charged with controlling Mediterranean degradation and restoring the ecosystem. The way is becoming open for the further transfer of research results into effective environmental management." ■

**Contact** | Jane Brandt  
MEDALUS Project Office, UK  
Tel. Fax: +44 1635 876015  
E-mail: [medalus@medalus.demon.co.uk](mailto:medalus@medalus.demon.co.uk)

## Global change, climate and biodiversity

From 1996 to 1999, Medalus (phase III) has been funded by the Environment and Climate programme. Desertification was a high priority for European environmental research under the Fourth Framework Programme, which supported some 20 other scientific projects in this field, almost all concerning southern Europe. This priority is fully taken up by the new Fifth Framework Programme,

notably under the Key Action *Global change, climate and biodiversity*.

**Contact** | Denis Peter and Panagiotis Balabanis  
E-mail: [eesd@dg12.cec.be](mailto:eesd@dg12.cec.be)  
[www.cordis.lu/eesd](http://www.cordis.lu/eesd)

# So the cork doesn't spoil the wine



*The disappearance of cork production would hit many jobs and SMEs in the often poorer southern regions of the EU.*

*Many corks undergo microbiological and chemical changes which impair the quality – or even the safety – of wines and spirits, with the danger that natural cork could be progressively replaced by synthetic substitutes. A European research project has patented an innovative new process which looks set to remove the threat.*

possibility of contamination by chemicals or micro-organisms.

"The poor quality of the water absorbed by the cork during washing, particularly in southern Europe, explains most of toxic – or even carcinogenic – chlorides present. In addition, some of the glue ingredients, such as tetrahydronaphthalene, have been shown to be responsible for changes to aromas, and also the disintegration and permeability of certain corks."



*An age-old tradition: could popping the plastic stopper on a fine champagne ever be quite the same?*

which is free of any unwanted ecological, toxic or sensory effects.

"We showed that initially exposing all the raw materials to microwaves effectively kills the micro-organisms. Better still, it substantially reduces chemical contamination."

This technology was recently patented and is to be integrated in the Portuguese and Spanish partners' production lines. "We have presented this innovation to French, German, Hungarian, Australian, Chilean, Argentinean and American wine producers. The response has been very positive. The first corks produced using this technology should be available next spring. It should not only save the cork-producing companies but boost their growth. The interest expressed by the principal customers opens up the prospect of further research." ■

*(1) Supported by the Brite-EuRam programme (Fourth Framework Programme).*

**T**he wine industry estimates the financial losses due to the chemico-microbiological deterioration of natural cork stoppers at more than 500 million euros a year. So it is small wonder that the industry is beginning to look for alternative synthetic solutions. "Research by the cork industry over the past 30 years has lacked any clarity of vision or genuine innovation. We have sought to make up for this deficiency," explains Dr Jens Jaeger of the Neustadt (Germany) Institute of Phytomedicine and coordinator of a CRAFT cooperative research project in this field. <sup>(1)</sup>

## Upstream research

In 1997, three cork-producing firms – Juvenal (Portugal), Oller (Spain) and Ohlinger and Buerklin (Germany) – decided to pool their efforts in order to find out why approximately 4% of corks – 500 million every year – seriously spoil the quality of the contents they are supposed to seal. First they analysed the upstream processes, and the way in which the cork sheets are left to stand a while in a warehouse to begin with and then boiled. The corks are produced from a combination of pure cork rings and a mix of compressed granules which are glued together. They are then chamfered, marked and waxed. At each stage in the production process there is the

## A patented innovation

Despite the efforts made in terms of water purification, glue quality and the speed of drying after gluing, the only way to significantly reduce the presence of such micro-organisms is to radically change present production processes. The partners therefore studied a new production method

**Contact** Jens P. Jaeger  
Tel.: + 49 63 21671328  
Fax: + 49 63 21671222  
E-mail: jaeger.jensp@t-online.de  
www.ohlinger.de – www.ifs.pt –  
www.6tems.com/oller/

# Fly-by-wire cars

*In the slipstream of the aeronautics industry, European research projects are developing new concepts in on-board automotive electronics systems. A fail-safe computer network with its own architecture and protocols will enable the car to steer and brake "by wire", in much the same way as modern aircraft.*

**T**oday, systems such as Brake Assist and Electronic Stability Program are already helping the driver keep control of a vehicle if he or she should react inappropriately. In future we shall see the introduction of much more active safety functions based on electronic intervention in the drive system, brakes, suspension and steering," explains Dr. Michael Franck, Director of Research at DaimlerChrysler. Dr Franck is coordinating two projects, Time-triggered-architecture (TTA) and X-by-wire - Safety-related fault-tolerant systems in vehicles, supported by the EU's Esprit and Brite-EuRam programmes respectively.

## New nervous system

As a result, within a few years, vehicles coming off the production line will have a completely new nervous system. Current car transmission technology is based on mechanical and hydraulic components and connections linking the gears, pedals and steering wheel to the steering column and drive shafts. These will be replaced by electronic actuators and sensors with optical fibre cables carrying data from an on-board computer network with its own architecture and protocols.

