

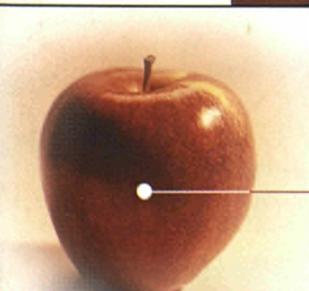


# Women in science, women and science



Information society

Interview with  
Nicholas Negroponte from MIT



Food and health

A Better diet for a Better life

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Two days of meetings to consider how to reinforce equal opportunities under European RTD programmes.



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Mrs Edith CRESSON, Commissioner for research, innovation, education, training and youth.

Directorate General XII - Science, Research and Development

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## A step towards the Fifth Framework Programme

Despite a very difficult context, on 12 February 1998 the Council of Research Ministers reached agreement on the Fifth Framework Programme. Thanks to the laudable efforts of the Presidency, the Council was able to arrive at a common position on the basis of the Commission's initial proposal, modified at the beginning of the year in the light of the European Parliament's amendments. However, I have very substantial reservations regarding this agreement.

Admittedly it makes it possible to keep to the agreed timetable - the importance of which everyone appreciates - and should permit continuity in the European Union's research activities.

Another underlying element is also welcome: the Council has largely confirmed the approach proposed by the Commission, an approach which constitutes a marked departure from previous framework programmes.

Nevertheless, the approved budget of ECU 14 billion is significantly lower than the Commission's and Parliament's proposals (ECU 16.3 billion and ECU 16.7 billion respectively). In real terms, this marks a reduction in the European Union's research effort compared with the Fourth Framework Programme. In addition to the negative signal which this sends to Europe's industry and its researchers, this amount jeopardises certain research activities, such as those of the Joint Research Centre. In the interests of European and European Union research, it is therefore essential to initiate an in-depth debate on the implications of this budget. Given the crucial importance of what is at stake, I am in no doubt that the debate will very soon demonstrate that the Commission's proposal and Parliament's position were both well founded.

*Edith Cresson*

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

# Women in science - women and science

*Why are women so under-represented in the world of technological research and development? Why does their career path often seem such an obstacle course and rarely lead to positions of responsibility? Over a two-day period, at the request of Edith Cresson, women in science will be looking at how to improve equal opportunities under European research programmes.*

**5** 2% of European higher education graduates are women, but science and technology subjects are taken by only 25% of female students. In France, 24% of physicists are women and 20% of mathematicians are women. In Sweden, 44% of doctorates in the biomedical field are awarded to women, but just 25% of them take a post-doctorate and only 7% teach at universities. In the Scandinavian countries, where one third of members of parliament are women, university chairs remain very much a masculine stronghold (96% male-dominated in Denmark and Sweden, 94% in Norway). In Belgium, 18 boys and just 5 girls made up the "class of 97" research graduates from the FNRS (Fonds National de la Recherche Scientifique). "In most Member States, there is no disputing the figures: the selection mechanisms in the world of science eliminate more women than men," declares Mary Osborn, lecturer at the Max Planck Institute for Biophysical Chemistry in Goettingen (Germany).



ment (see box). The name says it all. Women? One immediately thinks of equal opportunities, which the Commission has always considered to be one of the fundamental principles of European democracy and a major consideration in all its policy-making<sup>(1)</sup>. Science? In other words research and, specifically for the Commission at the present point in time, the drawing up of the

Fifth Framework Programme.

This meeting is therefore a response to the desire to increase the involvement of women scientists in R&D activities conducted throughout the EU. Partly because they are under-represented. But also because they bring a specific approach and sensitivity to the many questions facing Europeans today in health, biotechnology, the environment, education and other fields. A more active involvement of women in research will not only add to the available skills, but also broaden the content.

### Equal opportunities

Mary Osborn is one of the panel of scientists invited to attend the two-day Women and Science conference to be held at the end of April and organised by the European Commission in association with the European Parlia-

(1) In addition to the Fourth Community Action Programme for Equal Opportunities between Men and Women (1996-2000), the Council has adopted the Communication "Integrating equal opportunities between men and women in all the Community's policies and actions". The first annual report on Equal opportunities for men and women in the EU - 1996 is now available (ISBN 92-827-8238-7).

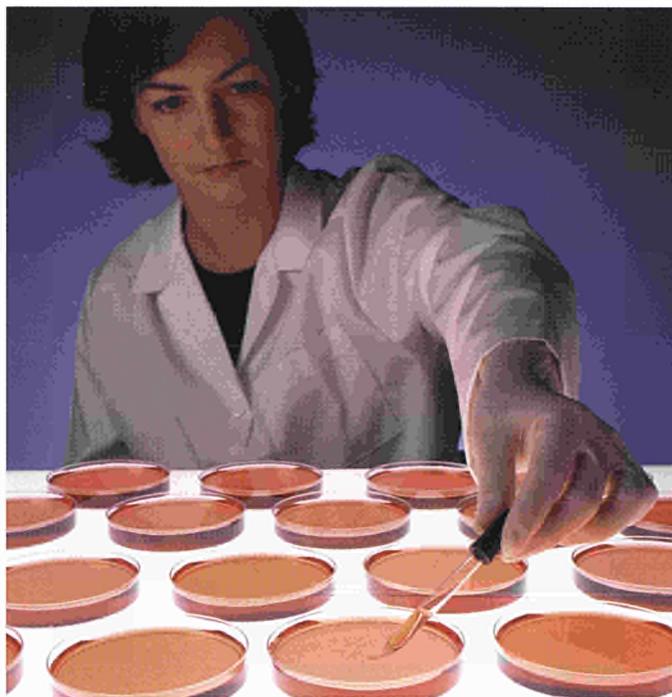


## A greater onus on women

In 1993, two European meetings made it possible to assess the situation of women and science: the seminar Women in Science, an initiative of the European Commission<sup>(2)</sup>, and the workshop The Under-representation of Women in Science & Technology, organised by the European Parliament's Scientific and Technological Options Assessment (STOA) unit<sup>(3)</sup>.

The reasons for the generally low percentage of women active in European research - even if the lack of statistics sometimes makes precise comparisons difficult - are many and complex. Participants at the Women in Science seminar identified the principle obstacles in the way of women researchers. Their conclusions have lost none of their pertinence today.

Women scientists, like all women, are faced with the dilemma of reconciling working life and private life, career and family. In their laboratories they most often find themselves assigned to male project leaders and decision-



*"A woman has to be twice as productive as a man in order for her skills to be assessed at the same level."*

makers who charge them with tasks offering little scope for creativity. This sets in train the whole mechanism. Women publish less and - as they also seem to prefer joint research and to publish their results as one of a team - their success remains more anonymous. "A woman has to be twice as productive as a man in order for her skills to be assessed at

the same level" (for example, publish three times as many articles in a prestigious scientific journal or 20 times as many in the specialist journal for her area) observes Christine Wieners, Doctor of Medicine at Gothenburg University, who will be raising the subject of sexism in sciences in Brussels. Women researchers travel less and attend fewer

seminars than their male colleagues, more rarely rise to positions of seniority, receive fewer prizes (they have received just 11 of the 441 Nobel Prizes for Science), and are more rarely members of international organisations or prestigious academies of science.

## Images and realities

Yet even if it is a difficult road, why is it that more women are not attracted to the exact sciences or to technology in the first place? No doubt because these disciplines suffer themselves from stereotypes which influence the choices made. They are too often seen as cold disciplines, disciplines where logic and rigour are the primary requirements - qualities wrongly viewed as being essentially masculine. Engineering is seen as a purely technical profession, when in fact it requires a keen sense of human relations. Women fill 20% of positions in science and technology in Europe today - at a time when they fill between 40% and 50% of jobs on the employment market as a whole.



## Women and Science

"Don't miss the Fifth Framework Programme's rendezvous with equal opportunities." Such is the objective of this two-day meeting during which Edith Cresson is inviting Europe's women scientists to report and reflect upon the situation of women in the field of research, and to submit proposals to improve their situation throughout the EU.

Two round-table meetings will take stock of the situation. The first will be attended by women scientists and engineers and chaired by Rita Levi-Montalcini, winner of a Nobel Prize for Physiology and Medicine. The second will bring together high level decision-mak-

ers chaired by John Battle, UK Minister for Science, Energy and Industry, and current president of the Research Council.

Various papers will be presented at the debate, by leading researchers and university lecturers (Mary Osborn, Christine Wenneras, Nancy Lane, Dominique Weis, Leena Peltonen, Huguette Delavault, Paola Manacorda), political leaders in the field of R&D, a sociologist (Hilary Rose) and a philosopher (Françoise Collin).

28-29 April 1998

Information - Fax : +32-2-296.42.99

"The progressive access of girls to science and technology subjects does not necessarily mean that the way is clear for them to pursue a career in science and technology," points out Françoise Collin, lecturer at the Collège international de Philosophie (Paris), who will be looking at the sharing of knowledge at the Brussels Conference. "Too often they are called upon to fill junior posts, to play an instrumental role, to carry out preparatory and executive tasks in projects which they do not manage. When they are innovative," she continues, "it is more difficult for their discoveries to find approval in the predominantly male scientific community, an approval which is



*A different approach to the world, and thus to research.*

essential for their legitimacy." (4)

### Female research ?

Do women scientists view their research differently from

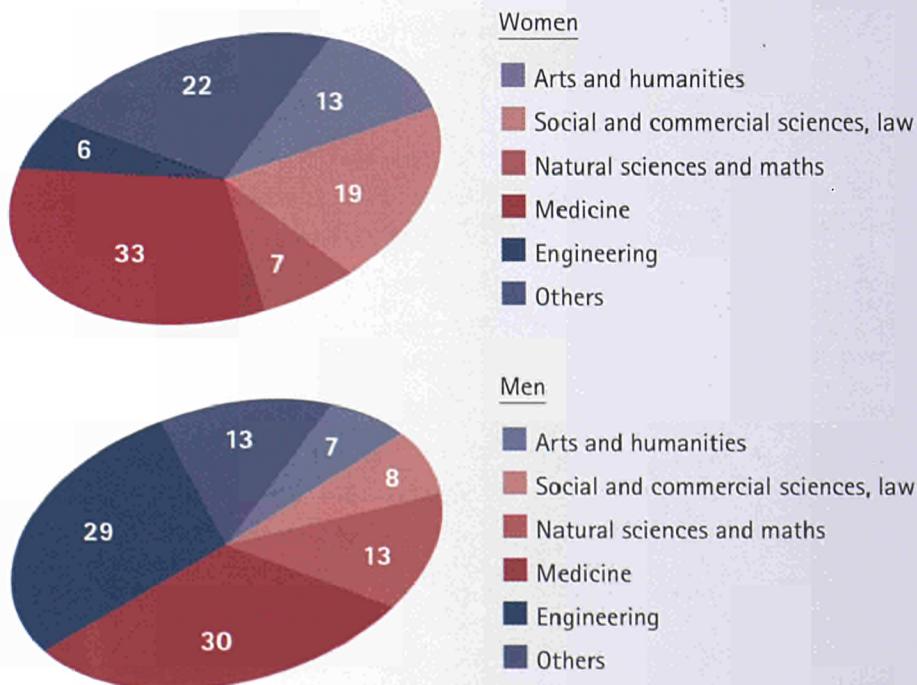
their male colleagues? Is their choice of subject different? Do they work differently? Do they expect something else from their projects? Is their career path inevitably at odds with the route mapped out by

men? The debate is open - and impassioned.

The feminist view, which is particularly prevalent in the Anglo-Saxon world, is that women approach the world - and thus the object of their research - in a manner which is both emotional and intellectual, investing it with their whole being. "There is no divide between knowledge and thought, or between thought and love. Subject and object become one in everything a woman undertakes. It is the same woman who looks, understands, desires, wants," writes Françoise Collin on the subject of this conception of knowledge.

"It is the admission of love, a recognition that the process of care shapes the product, which opens up the prospect of a feminist reconstruction of rationality itself as a responsible rationality - responsible to people and to nature

## Higher education graduates by fields of study (1991/1992 - EU 12)



Source : Eurostat

(2) *Women in Science*, European Commission, ISBN 92-825-7045-2

(3) Proceedings of STOA Workshop. *The Under-representation of Women in Science & Technology*; EP N° 177.698, February 1994

(4) *Le sexe des sciences*, Autrement, n°6, October 1992



*"The progressive access of girls to science and technology subjects does not necessarily mean that the way is clear for them to pursue a career in science and technology."*

alike," writes Hillary Rose<sup>(5)</sup>. A sociologist and emeritus professor at Bradford University (UK), she will also be looking at the causes of the "disaffection" of women with science at the Brussels conference.

Such a "gender" theory is not necessarily shared by all women scientists. "So-called fundamental science obeys an internal necessity, one which 'the subject of science', whether a man or a woman, whether black or white, whether rich or poor, cannot change in any way," believes Françoise Balibar, professor of physics at the Université de Paris VII. A speculative activity, founded on a vital passion, which Albert Einstein

himself would not deny: "I started Euclid at eleven ... It was one of the most important events in my life, as fiery as a first love. I would never have imagined that there was anything in the world so delightful." ■

(5) Hilary Rose, "Love, power and knowledge", Polity Press, 1994. Hilary Rose refers here to the feminist critique of science formulated by Mary Shelley, which speaks of the danger of knowledge disconnected from love, as opposed to Bacon who, during the Renaissance, traced the origins of science to its intimate connection with power.

## It all starts at school

Is it not at school that we first find the notion of a "head for maths" as being essential for the study of science? Even when the results are the same, the girls are more modest: 62% of them believe they have abilities in this area, compared with 72% of boys, according to a study carried out by the Association Femmes et mathématiques in 50 French secondary schools.

Is anything being done to change this self-image? The filming of science classes in Germany, the UK, and Portugal show that teachers reply more to questions from boys than from girls. Similarly, researchers from the Universities of Rennes and Dijon (France) found that science teachers devoted 20% more time to boys, were less likely to put questions to girls, and congratulated girls on their discipline and tidy work, while praising their male classmates for their reasoning abilities. "Girls are under-evaluated and less is expected of them - an attitude which they appropriate by excluding themselves from the competition. Maths and technology? Those are not subjects for them. Because girls are not seen as the builders of the nation," believes Boel Berner<sup>(1)</sup>, lecturer at the University of Linnköping (Sweden).

(1) Cited by Ingrid Carlander, *Le sexe des sciences*, Le Monde diplomatique, June 1997.

# A measurable impact

**More than 12 years after its launch, what is the impact and added value of Brite-EuRam, a key programme aimed at boosting industrial competitiveness? In the interests of greater transparency, the fifth evaluation of Brite-EuRam project results provides the answer.**

**"E**very ecu invested in Brite-EuRam research<sup>(1)</sup> produces a potential economic benefit of over four times that value within five years of the completion of the project." The point is made by European Commissioner Edith Cresson in her preface to the synthesis of this fifth evaluation study of projects completed during the 3rd Framework Programme (Brite-EuRam II 1991-94).

With its many graphs and extensive data, this 30-page report<sup>(2)</sup> summarises the 1995 study carried out by seven firms of independent consultants. They included in their analysis the new priorities set for the programme, such as taking into account environmental problems and the quality of life, the benefits of studies carried out by multidisciplinary teams, increased participation by SMEs, and the bringing together of partners from the fields of research and development.

## Performance and reality

There has been a very positive development in the performance of the projects evaluated. 88% of them lead to the commercial exploitation of results, with shorter intervals before products, processes, or services are marketed (26 months versus 30 during Brite-EuRam I). The quality of the projects is also improving, in economic terms and in terms of know-how. 50% of them include at least one SME (compared to 18% in 1989) and in two-thirds of cases an SME played a leading or coordinating role. This increase in SME participation shows the effectiveness of the stimulation measures, introduced in 1990 through the CRAFT programme, in order to facilitate the involvement of small and medium-sized enterprises in European projects by streamlining procedures, providing financial support, etc.



Most of the industrial partners interviewed (87%) nevertheless stress the difficulty of seeing their projects through to completion. Problems encountered include competition on limited markets, constraints of profitability at the manu-

facturing stage, access to financing, and difficulties in finding one or more partners with the right industrial or commercial experience to take the research through to a subsequent stage.

The Commission is currently evaluating the real economic impact generated by 800 organisations involved in the Brite-EuRam projects completed five years ago. This will supplement this study and permit further analysis of trends. ■

(1) Launched in 1985 with the focus on industry, Brite-EuRam aims to develop applications for new technologies and materials in traditional sectors.

(2) "Brite-EuRam: a measurable impact" is published by the European Commission and is available in English and French for the price of ECU 7. It can be ordered by fax on +32-2-296.67.57



## The impact in figures

### Scientific and technological results

75% of participants believe they achieved their RTD objectives either fully or to a large extent. 71% rated their results as "beyond ... the current state of the art" ("strongly beyond" for a third of them).

### Economic effects

The average economic gain per project within 5 years is estimated at ECU 16.3 million.

### Cooperation

92% of participants continue their partnership after completing their project. 71% of projects experienced "strong" or "very strong" cooperation.

### SMEs

50% of the projects included at least one SME. The economic impact on the SMEs resulting from these partnerships is considered "strong" in 41% of cases and "moderate" in 35%.

### Environment

Almost two-thirds had one or more result with a positive impact on the environment: energy saving (35%), material saving (33%), lower release of dangerous products (25%).

### Employment

36% of projects bring the prospect of direct job creation. The technologies developed involve training for their users in more than 40% of cases.

### Health and working conditions

Among the positive benefits in this area, resulting from some 50% of projects, are safety of use (28% of these projects), quality of the working environment (27%), biocompatibility or the production of less dangerous products (18%), and various other factors (predominantly stress reduction).

# Laser makes light work of cleaning up the past

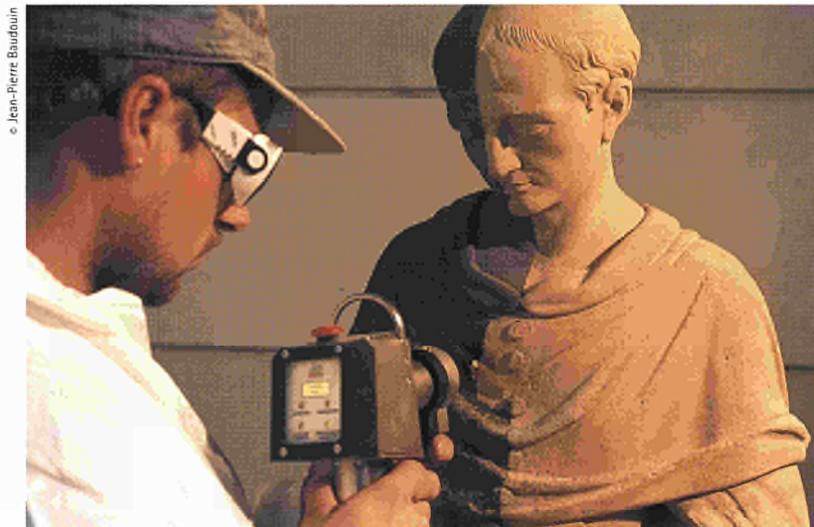
*A laser beam, carried by an optical fibre, erases the mark of time. Developed to clean buildings, in particular the masterpieces of our cultural heritage, this innovative technology was unveiled at the Brite-EuRam conference in Toulouse last October. Now it is giving Brussels' Town Hall a much-needed facelift. We trace the history of a customised development.*

**F**our minute spots of light act like a magic eraser. The sculpture turns from black to white before your eyes. The laser beam keeps at it, restoring to life all the vital details - a piece of jewellery, an embroidery. Some parts remain grey, the misshapen traces of cement bearing witness to earlier, clumsy attempts to restore the figure of Henry IV to its original glory. Along with 20 of his contemporaries, the King of France is one of the first batch of some 150 sculptures which normally adorn Brussels' Town Hall - the heart of the

Grand' Place, which French writer Jean Cocteau once described as the world's most beautiful theatre. It is to Deinze (Belgium) and the workshop of the SME, MRT, that all the statues from this neo-gothic building have been brought to receive this gentle facelift. MRT uses a laser technology specifically designed for cleaning the historic buildings and monuments which are such a vital part of our cultural heritage.

## Restoring without destroying

"All these sculptures are made of limestone, which is



Brussels - A facelift for the Town Hall's statues

very fragile. Using laser technology we are able to undertake a perfect cleaning, secure in the knowledge that we will not be causing any damage to the material. The beam of light is absorbed by the dull areas and the dirt literally explodes. When this dirt has disappeared and the beam comes into contact with a clear area it is deflected, producing no effect. The principle is as simple as that," explains Dirk Leeuwerck, manager of MRT.

Known as the LAMA (Laser Manuportable), this tool is the

fruit of a European partnership supported by the Brite-EuRam programme. Coordinated by GTM Construction (France), between 1993 and

France first began to look at how to apply this technology to restoring historic buildings. Professionals in this sector, such as experts from the Jaulard company, a subsidiary of GTM Construction, soon realised the potential benefits of this system. They believe that the "hard" methods (high-pressure water, sand blasting, hydro sand blasting), which are frequently used because of the low cost (ECU 15/m<sup>2</sup>), are too hard on both the building and the environment. At the same time, they appreciate that the cost (ECU 450-1500/m<sup>2</sup>) of the more effective "soft"

1996 this ECU 3.5 million project brought together two SMEs specialising in the restoration of historical works (Jaulard, F and Trivella, IT), two manufacturers of lasers for scientific instruments or industrial applications (Quantel, F and Unilaser, PT), and three research centres (the CEBTP, F, the LNEC, PT, and QUASCO, IT) <sup>(1)</sup>.

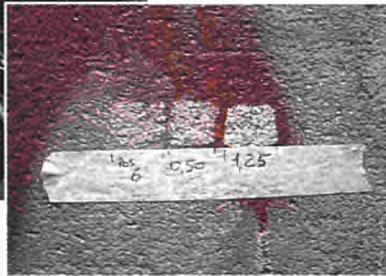
The effect of a laser beam on dirt has been known since the early 1970s, which is when various research teams in Italy, Great Britain, and

methods (spraying, micro sand blasting, chemical processes) means that they are only going to be used for objects of high value. Meanwhile, the intermediate solutions, such as "erasing" which costs between ECU 30 and ECU 75/m<sup>2</sup>, remain abrasive.

None of these methods is therefore totally satisfactory. "Attacking the stone during a cleaning operation often means attacking the protective layer - the stone's 'epidermis'," explains Jean Weiss, technical manager with the



Rome - Cleaning up graffiti : state of damage and parameter determination test.



GTM group. "Such an operation actually makes the stone more vulnerable to subsequent pollution and thus reduces the building's life." The partners in the LAMA project are counting on the laser to preserve our visible history. <sup>(2)</sup>

### Customised laser

"The first stages of the research into the use of the laser concentrated on analysing the relationship between the underlying object and the dirt," continues Jean Weiss. "These two elements are inseparable because the aim is to erase the effects of time without damaging the object. For each there is a 'threshold' density of luminous energy, above which an ablation effect is produced." Fortunately, in most cases the threshold for the dirt is lower than for the material underneath, meaning that the energy density used must be between these two values.

A hundred samples of stone (limestone, marble, granite, etc.) bearing different types of dirt (vegetal, urban, paint traces, etc.) were meticulously analysed (density, coefficient of water absorption, nature of dirt, etc.) before undergoing cleaning tests using various methods: from the very lightest, such as atomised water and micro sand blasting, to the most aggressive such as hydro sand blasting and high-pressure washing, and, of course, the laser. The latter very often proved the most effective: no damage to the stone, no abrasive effect, no excessive decoloration, no change in the texture. "We experimented with various laser parameter combinations - wavelength, energy density, duration of impulses. On this basis we then built two prototypes which were tried out in practice, most notably on Milan's cathedral and the Strozzi Palace in Florence," explains Adolf Pasetti of the Centro Studi Trivella.

### Optical fibre, flexible beam

"The research had to be aimed at increasing the average strength of the sources and achieving a uniform spread of energy over the area being treated," explains Jean Weiss. "This is why, instead of using mirrors, we concentrated on the possibility of using fibre optics to transmit the beam. This option provides better quality, as there is no risk of cleaning too much at the centre whilst forgetting the edges, and speeds up the cleaning process significantly by increasing the proportion of the source energy reaching the target. It also makes for a highly manoeuvrable device and better ergonomics."

### From cultural heritage to industry

The LAMA comes in the form of a particularly handy kit. On the ground you have the laser and its cooling unit (two small cubes which can equally well be placed on scaffolding). The operator holds only a tool weighing around 1 kg, about the same as a light video-camera, and running between the two is a cable 10 to 12 metres in length protecting the optical fibres. "That did not stop us from making a demonstration, in the Lebanon, on steles at the top of a cliff. The machine stayed at the bottom, the cleaning was done from a

facade elevator at a height of 70 metres, the fibres being extended by this same distance," explains Philippe Aubourg, marketing manager with the Quantel company, the French SME which makes LAMA.

The Lama laser provides the same quality as the "soft" techniques but more cheaply and quickly (1m<sup>2</sup> per hour, on average). The technology could find other applications in industry (cleaning moulds in the glass-making and plastics industries, for instance) and - thanks to the use of fibre optics - in the more specialised field of nuclear decontamination.

In the meantime, in 1997 the LAMA was awarded the ALTRAN Foundation prize for innovation (France) as a new technology "in the service of man's past and humanity's cultural heritage." ■

(1) Centre expérimental du Bâtiment et des Travaux publics - Laboratorio nacional Engenharia civil - Qualità Sviluppo del Costruire.