This computer network will relay input and control output with a precision and at a speed that could never be achieved by current technology under existing cost constraints. Drivers will get assistance in all situations in



*The test vehicle has electrical brakes on all four wheels that are actuated by the electronic system. The electric motors each build up a braking force of 40 kN within 150 ms - the distance it takes to cover 3 mm!*

a matter of milliseconds - before they know they need it, in fact. The result will be that they will be able to concentrate on the critical 'strategic' elements of their driving, free from the many routine tasks they now have to deal with.

The potential for increased safety is clear. But there could also be knock-on effects in the areas of making cars "greener" and keeping costs down. Getting rid of mechanical connections will mean better use of materials, more refinement of production processes, and more freedom of design in the interior of the vehicle. And the greater precision and accuracy of the new systems will mean less engine wear, better fuel economy, and easier maintenance.

## Backing up the system

"Drive-by-wire systems place high demands on the robustness and dependability of on-board electronics. And all the electronic control elements required must work together in an on-board network, communicate with each other and exchange data in real time," says Dr Franck. Otherwise there would be the risk of giving a whole new meaning to a computer crash!

Put simply, real-time systems have to do what they are told when they are told. It is no use delivering the correct output value at the wrong time, or providing the wrong value at the right time. This led to the underlying concept of time-triggered architecture (TTA) and the related

time-triggered protocol (TTP), two new concepts developed mainly by the Vienna University of Technology.

There is simply no room for error, and TTA is designed with that in mind. Input sampling, calculation and output take place at fixed times set at the design stage. This means that the transmission bandwidth can be limited at any of these points, and a system overload is impossible.

But if errors do occur, they must be contained within the subsystem, and must not be allowed to contaminate other parts of the network. "The core challenge is thus dependability, which we are achieving by means of electronic redundancy: two computers calculate the same functions at the same time in a



*The electric brakes on the test vehicle can be operated by the normal brake pedal or by a manually operated potentiometer for test purposes.*

dual network. Even if one computer should fail, the data from the redundant computer is immediately available," explains Dr. Franck. "In addition to a dependable power supply, the key element is thus an absolutely reliable real-time exchange of data between all units involved, via an appropriate data bus."

The big advantage of this approach, known as fail-silent architecture, is that a system-wide breakdown is impossible, so complex error-handling strategies are not needed. Each component knows what the other is doing, and can react accordingly. The whole car is smart. Intelligence is distributed throughout the system. As a result, the driver becomes more akin to the CPU (central processing unit) controlling the computer and the network. "Vehicle characteristics will in future be more strongly influenced by the installed software," says Dr. Franck. "A vehicle can thus be optimally adapted to operating parameters such as weather and road conditions and also take into account the individual wishes of the driver."

### **Commercial advantages**

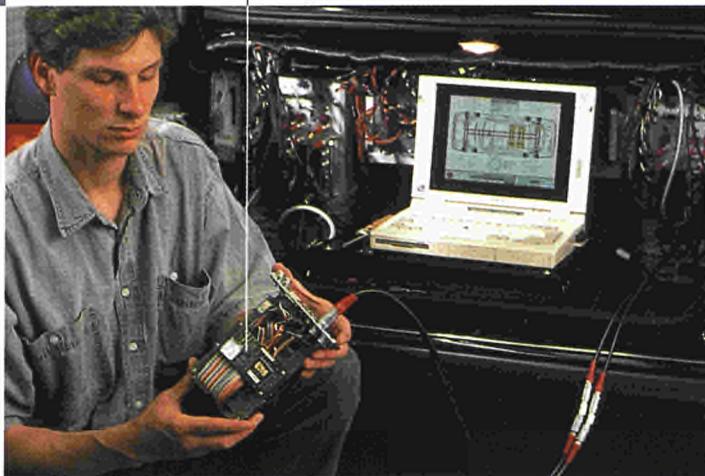
Despite the potential benefits, however, before these projects, no single vehicle manufacturer had been able to develop or introduce concepts like TTA and x-by-wire. The costs and the ini-

tial outlay were prohibitive. Yet developing by-wire systems could give the EU's car industry just the edge it needs in a sector where global competition is keen.

The two projects have brought together major car makers such as DaimlerChrysler, Ford Europe, Fiat and Volvo, as well as the avionics company British Aerospace (a member of the Airbus consortium), component and electronics producers like Robert Bosch, Mecel, and Magneti Marelli, and academic institutions including the Vienna University of Technology, the University of York, the University of Ulm and others from throughout the EU.