(2) It is, however, up to the heritage experts to decide in each particular case whether the laser technique can be used without causing any damage in the long or short term to the historic buildings to be cleaned.

Contact | Jean Weiss  
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# Bridging the research-industry divide

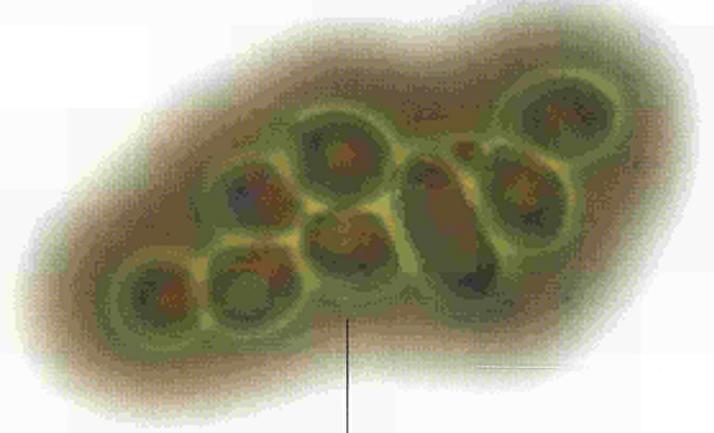
*In order to make the most of the results of the advanced research it supports, the Biotechnology programme has encouraged an original system of thematic industrial platforms within which groups of European enterprises can closely monitor and participate in current projects.*

**T**issue plasminogen activator, now used very widely in the treatment of cardiovascular disease, originated in the scientific studies carried out by the Katholieke Universiteit Leuven (Belgium). But it was a US pharmaceutical company which developed the product on an industrial scale and now markets it worldwide. This is just one example of an unfortunately common European paradox: the results of many successful European research projects are developed elsewhere.

Although there are many reasons for this "innovation drain", one of them is most certainly the continuing divide between the academic world and industry, a divide which acts as an effective obstacle to the transfer of knowledge. To help remedy the situation, for a number of years now the Biotechnology programme has been busy successfully setting up industrial platforms (IPs). IPs are liaison structures centred on various research topics which provide the opportunity for groups of biotechnology companies to discuss and, if necessary, cooperate with researchers involved in projects under the Biotechnology programme.

## **A first: the YIP**

The first IP was launched shortly after the idea was first



*Sacharomyces cerevisiae (yeast) cells. The ambitious project for yeast genome sequencing and function analysis was at the origin of the first IP.*

envisaged in the framework of the Green Industry Biotechnology Platform (plant biotechnology). This was the start-up of the ambitious project for yeast genome sequencing and function analysis. Anxious to speed up the process of capitalising on the results obtained, in March 1990 the Commission invited the biochemical, pharmaceutical and agri-foodstuffs industries to get together with the scientists working on the project in order to assess its potential impact. The meeting gave rise to the YIP (Yeast Industrial Platform). This model IP is concerned with the commercial exploitation of the most promising results and helping to overcome the difficulties which stem from the diversity of regulations which apply in the various Member States. From intellectual prop-

erty to environmental protection, where the use of certain biological materials poses a potential threat, a wide range of issues are taken up with European authorities and solutions proposed.

"Industrialists have expressed great interest in this type of association, as proved most notably by their increasing financial contribution to the funding of research projects," points out Anne-Marie Prieels, a biochemist appointed by the industrial partners to manage the coordination of a number of platforms. "Certain budgets, such as the one to maintain the collection of yeast strains, are partly funded through annual subscriptions paid by YIP members."

## **Access to the results**

There are now eleven (see table) of these IPs, all of them independent of the Commission and self-financed. They

make it possible for industry to follow EU-funded research closely and can also help encourage the direct participation of industries in the Biotechnology programme. Set up around specific themes, they bring new prospects in very diverse fields. Examples include the development of new drugs and antibiotics, in particular in the wake of the *Bacillus subtilis* genome sequencing programme (BACIP), various developments connected to the project to develop in vitro tests in order to reduce - or even eliminate entirely - the use of laboratory animals (IVTIP), and the exploitation of the results of the study of the lactic bacteria responsible for many fermentations of fundamental importance for the agri-foodstuffs sector (LABIP).

"The IPs guarantee their members access to results, prior to publication, and to confidential data bases. The information is conveyed at meetings with the promoters of this research. These meetings also allow the parties to exchange opinions and interests," explains Anne-Marie Prieels.

Many IPs have also set up coordination units which distribute among their members the results sent in by researchers and, if necessary, prepare a concerted response by industries with a view to possible applications.



*Encouraging a global approach to the health problems linked to the ageing population.*

### Customised transfers

Although all the IPs have the same "transfer" or bridging mission, they each define their own specific objectives and working methods. The BBP (Biotechnology for Biodiversity Platform) for example, brings together representatives from the agricultural production and farm animal sectors, managers of zoos and botanical gardens, and environmental management officials. The uniting factor being that they are all concerned with safeguarding the diversity of the genetic heritage of the living world. This platform functions as a forum for dialogue between molecular biologists and the users of their discoveries. In response to the latter's demands, the researchers have standardised practices for analysing biodiversity, resulting in a method patented and marketed by the Qiagen company.

HAE2000 (Healthy Ageing Europe), set up in 1997, is even more open. Members of this platform promote a global approach to the health of Europe's increasingly ageing population, one which takes into account preventive and treatment aspects together with improvements in living

conditions. This platform not only includes the pharmaceutical and agri-foodstuffs industries and academic institutions, but also telematics companies seeking to produce products to facilitate the autonomy of elderly people, consumer organisations, and other groups.

### Influencing European choices

The industrial platforms also provide an operational bridge between the world of enterprise and the European Commission. The industrial partners within an IP are better able to bring their opinion to bear on the Union's present and future strategies in the field of biotechnologies. This

European dimension also allows them to tackle global problems such as regulations on the use or marketing of certain products.

Although IPs are experiencing growing success in the industrial world, the role of the SMEs remains modest and their participation must be encouraged. As biotechnology is "one of the most important technologies for the future, one likely to experience a sustainable, environmentally friendly development"<sup>(1)</sup>, it is one of the priorities in the *Improving the quality of life and the management of living resources* component of the

Fifth Framework Programme, in particular through the key actions *Health, food and environmental factors*, *Control of viral and other infectious diseases* and *The "cell factory"*. The platforms are therefore set to continue to develop (a new IP is being prepared in the field of neuroscience) and to assume their role as bridging mechanisms. ■

(1) *White Paper on growth, competitiveness and employment*, European Commission, 1994

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Research theme	Acronym	Date founded	Number of organisations
Yeast genome sequencing and analysis	YIP	1990	19
Animal cell technology	ACTIP	1900	28
Lactic bacteria	LABIP	1991	30
Plants of industrial interest	PIP	1992	27
Development of in vitro tests	IVTIP	1993	17
Bacillus subtilis genome sequencing	BACIP	1994	8
Farm animals	FAIP	1995	35
Microbiology	IPM	1995	15
Biotechnology for biodiversity	BBP	1995	25
Structural biology	SBIP	1996	15
Europe's ageing population and health	HAE	1997	71

# Seeing is believing

*The concept of Demonstration Projects is a special feature of the three Life Sciences and Technologies Programmes (Biotechnology, Agriculture and Fisheries, and Biomedicine and Health Programmes). The intention is to provide each of them with its own appropriate mechanism for the exploitation and dissemination of new technologies.*

**T**ypical objectives of the current Life Sciences demonstration projects include using pilot testing on children and adults to prove the beneficial value of probiotic products to an audience of industrialists, consumer organisations, and authorities; and the clinical validation of a new device for real-time monitored, minimally-invasive brain surgery (see boxes below for more examples).

## The need for a realistic scale

In the field of life sciences and technologies, many difficulties are encountered between an idea for an application, resulting from research, and turning this idea into a new product, process, methodology, or clinical practice. Before adopting such ideas, decision-makers at all levels (policy makers, regulatory authorities, industrialists, venture capitalists, medical community, etc.) often need to observe its technological and economic advantages on a realistic scale. This process entails a funding gap between the development of the concept and the proof of its feasibility by a working prototype.

Demonstration projects, i.e. pilot projects, networking producers and users of the technology (i.e. industry, researchers, control agencies, clini-

cians, retailers, authorities, etc.), aim at bridging this gap. They are able to elicit the attention of all potentially interested parties and to facilitate, through this validation phase, the transfer of the novel technology from the laboratory to the market or clinical practice.

## Removing uncertainties

This type of project is particularly appropriate when the uncertainties and risks associated with innovation might discourage potential users from adopting a newly developed technology. Such uncer-

tainties might appear, for example, when new technologies have to replace well-proven existing practices, when there is a need to show compliance with regulatory requirements and market standards, or when the negative public perception of technologies such as genetic engineering seems to be a deterrent for its application by users.

In contrast to traditional research projects, the Demonstration Projects aim to use available *pre-competitive* knowledge<sup>(3)</sup> representing a high degree of *novelty*, thereby transforming research

results into a proven technology. In fact, the objective is to *show* the *technical viability* of a new technology on a scale of operations representing reality, together with its possible *economic advantages* under realistic conditions.

Demonstration Projects are funded on a *shared cost* basis. In general the financial contribution from the Commission is below ECU 2 million and the individual contribution to each of the project participants reflects a good balance amongst their respective tasks and responsibilities within the project.

## Controlling Melon Ripening by Genetic Engineering

This project networks industrial and academic partners in order to demonstrate the technical safety and economic feasibility of the use of

genetically engineered melons (Cantaloupe charentais). By replacing a key enzyme (ACC oxidase) in the ripening process with a corresponding anti-sense gene product, the formation of the melon ripening hormone, is reduced by 98%, leading to significantly

delayed post-harvest deterioration and greatly improved shelf-life, while maintaining the characteristics of healthy and high-quality vegeta-

bles. The physiological, biochemical and molecular properties of these transgenic melons are being studied in terms of sensory quality, agro-

nomic performance and economic benefits. *Technical and Economic Feasibility of Controlling Melon Ripening by Genetic Engineering - FAIR demonstration project n° CT-961138.*



*Ripening delay obtained for a transgenic melon (right) compared with a "normal" one.*

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## Further reading: Examples of demonstration projects in the life sciences programmes -

Vol.1 (Fourth Framework Programme) - Office for Official Publications of the European Commission 1997, EUR 16981, ISBN 92-827-9528-4

There are currently about 45 projects, either ongoing or being negotiated. During the years 1996 and 1997 the awareness and interest from the scientific community and industry for demonstration projects have dramatically increased. This can be illustrated by the fact that 75 project proposals were received in response to the fourth call of the Biotechnology Programme, compared with four proposals for the first call, nine for the second, and a total of 37 proposals for the third.

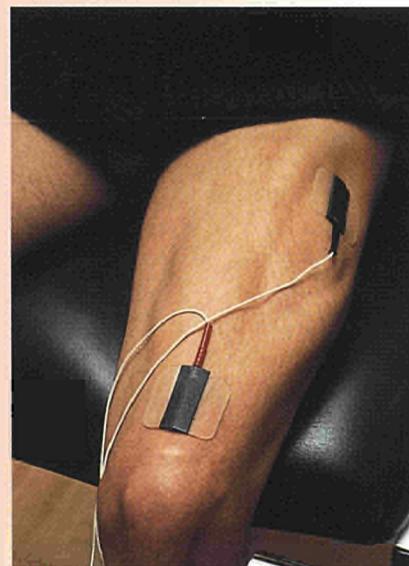
During 1998, the number of projects supported could reach a total of 80, and this kind of Community support is expected to play a major role in the key actions of the Fifth Framework Programme. ■

### Paraplegic patients can walk with neuro-prostheses

The main objective of this BIOMED demonstration project is to show the possibility of restoring locomotion in paraplegic patients by implanting a neuro-prosthesis (a computer-aided neuro-stimulating system) in six selected patients in six different European countries. A patient-evaluation period of nine months is planned. This project will combine the results of years of progress in electronics, biomaterials and computer science to demonstrate the functional usefulness of this technology for the improvement of the quality of life of paraplegic patients, and to bring it into the clinical practice.

*Stand up and Walk - Biomed demonstration project n° BMH4-CT96-1501*

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*A computer-aided neuro-stimulating system helps the paraplegic patient to restore their locomotive ability.*

### Producing safer and cheaper biopharmaceuticals

One important process for producing biopharmaceutical proteins consists of cultivating mammalian cells in a nutrient medium. The widely used conventional media, however, contain proteins that affect the purity of the targeted proteins produced in this way, increasing the cost of downstream processing. The objective of this project is to demonstrate the potential of using protein-free media for the cost-effective and safer production of biopharmaceuticals, like anti-HIV-1 human monoclonal antibodies, which will be used in clinical trials world-wide.

*Beneficial application of a protein-free medium in industrial processes with mammalian cell cultures producing biopharmaceuticals - Biotech demonstration project n° CT97-2140*

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# Tailoring new drugs to suit the indiv

*A large pan-European research effort is helping to explain why drugs work well in some people but in others have serious side effects. In many cases the problem is not the drug itself, but the different ways in which individuals process it. Finding out about the variations in the enzyme systems responsible has had an enormous impact on drug design.*

**T**he public becomes understandably alarmed when the press reports that an apparently safe drug is being withdrawn because unexpected and serious side effects have appeared after years of use. The natural reaction is to label the drug as dangerous and look for someone to blame: "Was the drug ever really safe?", "Were the side-effects known about but hushed up?", "Why were so many people allowed to take it?"

A twelve-year research project involving many European countries is helping to explain these tragedies and is showing how to avoid them in the future. COST Action B1 was started in 1986 following a proposal by Pierre Bechtel, a leading French clinical pharmacologist. At the time, reports were emerging from research groups in several parts of the world that, just as eye colour varies from person to person, so do the enzymes responsible for processing drugs. Bechtel, together with many other European biomedical scientists judged that it was time to find out more about this variation so that it could be taken into account when developing new drugs.

## Variations on a theme

European cooperation was necessary given the complex-



*Today drugs are being designed from the outset to avoid those human enzyme systems known to be variable.*

ity of the problem. One particularly important family of drug-metabolising enzymes, the P450s was studied intensively. Over three dozen different P450s occur in humans. About half of these control reactions that involve substances normally found in the body - most of these have remained the same over the course of human evolution and we all have virtually identical enzymes. The other half, thought to have evolved to process substances that we no longer encounter, are the ones that deal with many modern drugs. Over time, with no particular function, these enzymes have drifted in genetic terms, and have changed as mutations have crept into the DNA that codes for them. Up to 10% of the population now have slightly

unusual versions of some of these enzymes. As a result, when they are given a drug that is perfectly safe for the rest of the population, these patients can suffer severe problems because of the altered way in which they process it.

## The early years

In its first four years the many research groups working within COST Action B1 achieved a great deal. Considerable progress was made in characterising the variation in the different enzyme systems and regular meetings ensured a productive exchange of results, problems, ideas and expertise. Many invaluable techniques for studying the variations in drug metabolism that exist in humans were

developed, refined and standardised and the implications of this variation were established. 'Standardising the techniques used for classifying the different human variants and for studying the enzymes involved was a major achievement. We needed to harmonise our efforts and our methods to avoid duplication of work and to ensure complementary results,' said Alan Boobis, UK representative on the COST B1 Management Committee.

## Moving on

Results were so good that the Action was renewed for a second round in 1991 and then for a third in 1995. Studies throughout the 15 participating countries expanded on the basic research, to include mathematical approaches to identify variability in the handling of drugs in human populations across Europe. Different groups specialised in a range of parallel projects. Some looked into what happens when drugs interact with other drugs, with substances in cigarette smoke, with alcohol, and with chemicals found in common foods. Others studied how drugs behave differently in people who already suffer from ill health as a result of, for example, kidney failure or heart disease. Another group investigated

why the effects of drugs vary amongst individuals.

The project has had a significant impact on pharmacology and drug development. Twenty years ago, before human use a new drug was tested as far as possible in animals, but complications were often detected only after it started to be used in patients. Today drugs are being designed from the outset to avoid those human enzyme systems known to be variable. New drugs are tested in vitro and also with complex computer models to try to ensure that no unexpected side effects occur, even in the small percentage of people who have unusual enzyme systems. The potential for drug-drug interactions can be designed out of new products. Much more information can be made available to doctors about possible inter-patient variability and likely interactions with, for example, alcohol or coffee

It is already possible to predict sub-groups of the population likely to suffer problems with a particular drug because of other health problems. In the near future, individuals may also be tested routinely for the unusual forms of drug metabolising enzymes: DNA taken from a small sample of cells (from the blood or from those lining the cheek) could be analysed and compared against the increasing bank of data that COST Action B1 and others have generated. Computer models should be able to show exactly what would happen if a particular person

were to take a new drug and this should cut down the incidences of side-effects and rare adverse reactions, saving many lives.

### Role reversal

In addition to making scientific progress, COST Action B1 has also led to a much closer collaboration between scientists from the participating countries. Alan Boobis comments, 'Because so many countries have been involved, this project has had a very significant impact on the pharmaceutical industry throughout Europe. Our findings are now influencing almost all major drug development companies and our

approach is highly respected by research teams based not only in Europe but throughout the world. Before COST Action B1, the USA was undoubtedly

leading the way in most areas in the study of drug metabolism. Now, Europe is calling the shots in many of the key areas.' ■



## Getting to the bottom of drug-drug interactions

For years doctors have known that some drugs interact with each other and COST Action B1 has been very active in studies into why this sometimes happens. One interesting example is terfenadine, an anti-histamine marketed widely as an anti-hay-fever preparation. Certain drugs, such as some anti-fungal agents and the antibiotic erythromycin, interact dangerously with terfenadine - patients who have taken terfenadine in combination with one of these otherwise harmless drugs have suffered life-threatening and occasionally fatal heart problems.

The anti-hay-fever effects of terfenadine are due to the formation of a metabolite in the liver as the drug is being taken up from the intestinal system. The enzyme responsible is CYP3A4. Terfenadine itself can change the way cells in the body move potassium about, but normally there is very little terfenadine present after its conversion to its anti-hay-fever metabolite. It turns out that drugs such as some anti-fungals and erythromycin react with CYP3A4, rendering it temporarily disabled. With no enzyme to break the terfenadine down, its levels rise in the body, causing havoc in heart muscle where the cells are notoriously sensitive to disturbances in potassium levels.

*Thanks to the COST Action B1, a very rare but extremely dangerous interaction of Terfenadine, a very common anti-hay fever preparation, with some other drugs can now be avoided.*

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# A better diet for a better life

*Europeans are increasingly demanding that the food they eat be perfectly safe, better from a dietary and nutritional point of view, and suited to modern life styles. The European Union already supports many scientific research projects corresponding to these expectations and will continue to do so under the Fifth Framework Programme. We put the spotlight on a research policy which is today uniting food and health.*

**H**ealthy food is now clearly a priority concern for the European population as a whole. It is also an area in which the interests of producers and consumers - often presented as conflicting - are in fact complementary," explains Bruno Hansen, Director of life sciences and technologies at the Commission.

The EU agri-foodstuffs industry is Europe's leading manufacturing industry with an annual turnover of more than ECU 500 billion, employing more than 2.5 million people, and offering a range of products unequalled anywhere in the world. Yet it invests proportionally less in research than any other sector. This is why Bruno Hansen believes that "The helping hand of European programmes in the agri-foodstuffs sector is particularly justified, as it facilitates the effective networking of European expertise."

## Food, health and the environment

Over the past decade or so, these European programmes have increasingly focused on the specific effects of food on health. Following an initial series of 33 research projects launched in the food sector under the FLAIR<sup>(1)</sup> programme, between 1991 and 1994, 72 new projects received financing of ECU 59 million (15% of the total budget) under the AIR<sup>(2)</sup> programme. The FAIR<sup>(3)</sup> programme (1994-1998) is currently funding more than 100 projects in generic science and advanced technologies for nutritious foods and has a budget of over ECU 100 million for four specific themes: con-

sumer nutrition and well-being, new and optimized food materials and nutritious food products, advanced and optimized technologies and processes, and generic food science.

The study of the links between food and health will be reinforced under the



*"Healthy food is now clearly a priority concern of Europeans"*

Fifth Framework Programme (1998-2002 - see box p. 21). This new approach will make it easier to bring together a range of specialists within multidisciplinary projects and to develop new synergies in operational research and industrial applications.

The approach is also a response to the public's increasing interest in the close and complex links between food and health. European consumers are concerned at the possible effects of what they see as scientific and technological "interference" and the mad cow affair is

an alarm signal which will long leave a mark on a public alerted to the dangers of uncontrolled excesses.

## Complementary interests

A major research effort is still required to supplement our biochemical and medical knowledge of the subtle relationships between man and his food. The need to give such research a European dimension, in order to encourage cooperation between Europe's scientists and industrialists and to stimulate the sharing of knowledge, is largely due to the increasing unification of the European market. "The food shelves are full of a vast range of products originating not only from all over Europe but all over the world," stresses Bruno Hansen. "Consumers, together with the industrialists and public authorities regulating the sector, have complementary interests in ensuring the European transparency of the scientific bases on which we rely." ■

(1) Food Linked Agro-Industrial Research (FLAIR), 1989-1993

(2) Agriculture and Agro-industry, including Fisheries (1990-1994) (AIR)

(3) Agriculture and fisheries (including agro-industry, food technologies, forestry, aquaculture and rural development) (1994-1998) (FAIR)

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# High tech and edible

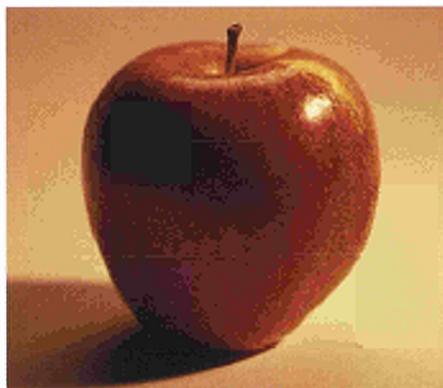
*Advanced technologies involving the use of high pressure or electric fields could provide the agri-foodstuffs industry with new preservation and processing methods. A number of European research projects are already aimed at making better use of the potential of these innovative technologies.*

**C**ompared to the results of the constant research carried out in the field of pasteurisation since it was first invented about 150 years ago, the results obtained in ten years of research on subjecting food to high pressures are considerable," points out Professor Dietrich Knorr (Berlin University), who has participated in several European projects in this field. This recently developed technique - to which scientists have given the name pascalisation - boasts a double advantage: firstly for food preservation, as high pressure (HP) of between 500 and 10,000 bars <sup>(1)</sup> makes it possible to inactivate micro-organisms and enzymes, thus producing similar effects to pasteurisation and, secondly, in the area of nutrition, as it acts on the properties of the food and could therefore increase the quality of the treated products.

## A promising technology

This type of treatment offers major benefits to the agri-foodstuffs industry as it is effective at room temperature, is independent of the size and shape of the food treated, and does not impair characteristics such as taste, colour, or vitamin content. HP is therefore an extremely interesting alternative to the preserving of food using chemical, heat, or even radiation techniques. "Several specific uses exist in France, Japan and the United States, but much remains to be done. In particular, the physical mechanisms involved in deactivating micro-organisms must be the subject of further scientific investigation," explains Dietrich Knorr.

The industrial equipment must also be adapted to the needs of the food sector as over the last 40 years HP technology



has developed in very different fields, such as the ceramics or synthetic quartz industries. "For agri-foodstuffs applications the processes used must comply with very specific requirements, in particular in terms of hygiene and risk of contamination. To be profitable they must also allow continuous production, which is not possible with present HP technology. Applied research is therefore still necessary."

## Functional foods

In addition to deactivating certain substances (such as the enzymes responsible for oxidation and the loss of freshness in fruit and vegetable), pascalisation is also potentially interesting for the development of functional foods. For example, the processing of certain categories of polysaccharides using HP techniques makes it possible to obtain gelatinous systems with a texture close to fats." The polysaccharide chains generated by high pressure have totally different properties from those resulting from heat treatment. HP, combined with traditional processing techniques of time and temperature, is going to open up a whole new field in which we will be able to develop food

structures which are much more complex and sophisticated." ■

(1) 1,000 bars is equal to one thousand times the atmospheric pressure or the pressure found at a depth of 10,000 metres under the sea.

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## Electric fields : HELP technologies

Studies are also being carried out into the effects of electric field variations (HELP - High Electric Field Pulses - technologies) on foods. Under a European research project (FAIR 3044), a team of researchers from six countries of the European Union is trying to assess the potential of this technology for the protection, safety and quality of products. "As in the case of HP treatment, the prospects are very encouraging in terms of the deactivation of micro-organisms and the modification of food products," believes Dietrich Knorr. "These HELP technologies should quite soon find an application, in particular in preserving liquid products. They offer the double advantage of being very energy efficient and allowing continuous production."



# The food of the future is functional

*Science used to focus on the harmful effects of certain unhealthy foods. Today it is turning its attention - particularly in Europe - to the positive potential of certain foods. Known as "functional" due to the health benefits they provide, they could represent a worldwide market of ECU 25 billion by the year 2000.*

**C**ould some foods be more functional than others? And anyway, what exactly is a functional food? "Even if the term is not ideal, as by definition any food or food component has functional properties for the body, researchers have agreed on this terminology," explains Marcel Roberfroid, lecturer at the School of Pharmacy at the Université Catholique de Louvain (UCL-Belgium) and scientific coordinator of the FUFOSE1 (Functional Food Science in Europe) concerted action. "A functional food contains an ingredient, a micro-nutrient or a natural chemical product for which we have scientific results either showing significant and beneficial interactions with the bodily functions or a reduced risk of developing certain diseases."