Future developments are certain to follow market acceptance. The basic mechatronic systems for steering, braking, acceleration and suspension will then have an electronic interface which allows easy adoption of new added-value functions by intelligent software combination of existing base functions. And because of the bus architecture, new smart sensors and actuators can easily be added to the system bringing increased safety. ■

*The TTP module on this circuit board is the heart of the electronics innovation. Its functions will be integrated into a computer chip as the development continues.*



### **Contacts TTA Project**

**Christian Scheidler, DaimlerChrysler**  
christian.c.scheidler@daimlerchrysler.com

**Javid Khan, DG XIII**  
mailto:javid.khan@dg13.cec.be  
www.cordis.lu/ist/ka4

**X-By-Wire Project**  
**Thomas Thurner, DaimlerChrysler**  
thomas.thurner@daimlerchrysler.com

**Daniel Chiron, DG XII**  
daniel.chiron@dg12.cec.be

## **Wider benefits**

The benefits of real-time, fault-tolerant safety systems based on time-triggered architectures are not limited to the automotive industry, and other transport sectors are certain to come on board, with the industrial process-control sector next in line after that. A demonstrator for the railway industry using the ELEKTRA interlocking system developed by Alcatel Austria has already been built.

Wider use of TTA technology could also generate a market for tools in a variety of possible applications (such as emergency shut downs for off-shore oil platforms, lift systems management in buildings and tunnel ventilation systems), and thereby create marketing opportunities for small and medium-sized enterprises. This is already the case for the Vienna-based TTech Computertechnik GmbH, a spin-off company launched in late 1997 after 15 years of research on TTA at the Vienna University of Technology. TTech is actively involved in and exploiting TTA components and tools.

[www.ttech.com](http://www.ttech.com)



# Eureka in search of a second wind

*During their annual ministerial conference, held in Istanbul on 28 and 29 June, the Eureka member countries decided to relaunch the European initiative.*

**F**ourteen years after its launch and some 2200 projects down the road, the Eureka initiative seems to have reached a turning point. With 27 member countries together with the European Union, Eureka implements a flexible approach and provides mixed public/private sector financing in order to develop research close to the market. This places the initiative in a good position for winning the favours of European industry. However, the number of projects submitted has been falling for a number of years now, as has funding from the Member States, down from EUR 550 million in 1993 to EUR 309 million in 1998. Although the number of projects under way at the end of 1998 (669) is comparable to previous years, the projects are smaller and there are fewer strategic projects.

## Four scenarios

The experts are divided on the significance of this trend: is it a fundamental decline reflecting a lack of interest in the concept or is it a more specific cyclical phenomenon, one which may prove short-lived? As an indication of the seriousness with which the situation is being taken, a group of experts was charged with evaluating the initiative. In their recently published report, the experts call on politicians to choose between four future scenarios, each given the name of a season, namely the status quo (autumn), cessation pure and simple (winter), reactivation (spring) or even the launch of a second generation Eureka designed to coordinate the innovation policies of member countries (summer). The report also stresses the utility of the initiatives, the success of the projects supported and the value of the network created. The participation of SMEs has also increased significantly over recent years.

Luke Georghiou, president of the group of experts, sees the present problems as to



*The spring scenario, the most optimistic of the four, aims to reactivate the initiative.*

some degree reflecting the limits of the bottom-up approach: "Throughout Europe we are seeing a reduction in the public funds allocated to industrial research. Eureka would benefit from regrouping its activities around a number of clearly identified sectoral or even regional fields in order to make it easier to attract the financial support of the public authorities." Jean-Pierre Chevillot, one of the report's co-authors, believes that: "The approach makes Eureka very sensitive to cyclical situations. I remain convinced that it is an interesting formula, and in particular of its necessary complementarity with the framework programme, but European research is seeking to find its way at the same time as Europe is continuing to integrate."

All of this must then be seen against the background of the complexity or even

ambivalence in the attitudes of the member countries to European research, torn between the need to develop transnational cooperation on the one hand and the desire to preserve a national margin for manoeuvre on the other.

## New synergies

The Commission, for its part, has taken a number of initiatives in order to draw maximum benefit from the synergies between the Fifth Framework Programme and Eureka. During the annual ministerial conference on 28 and 29 June, Edith Cresson expressed her desire to see a relaunched and revitalised Eureka. In Istanbul, the research ministers from the member countries committed themselves to combating the reduction in national funding and to opting for the path of "spring". Uwe Thomas, German Research Minister, announced a doubling of funds for participants from his country. The ministers also adopted a number of other measures, including the involvement of industry in managing Eureka, support measures for SMEs in the post-research phase, and increased financial synergy between Eureka and the framework programme. It will be up to Germany, which has succeeded Turkey in the Eureka presidency, to implement these measures over the next 12 months. ■

## How to launch a Eureka project

Eureka implements a flexible approach, in terms of fields covered and partnerships. Project ideas can be sent to the Eureka secretariat (see [www.eureka.be/home/whats/newidea.htm](http://www.eureka.be/home/whats/newidea.htm)) which will then forward them to the national secretariats of the countries involved. Following appraisal, the project is then submitted to the High-Level Group for a decision, after which it can be launched. New projects to be supported by the member countries are announced at the annual ministerial conference.