## ***Is inulin a functional ingredient?***

While there is an undeniable link between certain food components and certain bodily functions, our knowledge of the exact conditions under which these links are established remains limited. Hence the need for further scientific research and the studies carried out under the AIR programme.

One subject of study is the food ingredient inulin. Rich in food fibres, inulin is present in a number of plants and is particularly abundant in chicory. It is distinctive for its physical properties and a texture which allow it to be used industrially as a substitute for fats in many hypercaloric products such as margarine, cheese and yoghurt. Inulin is also a non-digestible oligosaccharide (NDO), the ben-



*Chicory, which is particularly rich in inulin, is an ingredient full of promise for the food industry.*

eficial effects of which have been highlighted by some scientists in the past.

Researchers working on the ENDO (AIR 1095) project confirmed the nutritional virtues of inulin. "These studies yielded very encouraging results," confirms Marcel Roberfroid. "The stimulating effect of fructo-oligosaccharides on Bifodobacterium, which improve the properties of the intestinal flora, are today an established fact. Moreover, the experiments carried out on animals during this project also showed that NDOs make it possible to increase the absorption of important minerals such as calcium and magnesium significantly and to reduce triglycerides in the blood." If this action were confirmed in humans - the goal of current applied research - it could open up new

prospects of reducing the risk of complaints such as osteoporosis and obesity.

Encouraging studies to date and further research initiated ... yet the scientists remain cautious. They know that NDOs and functional foods offer promising prospects for development. But they also know that in the field of food - and thus of health - new products cannot be launched on the basis of unverified hypotheses. "We must not repeat the disastrous experience of a decade ago with light products, whose development was primarily influenced by marketing. Everything became light overnight, without any reference to scientific knowledge, and the concept was totally distorted," continues Marcel Roberfroid.

## ***FUFOSE, or scientific prudence***

It was largely to avoid a repeat performance of this kind that the FUFOSE (Functional Food Science in Europe) concerted action was launched by the International Life Sciences Institute (ILSI-Europe) in November 1995, under the FAIR programme. The aim is to assess the current state of knowledge and to highlight the gaps which further research must fill. Ten working parties, bringing together 54 researchers from 10 EU countries, are covering the six high-priority areas of human physiology: the gastro-intestinal system; defence against reactive forms of oxygen; the cardio-vascular system; the metabolism of substrates and metabolic diseases; development, growth and differentiation; psychological functions and behaviour.



*Identifying and improving certain qualities of food products in order to prevent health risks.*



*"The European food industry shows proof of a great sense of responsibility and believes that priority must be given to scientific criteria".*

19

A number of hypotheses must be verified in each of these fields, such as the effects on health of a change in the composition of the intestinal flora caused by non-digestible oligosaccharides, the effect of antioxidants in the fight against certain forms of cancer, or the long-term effects (early eating, late development) of consuming certain polyunsaturated fatty acids found in milk and meat, etc. at a young age <sup>(1)</sup>.

However, it is not enough to show that a particular food has an effect on a particular physiological or biological function. Before being able to make any functional or - an even more delicate subject - health claims, it must first be possible to prove that the food in question makes it possible to regulate this function and possibly to reduce the risk of the appearance of specific pathologies. The key need at present, in cases where the existence of links is firmly established, is therefore to develop reliable methodologies making it possible to monitor, in particular through pertinent tracers, the precise relations between the nutritional elements contained in certain foods and the bodily functions - and the pathologies which could develop when these become deregulated.

### **European ethics**

"We have reached a stage where nutrition, by drawing on all the available biological and chemical knowledge for the benefit of health, has achieved respect," continues Marcel Roberfroid. "The functional elements being studied at present may be seen as forerunners of a modern

food and this research promises a great deal for the future when manufacturers are going to be able to work on a more firmly established basis. We should note in this respect that the European food industry shows a great sense of responsibility and believes that priority should be awarded to scientific criteria rather than relying exclusively on marketing."

In several EU countries a code of good practice drawn up by the agro-industrialists themselves governs the use of functional or physiological claims, or claims relating directly to health, when promoting certain food products.

This research, supported by the EU, also reflects a specifically European approach. "In the field of functional food in particular, this approach is global and is based on the premise that you must work in the precise context of a balanced diet. Our aim is to identify and improve certain qualities of food products in order to create conditions conducive to better health. The key word is therefore not prevention as much as risk reduction. This approach differs from the American one which is more pharmaceutical in nature. It is also more complex and more prudent than the Japanese approach, which is characterised in particular by a tendency to say too much too soon. This characteristic of European research must be preserved and reinforced as Europe is exceptionally well-placed in this field." ■

(1) The results obtained by the various research groups under the FUFOSÉ project are about to be published in the *New British Journal of Nutrition*. This will allow a wide dissemination of the present state of knowledge.

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# Bio-packaging for contemporary products

*Natural polymer bio-films, edible packaging ... new technologies which are as ecological as they are economical are making it possible to improve both the safety and quality of ready-to-eat products.*

**R**eady-to-eat vegetables, pre-cooked dishes, vacuum-packed refrigerated foods. These and other innovations whose principal benefit is no doubt to save time and preparation are experiencing growing success, arousing the interest of consumers and caterers alike. At the same time, they offer a substantial profit margin for manufacturers and sales have recently been growing at from 10 to 15% a year. It is not hard to explain the success of these foods. They are identical to fresh products, their slight transformation impairing neither their appearance nor their quality. They offer a perfectly "contemporary" ease of use (divisible portions, microwave heating, etc.) and their freshness is guaranteed by a "best before" date. But that is not all.

## Natural polymers

In order to ensure the safety and quality of perishable produce it is necessary to prevent the growth of pathogenic micro-organisms (such as bacteria or fungi) and the development of the agents responsible for deterioration and the natural loss of freshness. Food protection and preservation techniques have traditionally involved temper-

ature (storage at low temperatures), and biological (disinfecting or antibiotic treatments), and physical (packaging) barriers. But the methods employed are improving all the time.

A research project under the AIR programme from 1993 and 1997 (AIR 0125),

fruit and vegetables which retain an active metabolism when stored at a low temperature and must therefore continue to "breathe". Thanks to this "bio" system, the antimicrobial agents and antioxidants used to protect the foods can also be incorporated into the packaging itself, thus



*Plastic films produced from natural polymers allow products to breathe while sealing in all their qualities.*

for example, made it possible to develop a new concept of bio-packaging in which protective layers (traditionally consisting of plastic films made of synthetic polymers) are made from natural polymers obtained from plants. This innovation brings major benefits. The ability of bio-packaging to modify gaseous exchanges makes it particularly appropriate for fresh

further preserving the natural character of the products.

Bio-packaging also offers a solution which is both economical (the raw materials used in the production of bio-films are not expensive) and ecological (natural polymer-based packaging is biodegradable, thus reducing industrial and household waste).

## Edible packaging

The concept of edible packaging also offers some interesting prospects. This is packaging which can be eaten along with the food it protects. At present, it exists in the form of protective layers, applied directly to food, or films which are prepared separately. In this field too, the AIR 0125 project - on which seven European research centres and two agri-foodstuffs companies worked - has successfully developed several products, using gluten, an elastic protein found in wheat. "We can expect to see extraordinary progress in this area," believes Professor Léon Gorris, project coordinator. "In addition to its role in protecting and preserving, we can also expect that bio-packaging will be nutritionally enriched."

The Irish company, Nature's Best, specialising in ready-to-eat food products, is very pleased with its participation in AIR 0125. "Our growth is primarily the result of the constant development and progressive improvement of these new soft technologies," believes Paddy Callaghan, managing director. "Thanks to the technical skills we developed during the project we have been able to expand our product range and improve



product quality significantly."

Since 1993, when the company first became involved in the AIR 0125 research project, Nature's Best has increased its turnover from 2 million Irish pounds to more than 7 million. It now employs nearly 200 people, a fivefold increase over the same period. "There is every indication that growth will be sustained in this sector over the coming years," adds Paddy Callaghan. "Technical progress makes it possible to supply increasingly diverse products which are better suited to consumer preferences at very competitive prices. Lightly processed and bio-packaged foods are progressively becoming a part of our diet."

"The experience of Nature's Best also shows the fundamental importance of a good information policy and disseminating research results among companies," points out Léon Gorris. "We have made full use of the resources offered by the "FAIR-FLOW Europe" network which was

set up in 1991 (see box). Information sheets and precise recommendations have been communicated to potential users of the technologies in question, in particular many SMEs. Conferences and workshops have also been held." ■

#### Contacts

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dg12.ccc.be

## Fifth Framework Programme : Health/Food objectives

In the first thematic programme, Improving the quality of life and the management of living resources, the European Commission has proposed three research topics linked to food:

- **quality:** the development of new materials, methods, and processes to improve food quality. In particular: the development of functional foods and the use of "naturally soft" technologies (such as the "bio-packaging" described in the article opposite).
- **safety:** processes for eliminating infectious, toxic, and allergenic agents, new tests for their rapid detection, etc.
- **health:** research on the role and impact of food on the physiological functions of the human body, the physical and mental performance of individuals, the nutritional needs of certain population groups, etc.

## Flair-Flow: the European food innovation window

Since 1991, the many and varied results of European research in the food sector have been disseminated through the extensive FLAIR-FLOW network to hundreds of SMEs and other users, such as health professionals and consumer organisations.

With a network leader in each of the 15 EU countries, together with Iceland and Norway, FAIR-FLOW circulates many documents - which are also reproduced in the general and technical press - and holds presentation workshops for professionals on the occasion of fairs and other food events.

Through contacts established with these professionals, the network plays a feedback role enabling both expectations and problems to be taken into account.

#### Contacts

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TEAGASC - The National Food Centre  
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Internet : <http://www.exp.ie/flair.html>  
Dr Liam Breslin, DG XII  
Fax : +32-2-296.43.22  
E-mail : liam.breslin@dg12.ccc.be

# News in Brief

## European RTD policy

**Fifth Framework Programme: common position of Research Council.** On 12 February 1998, the EU's research ministers passed a major milestone when they adopted a common position on the content and budget of the Fifth Framework Programme (1998-2002).

The Council has essentially approved the structure, based on four major thematic programmes and three "horizontal" programmes, proposed by the Commission in January, following the report from the European Parliament, but made the following amendments:

- the "Energy, environment and sustainable development" programme will be divided into two distinct sub-programmes corresponding to the two main themes.

- three new key actions have been proposed: "Land transport and marine technologies" (under the "Promoting competitive and sustainable growth" programme; "Sustainable marine ecosystems" (under the "Environment and sustainable development sub-programme"); "Socio-economic research" (this key action will be attached not to a thematic programme but to the "Improving human potential and the basis of socio-economic knowledge" horizontal programme).

A total of 23 key actions will thus be launched. RTD info will be taking a closer look at this new structure in its next issue.

The total budget has been set at ECU 14 billion (see the breakdown in the table opposite). The Commission is clearly disappointed that the figure is so much inferior to that proposed (ECU 16.3 billion), especially since, in real terms, it represents a reduction of the Union's research effort compared to the budget

## Programme addresses on EUROPA and CORDIS

the "EUROPA-12" and "CORDIS" Internet addresses given for the various programmes referred to in the following three pages should all be prefixed as follows:

For EUROPA-12: <http://europa.eu.int/comm/dg12/>

For CORDIS: <http://www.cordis.lu/>

## Reference to DG XII press releases

Information bearing the reference PR + DATE is also available as a press release on EUROPA-12: [press.html](http://europa.eu.int/comm/dg12/press.html)

Fax: +32-2-295.82.20.

## Publications

Publications listed where the EUR number is followed by an asterisk \* are subject to charges and can be ordered from the OOEPEC - Fax: +352-48.85.73. Other publications can be obtained from the programmes concerned.

for the Fourth Framework Programme. However, as a number of ministers pointed out at the meeting, it is very likely that the figure will be increased during subsequent stages of the co-decision procedure with the European Parliament (PR: 13/12/98).

## Publications

■ *Second European Report on S&T Indicators 1997* - EUR 17639 EN - ISBN 92-828-2754-2 (1) The 1997 edition of this report marks the culmination of a major effort of analysis and synthesis involving a dozen European institu-

tions and coordinated by DG XII. This two-volume work provides a wealth of significant and detailed information on European science and technology. Volume one covers five major themes:

- European S&T in the world: after presenting developments in the global economic context over the past two decades, the report analyses the EU's scientific and technological performance by comparing it to the performance of other countries and regions of the world.

- From R&D to innovation and competitiveness: the analysis focuses on the comparative

impact of research in Europe, the USA and Japan for the key industrial sectors.

- European diversity, convergence and cohesion: this section compares the performance of various European countries and regions.

- Cooperation in the field of R&D in Europe: in addition to a detailed statistical analysis of the Third and Fourth Framework Programmes, several chapters are devoted to various models of European public cooperation together with partnerships between companies and the mobility of researchers.

- The EU, global partner: analysis of cooperation in the field of S&T between the EU and industrialised countries, the countries of Central and Eastern Europe, and the developing countries.

(1) Only the English version is available at present. The French and German versions will be published this summer, together with a CD-ROM.

■ *Society, the final frontier* - EUR 17655 - ISBN 92-828-1185 - Have S&T policies entered a third phase, after having been subject to the imperatives of defence and industrial competitiveness? 'One can imagine the emergence, in most industrialised countries, of research and innovation policies of a "third type", combining societal goals with dynamic innovation as the prime objective of public action.' This is the principal theme of a discussion document written by two civil servants at the European Commission, Messrs Caracostas and Muldur. They analyse the context of the new direction taken by European research and innovation policy which underlies the launch of the Fifth Framework Programme 1998-2002 and consider the possible future of Europe's S&T policy.

## Budget for the Fifth Framework Programme:

### common position of the Council (12/2/98)

Programmes	No of KA*	millions of ECU	%
Quality of life and living resources	6	2,239	16,0
User-friendly information society	4	3,363	24,0
Competitive and sustainable growth	4	2,389	17,1
Energy, environment and sustainable growth	6	2,048	14,6
International role of European RTD	-	458	3,3
Innovation and participation of SMEs	-	350	2,5
Human potential and socio-economic knowledge	1	1,205	8,6
Other actions **	2	1,948	13,9
<b>Total</b>	<b>23</b>	<b>14,000</b>	<b>100</b>

\* KA: key actions \*\* including JRC, thermonuclear fusion and nuclear fission.

## Standards, Measurements and Testing

Fax: +32-2-295.80.72

EUROPA-12: bcr1.html

CORDIS: smt/home.html

**New projects** - 23 new research projects to study and define quality standards for various European projects - in particular with a view to consumer protection - were selected in December 1997, representing total community financing of ECU 10 million (PR - 8/12/97).

**Reference materials** - A survey is at present being carried out at various laboratories in order to determine the growing need for reference materials and anticipate the necessary developments at a European level. The questionnaire is published in the programme's newsletter and an international workshop, bringing together producers and users of these materials, will analyse the results in May (see Diary).

**Publication** - *Measurements & Testing Newsletter*, volume 5, n° 2 - ISBN 92-826-8507-1

**Diary** - *Reference materials workshop* - 18-20/5/98 - Bordeaux - France

■ *Major anniversary conference on the occasion of 25 years of the BCR* - 9-13/11/98 - Brussels - E-mail: philippe.quevauviller@dg12.cec.be

## Environment & Climate

Fax: +32-2-299.57.55

E-mail: environ-infodesk@dg12.cec.be

EUROPA-12: env1.html

**THESEO** - New measurement campaign on the hole in the ozone layer - After EASOE (1991-92) and SESAME (1994-95), which measured and studied the dramatic reduction in the ozone layer over the Arctic (up to 50%), this new international campaign launched by the EU (1) will analyse the growing phenomenon of ozone layer depletion above populated areas, from Europe to the

Tropics. The THESEO research will run to the end of 1999 and involve more than 400 scientists and 30 ground stations. These will collect the observations of 40 stratospheric balloons and six aircraft, together with more than 1000 ozone probes (PR - 22/1/98).

(1) in cooperation with Canada, Iceland, Japan, Norway, Poland, Russia, Switzerland, the USA, and South Africa.

**Publication** - *LCANET - European Network for Strategic Life-Cycle Assessment R&D* - ISBN 3-928379-53-4 - Fax: +49 8191-125-469 - E-mail: a.heinrich@ecommed.de

**Diary** - *Kick-off meeting of the Water thematic network* - This network will coordinate the activities of 15 research projects currently supported by the EU in the field of aquatic ecosystems and humid areas - 18-19/6/98 - Brussels, Belgium

■ *EROS Symposium: results of research in the north-west section of the Black Sea* - 11-13/6/98 - Ispra, Italy

■ *7th International Congress on Ecology: New tasks for ecologists after Rio 1992* - 19-25/7/98 - Florence, Italy

■ *Electronic symposiums: Research on biodiversity* - 25/4/98 - Land ecosystems - 25/5/98 - E-mail: mario.cattizone@dg12.cec.be

## Marine Science and Technologies

Fax: +32-2-296.30.24

E-mail: mast-info@dg12.cec.be

EUROPA-12: marine1.html

CORDIS: mast/home.html

**Diary** - *MAST new advanced training* - Internet: <http://europa.eu.int/comm/dg12/marine/marine-c.html>

**Publications** - *Sea/Air Exchange Process and Modelling* - A summary of research on the role of oceans as an interface in global and climate change - EUR 17660

■ *Interdisciplinary Research in the Mediterranean Sea* - Summary of the scientific results



## European marine RTD at Expo '98 - Lisbon

In parallel with the opening of the international exhibition, "The oceans: a heritage for the future" (Expo '98), to be held in Lisbon, Portugal from May to September, the European Commission is holding the "Third European Marine Science and Technology Conference", from 23 to 27 May 1998 - also in Lisbon. This international meeting will present a vast panorama of the many European research projects carried out in the fields of the protection and development of marine environments, principally under three Community programmes: "Marine science and technologies (MAST)", "Environment and climate" and "Agriculture and Fisheries" (FAIR). This conference is organised jointly by the EUREKA/EUROMAR Initiative and the European Science Foundation's European committee for marine and polar sciences. Finally, also in July, the European CEO (Centre for Earth Observation) programme, co-ordinated by the Joint Research Centre, will be holding the Earth Observation for Customers seminar in Lisbon.

**Contact** : E-mail : ceo.webmaster@jrc.it

obtained during the first phase of the Mediterranean Targeted Project (MTP), launched in 1993, which involved 200 physicists, geochemists and biologists from 70 European research bodies - EUR 17787 - ISBN 92-828-1554-4

■ *Conference Report on the Progress of Oceanography on the Mediterranean Sea* - Report on papers presented at the Rome Conference (November 1997) which analysed the results of the MTP project.

## Biotechnology

Fax: +32-2-299.18.60

E-mail: life-biotech@dg12.cec.be

EUROPA-12: biot1.html

**Publications** - *Biotechnology (1992-94): Final report* - Vol. 1: 49 projects - EUR 16922 ISBN 92-828-0534-4 - Vol.2: 84 projects EUR 16922 - ISBN 92-828-0058

■ *Biotechnology: Selected achievements* - OOPEC CG-96-96-401-EN-C - ISBN 92-827-7307-8

■ *Molecular tools for screening Biodiversity* - Description and evaluation of the latest methods of genetic screening developed by four Biotech projects - ISBN 0412638304, 498 p.

**Diary** - *Biotechnology and Finances Forum: Emerging Technologies in Life Sciences* - 12-14/5/98 - Brussels, Bel-

gium - This initiative seeks to encourage dialogue between researchers, "bio-enterprises", and venture and investment capital operators. The forum will analyse the results of a study on the financial needs of the biotechnology sector in Europe. A symposium on the subject of *National & Regional Biotechnology Innovation Initiatives* will be held on the last day.

■ *9th European Congress of Biotechnology* - 11-15/7/98 - Brussels, Belgium - Internet: [www.ecb9.be](http://www.ecb9.be)

■ *European Conference on Business from Genomics* - Organised by the Yeast Industry Platform (YIP) - 30/3-1/4/98 - Turin, Italy - E-mail: anne.marie.prieels@skynet.be

■ *European Biotechnology Forum: Public Perception and Public Policy* - Brussels, 20-22/4/98 - On the agenda: how to create a constructive dialogue on the key themes of biotechnology, with the general public, the political decision-makers, the media, the associations - Fax: +31-70-365.3857 - E-mail: efb.cbc@stm.tudelft.nl

## Agriculture and Fishing

Fax: +32-2-296.43.22 -

EUROPA-12: agro1.html

CORDIS: fair/home.html

**New projects** - 130 new projects were selected in December

1997, representing Community financing of ECU 95 million, and covering such diverse fields of research as heat and electricity production from biomass, improved food quality, and improved living conditions for battery poultry. (PR - 8/12/97).

**Publications - Crops for industry and energy in Europe** - 72-page catalogue describing 42 vegetable species and their many energy-generating and industrial applications - ISBN 92-827-9415-6

■ **Renewable Biomaterials** - Brochure on the results of European agro-industrial research in the non-food sector (energy-generating and chemical applications) - EUR 17617 EN - ISBN 92-827-9238-2

■ **ECLAIR - Agro-Industrial Research - Final Results** - Inventory of the results of all projects financed between 1988 and 1994 by the ECLAIR programme (European Collaborative Linkage of Agriculture and Industry through Research) - EUR 16952 - ISBN 92-826-9712-6

## Non-Nuclear Energy (Joule)

**Fax:** +32-2-295.06.56  
**EUROPA-12:** joule1.html  
**CORDIS:** joule/home.html

**New research projects on renewable energy resources** - 123 new projects, representing Community financing of ECU 98 million were selected in December 1997. The fields covered are: photo-voltaic energy (ECU 30 million) and wind power (19); energy production from biomass (16); the rational use of energy in buildings (10); problems linked to the integration of renewable energy resources (10); applications in the field of solar thermal energy, tidal energy and problems of energy storage (13) (PR - 8/12/97).

## Fission

**EUROPA-12:** fission1.html

**Publication** - Newsletter of European research on radio-protection - The second issue of this newsletter, produced by the concerted action launched in January 1997 by the European Commission, the EULEP (European Late Effects Project), EURADOS (European Radiation Dosimetry Group) and the IUR (International Union of Radioecologists), was published in January 1998. This concerted action is aimed at reinforcing the integration of research activities in fields such as radiobiology, dosimetry and radioecology.

## International Cooperation

**EUROPA-12:** intco1.html  
**CORDIS:** inco/home.html

**New EU-USA scientific and technological cooperation agreement** - After negotiations lasting one year, on 5 December the European Union and the United States signed a new agreement widening and strengthening their scientific and technological cooperation. Reciprocal participation and joint research projects have already been set up in the past - in fields such as civilian nuclear energy, fusion, biotechnology, information technologies and industrial technologies. This agreement, which is set to last for a renewable period of five years, widens prospects for cooperation between institutions and companies (including subsidiaries on both sides of the Atlantic) to include virtually every aspect of science and technology. It also clarifies a number of basic principles relating to reciprocity and intellectual property rights. (PR: 5/12/97)

**Diary** - *Cooperation with the Baltic countries: meeting of EUREKA business partnerships in the area of food and information technology* - 25-26/5/98 - *Jurmala, Latvia* - Bureau of Information and Consulting (BIK) - Fax: + 371 73

100 27 - E-mail: bik@edzi.iza.lv

## Training and Mobility of Researchers

**Fax:** +32-2-296.32.70  
**E-mail:** tmr-info@dg12.cec.be  
**EUROPA-12:** tmr1.html  
**CORDIS:** tmr/home.html

**Publication** - Marie Curie Fellowships - Success Stories - Presentation of the research experiences and results of 16 Marie Curie fellows - EUR 17763 - ISBN 92-828-1798-9

## Joint Research Centre

**Fax:** +32-2-296.23.11  
**E-mail:** gisele.vanwert@cec.be  
<http://www.jrc.org/jrc/>  
New Director-General for the JRC - Mr. Herbert J. Allgeier has been appointed Director-General of the European Com-

mission's Joint Research Centre (JRC), effective 15 February 1998. His previous positions have included Assistant to the Director-General of DG XII and Director of the JRC's Institute of Prospective Technological Studies in Seville. He has also managed the specific programmes Human Capital and Mobility, Energy, and Advanced Communications Technologies and Services.



Mr. Herbert J. Allgeier

## New series of publications from DGXII. Concrete examples of European RTD

DG XII is at present preparing a new series of descriptive sheets presenting the results of the many and varied research projects carried out under Community programmes, with the emphasis on the history and "sociology" of the projects. The aim is to inform the public of projects whose high quality results are largely due to a cooperative and transnational approach in a way that is both educational and easy to understand.

■ A first set of 36 sheets covers projects from various fields: agriculture and food, energy, the environment, medicine and health, industrial processes, and transport. Published in English, French and German by DG XII's Communication Unit, it is available in the form of a bound brochure, but can also be supplied in the form of separate (double-sided) sheets.

**Reference:** *Research and technological development in Europe - 36 examples of projects* - EUR 16731 - ISBN 92-828-1058-5 -

■ A number of scientific programmes have also published sheets of the same type. The following sheets are currently available:

- *Industrial Technologies: Making an Impact* - 50 bound or separate sheets in English - EUR 17750 - ISBN 92-827-9980-8

- *Standards, Measurements and Testing* - 20 separate sheets in English - ISBN - 92-828-1161-3

- *Opening up to Central and Eastern European Countries* - 17 separate sheets in English -

This documentation is available on request from DG XII's Communication Unit (see address on page 2). More are in the pipeline!

# Ongoing/Upcoming calls for proposals (as of 31 March 1998)

Programmes (and contacts)	Publication	Deadlines	Areas (and specific contacts)
<b>INFORMATION TECHNOLOGIES (ESPRIT)</b> E-mail : <a href="mailto:esprit@dg13.cec.be">esprit@dg13.cec.be</a>	15.4.97 ..... 17.3.98	31.3.98 ..... 16.6.98	Submission of full proposals for the open call Intelligent Manufacturing Systems (jointly with BRITE-EuRam). <b>CONTACT:</b> IMS Secretariat - Fax: +32-2-299.45.72 Call in domains 1,2,6 and 8 including Humanitarian Demining
<b>INDUSTRIAL &amp; MATERIALS TECHNOLOGIES (BRITE-EuRam)</b> Fax : +32-2-295.80.46 / 296.70.23 E-mail : <a href="mailto:imt-helpdesk@dg12.cec.be">imt-helpdesk@dg12.cec.be</a>	15.4.97 ..... 15.12.95	31.3.98 ..... 20.5.98	IMS call: see Esprit Programme above. Open call for support & accompanying measures.
<b>STANDARDS, MEASUREMENTS &amp; TESTING</b> Contact : Philippe Quevauviller Fax : +32-2-295.80.72	15.6.95	30.7.98	Open call for accompanying measures.
<b>MARINE SCIENCE &amp; TECHNOLOGIES</b> Fax : +32-2-296.30.24 E-mail : <a href="mailto:mast-info@dg12.cec.be">mast-info@dg12.cec.be</a>	15.3.96	12.6.98 (open call)	Preparatory accompanying & support measures in various areas.
<b>BIOTECHNOLOGY</b> E-mail : <a href="mailto:life-biotech@dg12.cec.be">life-biotech@dg12.cec.be</a>	17.12.96	15.3.98 15.9.98	Advanced practical workshops. <b>CONTACT:</b> Alessio Vassarotti - Fax : +32-2-299.18.60
<b>TRAINING &amp; MOBILITY OF RESEARCHERS</b> Fax : +32-2-296.32.70 E-mail : <a href="mailto:tmr-info@dg12.cec.be">tmr-info@dg12.cec.be</a>	15.12.97	31.3.98	Euroconferences, summer schools & practical training courses. <b>CONTACT:</b> Jürgen Rosenbaum

## Technology stimulation measures for SMEs (Cooperative research)

GENERAL CONTACT: Giorgio Clarotti - Fax : +32-2-295.71.10 - E-mail : [sme-helpdesk@dg12.cec.be](mailto:sme-helpdesk@dg12.cec.be)

<b>INDUSTRIAL &amp; MATERIALS TECHNOLOGIES</b>	15.12.94	8.4.98	<i>Klaus Kögler - Fax : +32-2-299.46.35 E-mail : <a href="mailto:imt-helpdesk@dg12.cec.be">imt-helpdesk@dg12.cec.be</a></i>
<b>STANDARDS, MEASUREMENTS &amp; TESTING</b>	15.12.94	8.4.98	<i>Christos Profilis - Fax : +32-2-295.80.72</i>
<b>ENVIRONMENT &amp; CLIMATE</b>	17.1.95	1.4.98	<i>Jitka Vennekens - Fax : +32-2-295.20.97</i>
<b>MARINE SCIENCE &amp; TECHNOLOGIES</b>	15.12.94	8.4.98	<i>Christos Fragakis - Fax : +32-2-296.30.24 E-mail : <a href="mailto:mast-info@dg12.cec.be">mast-info@dg12.cec.be</a></i>
<b>BIOMEDICINE &amp; HEALTH</b>	17.1.95	8.4.98	<i>Viviane Thevenin - Fax : +32-2-295.53.65</i>
<b>AGRICULTURE &amp; FISHERIES<sup>(1)</sup></b> E-mail : <a href="mailto:life-fair@dg12.cec.be">life-fair@dg12.cec.be</a>	15.12.94	8.4.98	<i>Areas 1,2,3 : Xabier Goenaga - Fax : +32-2-296.43.22 Area 4 : Armin Muenzinger - Fax : +32-2-296.30.29 Area 5 : Mario Lopes - Fax : +32-2-295.78.62</i>
<b>NON-NUCLEAR ENERGY (JOULE)</b>	15.12.94	8.4.98	<i>Barry Robertson - Fax : +32-2-299.36.94</i>

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

## Marie Curie Research Training Grants

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

<b>INDUSTRIAL &amp; MATERIALS TECHNOLOGIES</b>	15.12.95	1.6.98	<i>Susanne Becker - Fax : +32-2-296.70.23 E-mail : <a href="mailto:imt-helpdesk@dg12.cec.be">imt-helpdesk@dg12.cec.be</a></i>
<b>STANDARDS, MEASUREMENTS &amp; TESTING</b>	15.12.95	15.6.98 1.9.98	<i>Philippe Quevauviller - Fax : +32-2-295.80.72</i>
<b>ENVIRONMENT &amp; CLIMATE</b>	15.12.95	20.8.98	<i>Angel Arribas San Martin - E-mail : <a href="mailto:angel.arribas@dg12.cec.be">angel.arribas@dg12.cec.be</a></i>
<b>MARINE SCIENCE &amp; TECHNOLOGIES</b>	16.12.97	20.8.98	<i>Elisabeth Lipiatou - E-mail : <a href="mailto:elisabeth.lipiatou@dg12.cec.be">elisabeth.lipiatou@dg12.cec.be</a></i>
<b>BIOTECHNOLOGY</b>	15.6.96	1.7.98	<i>Alessio Vassarotti - Fax : +32-2-299.18.60 - E-mail : <a href="mailto:life-biotech@dg12.cec.be">life-biotech@dg12.cec.be</a></i>
<b>NON-NUCLEAR ENERGY (JOULE)</b>	15.6.96	1.7.98	<i>Ingrid Tenten - Fax : +32-2-299.18.47</i>

# The unknown factors of convergence

*For computers, televisions, and telephones, it's all change with the digital revolution and the new age of "convergence". The traditional barriers between information technology, telecommunications, and audiovisual and print media are coming down fast. In response, the European Commission has launched a wide-ranging debate on the challenges brought by a change which is symptomatic of the coming of the information society.*

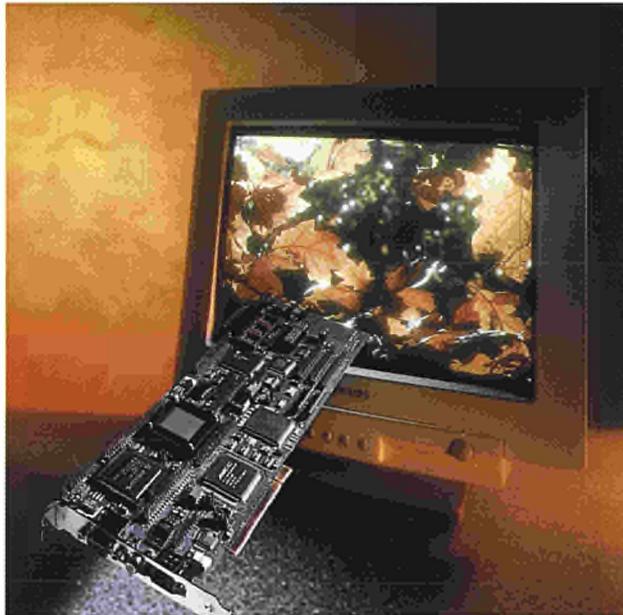
**T**here is nothing abstract about this notion of convergence. The irresistible rise of the Internet and the unbelievable explosion of services accessed through the Web is a convincing illustration. Electronic commerce is now ... common currency. And you can use your PC to link up to more than 270 TV sites or listen to 650 "Web radios" broadcasting from the four corners of the globe.

But convergence is not the prerogative of computers online to the Web. Mobile telephony is not going to end with the transmission of the human voice. As it becomes increasingly sophisticated, its ambition is to become the sole platform with a "nomad" capability - able to send electronic mail, consult the Web, or connect to various remote services from almost anywhere in the world.

Television too has entered the digital age. More than 200 channels can now be received throughout Europe using a satellite dish and an increasingly extensive and effective cable network. TV is ceasing to be a passive medium as interactivity transforms passive receivers into intelligent devices able to manage a new range of personalised services (video on demand, home-shopping, etc.).

## Digital revolution, revolution

But leaving aside the technological advances which are driving it, what will be the impact of this irreversible trend



*The information society is more than a technological revolution. It brings with it legal, social, industrial, economic and other implications.*

towards convergence? The truth is that the debate on the implications of this unification is only now beginning. It is bringing new ways of communicating, of learning, of acquiring culture, of looking after yourself, of doing business, and of functioning in a democracy. It is also overturning the legal and regulatory structures which have previously governed areas of communication and commerce.

Over the past decade the European Union has undertaken a vast restructuring of the former national monopolies in the fields of telephony and television. On 1 January this year, the European telecommunications market became open and competitive. And the successive changes to the "Frontier-free television" Directive have adapted the European audiovisual space to the growing number of stations and programmes now avail-

able through satellite broadcasters.

But the present European regulatory environment was drawn up in a context where these fields were still separate. It fails to take sufficient account of the phenomena of convergence and, in particular, of the way in which information technology is now everywhere spilling over into communication: through the Internet, and with implications for the protection of private life, ethics, taxation on commerce and services, etc.

This regulatory environment is now clearly out of sync with the reality of the exponential development of digital technologies. The great danger is that a failure to adapt these

regulations coherently in response to change will constitute a major obstacle to this development.

## European debate on the Green Paper

The European Commission therefore decided to place this subject at the centre of a wide-ranging European discussion - at the industrial, economic, social and legal level - on the coming of the information society. The debate was launched last November at the 1997 "European Information Technologies Conference" (EITC '97), whose central theme was: "Convergence: Creating the Future".<sup>(1)</sup>

One month later, a European Green Paper on convergence was addressed to all sectors of society - manufacturers, users and the public authorities - in order

## European IT Prize 97: three model European innovations

*Since 1994, three prestigious prizes of ECU 200,000 have been awarded at the European IT Prize ceremony, held during the European Information Technologies Conference (EITC), for research resulting in successful commercial innovations. The prize-winners for 1997 were:*

to identify the issues at stake and define the means of action. "If Europe can embrace these changes by creating an environment which supports rather than holds back the process of change," states the Commission in its introduction to this strategic working document, "we will have created a powerful motor for job creation and growth, increasing consumer choice and promoting cultural diversity. If Europe fails to do so, or fails to do so rapidly enough, there are real risks that our businesses and citizens will be left to travel in the slow lane of an information revolution which is being embraced by businesses, users and governments around the world. The Green Paper initiates a new phase in the European Union's policy approach to the communications environment."

The conclusions of this very open debate, which will end next June, will be used in the very near future to determine the basic Community policies that will enable Europe to draw maximum benefit from the digital revolution.

(1) See the following page for an interview with Nicholas Negroponte, one of the key speakers at this event.

- The "SMARTpen™" patent, registered by LCI Computer Group (the Netherlands) and IMEC (Belgium), marks a spectacular advance in the reliable development of electronic commerce and financial transactions in the information society. This marvel of miniaturisation incorporates - in a standard size ball-point pen - sensors linked to microprocessors which recognise the unique biometric characteristics of a signature on paper and transmit them to a computer network which in turn checks their authenticity against a "registered" model. In addition to the obvious applications such as home-shopping, home-banking, and the use of credit cards, the "SMARTpen™" could also permit the authentication of signatures in a number of other fields, such as medicine. This invention also represents a new user-computer interface, which opens the door to yet more possibilities.



makes it possible to locate and characterise genetic aberrations in chromosomes, offers new possibilities in diagnosing and treating cancer and genetic anomalies (especially for prenatal medicine).

- The joint German-Austrian company Hyperwave Information Management received the EITC prize for its Hyperwave Information Server 2.5 software, a particularly effective system for the management of Internet and Intranet sites. With extensive navigation capacities and search engines, HIS 2.5 allows various members of an organisation or company to introduce data and links to Web databases easily and consistently.

The 1998 European IT Prizes will be awarded on 1 December in Vienna. On this occasion, of the 25 competition finalists, 5 places will be reserved for high-tech products developed by companies from Central or Eastern European countries.

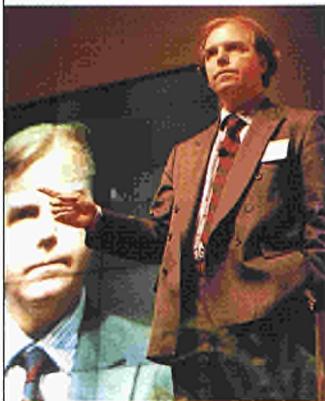
- "SpectraCube®" is a new medical imaging technology, using spectroscopy, developed by the Israeli company Applied Spectral Imaging (ASI). This process, which

### How can you participate in the European convergence debate?

The "Convergence" Internet site allows you to consult the Green Paper and to participate in the European debate by submitting your comments and recommendations: <http://www.ispo.cec.be/convergencegp>

# A Wired Worldview

*Nicholas Negroponte is a founder and the director of the unique - and uniquely successful - MIT Media Lab and was one of EITC '97's keynote speakers. We asked the author of the best-selling book, "Being Digital", to comment on the present state of play in the world-wide information society.*



*Nicholas Negroponte, director of the MIT Media Lab, addressing the EITC'97 in Brussels.*

**R**TD Info: At EITC '97, you pointed out the vast difference in connectedness - whether wired or wireless - between the Nordic region and the rest of Europe, which you said was like the Third World in comparison! Can you see historic, geographic, or legislative reasons for this? Will the liberalisation of the telecoms markets in Europe help to catch up?

**Nicholas Negroponte :** Market liberalisation is not enough. You need attitude. There are many reasons why the Nordic countries are more digital; no one reason is the explanation. There are tax laws, and the like, which help. But one reason is less arrogance about history and self, and more desire and need to be connected. In many ways, they suffer less from the baggage of history.

The best way for the rest of Europe to catch up is through children. A small fix would be to provide local Net access at a fixed price, versus the metered and high prices so common in European local telephony.

**You describe yourself as 50% European and "without a nationalistic bone in my body", but you say that the US is the place to get things done. What do you think makes this so?**

A topic I think about a lot. There are many reasons, which include venture capital, decentralist thinking, and high risk-taking. But probably the strongest is that we take our young more seriously - by that I mean, what they say and what they do. Many Europeans occupy a job like an office. Age is stature and authority. So many times, I want to say to Europeans: "Lighten up, listen to your young."

**The US is considering making the Internet a tax-free zone. How important do you think this is, and how important is it for Europe to do the same? Does it not mean that the new technologies will lead to a decrease of the sovereignty of states?**

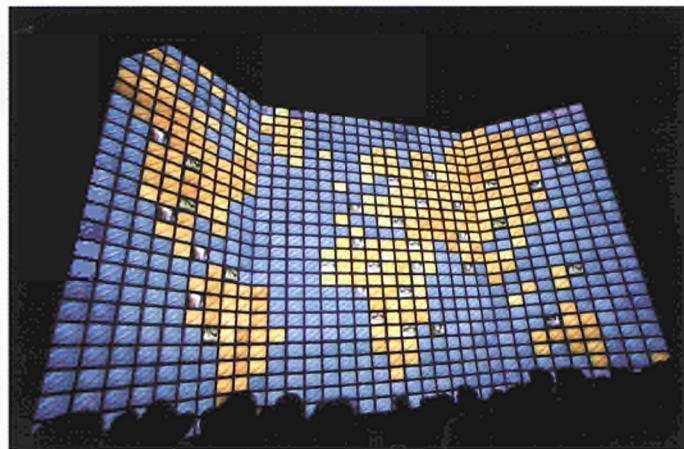
It is easy for the US federal government to declare the Net as a tax free zone, because much of its taxation

comes from income, versus VAT and sales taxes. Taxes are a complex issue and, in the end, we will only be able to tax real property.

Does the Net change sovereignty? You bet it does. The state does not evaporate, by any means. But countries tend to be the wrong size - too big to be local and too small to be global. We will invariably see the nation state behave like all things digital: getting bigger and smaller at the same time.

The change is fundamental - being digital is not technology, but a way of thinking. Imagine how differently today's Net-savvy children will think about the world, their place in it, and the meaning of space and time. These topics fill a book.

**Paper consumption nearly doubled in the US between 1980 and 1993. You have written books and stressed, in one of your articles, that books have a future, simply**



*"The risk of the digital divide is great, because the telecommunications infrastructure is both poorest and most expensive in exactly those parts of the world which need education the most."*

## Being digital

Are the Internet and other new communication technologies fundamentally changing the way we communicate? Or are they merely technological facilitators? Digital revolution or technological evolution?

because at least some people prefer to read books on paper than on-screen. Is this only a "cultural" phenomenon? Could we discover, for example, that the brain zones activated when reading a document on paper and on-screen are different?

Paper is not the issue.

*"I entrust the world much more to the very young, who will grow up digital and wonder how their grandparents were so dense about topics like health, education, environment and peace."*



Reflected light and transmitted light have different properties, depending of course on how it is done (contrast ratio, brightness and resolution). The feel of paper and the random access of a book are also important. This is why the MIT Media Lab has such a large programme for making electronic paper, which will be great news for the trees!

### ***Kids and screens***

**Why do you think it is so important for children to have widespread low-cost access to the Internet? Don't you think this can also engender anti-social behaviour and isolation, and perhaps interfere with school work? And if their entire experience is mediated by their screens, how will we avoid the imposition of cultural and linguistic uniformity on the digital world?**

I am most worried that you even ask. All the evidence in the world points to the fact that children increase their social and communication skills by spending time on the Net. It is the exact opposite of isolation.

The Net will expand the strength and identity of increasingly local cultures and languages. Nobody ever suggested to me that reading a book about a country would replace, or deter them from, going there. Maybe you are saying that the virtual experi-

ence will be so good, so much more reality than a book, that going there will be needless. I don't buy that, because "there" includes people.

Some people argue that the Net will bring English into such common use, that it will kill other languages. Well, it is true that a German tourist in Rome will probably speak English to the cab driver. English as a second language is a given and there are probably more people now learning it in China than speak it today.

But there are two Englishes. One is the English which a French pilot, flying an Airbus, speaks to the tower at Charles de Gaulle. This air traffic control language is akin to what we will see English doing on the Net. The other kind of English will be for communications – which will use English less and less as the lingua franca, because of local languages and their widespread use, not to mention automatic translation. The most widely used language on the Net will invariably be Chinese.

**One of your visions for the future is enshrined in the**

**philanthropic organisation 2B1...**

2B1 has been set up in parallel with the MIT Media Lab. Its purpose is to bring the digital world to children in the poorest countries of the world, especially in rural areas. This is the first time in history we can look at children from a planetary point of view, versus country by country. But the risk of the digital divide is great, because the telecommunications infrastructure is both poorest and most expensive in exactly those parts of the world which need education the most.

2B1 will focus on rural access, using low earth orbiting satellites (*Iridium* this Autumn) and geostationary satellites to bring Net access, by seeding machines and connectivity around the world. What can be achieved will be determined in small part by money, but in larger part by the contagious nature of the Net and the degree to which one action leverages another action. Like the Net itself, growth is from the roots, not the centre. That is the only reason to hope for large scale

success of 2B1 and other similar and charitable efforts.

### ***Internet, Peace and Democracy***

**You said at the conference in Brussels that the Internet will bring world peace, and Bill Gates once said that "computers are a tool for democracy". But any technology has a dark side and can be misused as a vehicle for criminal activities...**

Bill and I have different motivations for saying the same thing. I am sure there was a lot of dark side conversation about books, when the printing press was invented.

The darkest side I see is all the time people spend talking about this subject, versus doing and taking actionable steps to expand the highly optimistic nature of the digital world. Neither I nor anybody will advocate blindness or thoughtlessness, but it may be time to focus on the bright side a bit more and listen to the many positive voices.

**IS** The Internet is attached to the concept of total freedom, but the Web is also an ideal vehicle for presenting lies with authority and allows the propagation of errors and confusion. How can users distinguish between fact and fiction? The European Commission has just adopted an action plan to promote safe use of the Internet. Are there measures or changes that are needed?

How can any of us distinguish between fact and fiction, in print and other media today? In fact, it may be a lot easier in the digital world, as we get better and better at electronic word of mouth. The best we can do today is via brand labels like your trusted local newspaper or television channel. Tomorrow, you'll have the added advantage of digital social filtering on a



*"Being digital is not technology, but a way of thinking".*

much wider scale than we can do through face-to-face acquaintances.

The major role which government can play is to get privacy and security right, to totally liberalise the encryption laws and to empower people to use every means and freedom to make their own decisions

**If we are to rely on the Internet more and more as an educational tool, as you implied, surely it will be necessary to have at least some form of quality control or at least quality certification for educational purposes. Could this work with the idea that WWW=total freedom?**

Think of your own education, what you remember most and what affected you most. Probably very little is formal education, but has to do with experiences and people, versus, say, the classroom. The single greatest force in learning is passion. I don't know how to do quality control on passion itself, it may be an oxymoron. Not for an instant, however, am I or anybody I know suggesting that

learning happens in a vacuum. But maybe the concept of certification will change in ways that can value imagination and creativity and exercise all aspects of the brain, not just test our ability to engage with symbols and facts. I cannot imagine people in the year 2050 taking tests the way I did at school.

**Finally, are you hopeful about the future?**

I deeply believe we can see a world with much less poverty and much more human hope. Much of this will come from resolve. Remember that the annual cost to deliver primary education to the 200 million children who do not get it, is less than half of what we spend on golf.

In a small way, I have given up on adults. I entrust the world much more to the very young, who will grow up digital and wonder how their grandparents were so dense about topics like health, education, environment and peace. So let's give them a better chance than we had. ■

(\*) This interview was carried out by Michel Claessens and Stephen Gosden. The heading and subheadings are editorial additions.

## Portrait of a digital being

Nicholas Negroponte graduated from the Massachusetts Institute of Technology (MIT), Boston, as a specialist in the then-new field of computer aided design. He joined the Institute's faculty in 1966, and for several years thereafter divided his teaching time between MIT and visiting professorships at Yale, Michigan, and Berkeley. In the 1960s, he pioneered research at MIT into radically new approaches to the human-computer interface.

In 1985 he helped found the MIT Media Laboratory (<http://www.media.mit.edu/>), which carries on advanced research into a broad range of information technologies including digital television, holographic imaging, computer music, computer vision, electronic publishing, artificial intelligence, human/machine interface design, and education-related technologies.

For the last 15 years, he has travelled extensively throughout the world as a lecturer. He consults to both governments and industry and serves as an active member of several corporate boards of directors.

# A foundation for educational multimedia and audio-visual materials

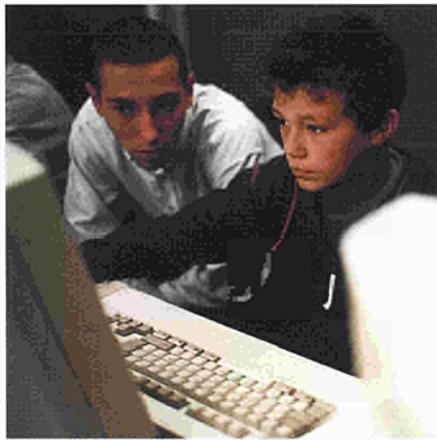
*The success of the Netd@ys showed the determination of the world of education and the desire of young people to participate fully in the information society. With a private foundation of educationalists and industrial partners soon to be set up, Europe is finally seeing the creation of a genuine virtual-education area.*

**1** 5,000 schools participated in the Netd@ys launched by the European Commission last October<sup>(1)</sup>. Its Internet site received more than half a million visits and there was extensive media coverage of the more than 700 events staged throughout Europe. Thousands of teachers enrolled on specially developed training courses and the many competitions on the Web and the launch of interactive multimedia journals all met with a resounding success.

## **Public/private, an essential partnership**

The Netd@ys - and this may be one of the keys to their success - brought together a range of players not usually to be found on the same field: educationalists, politicians and administrative officials, and industrialists. They effectively illustrated how Europe could respond to the major training challenge of ensuring that its young people are able to join the information society successfully. To do so, schools need equipment, access to services and networks, technical maintenance, educational software, and teaching materials. They cannot succeed in this without active support from a private sector (equipment vendors, service companies, software developers, etc.) which does not seem to know quite how to approach the school market.

It is in order to bring these two worlds of schools and industry together, and to allow them to build an essential virtual education area, that the idea of setting up a European Foundation for Educational Multimedia and Audio-visual Materials is now taking shape. "This is a



*15,000 European schools participated in the first Netd@ys. A success which illustrates the need to put the new technologies to work for education.*

response to the desire expressed by the players themselves to co-organise their activities," explains Alain Dumort, head of DGXXII's New Technologies Unit. "The Commission's role is to make it easier for the partners to come together in pursuit of common objectives, such as those set out in the Learning in the Information Society action plan. As a legal form, a private foundation will make it possible to reconcile the interests of industrialists, organisations representing education, and public authorities which, if they are able to come together in this way, will be able to adopt specific lines of approach."

## **A point of reference and forum for debate**

With the task of serving as "the point of reference and forum for debate between the partners", the aims of this Foundation are as specific as they are ambitious. As a study centre, it will look at underlying factors (changes in educa-

tional practices and technologies, the role of the new information and communication technologies in the learning process, etc.). With the focus firmly on the practical, it will analyse the needs of this specific market. Also, in its capacity as a centre for the exchange of information and experience, it will set up networks, stimulate partnerships, define models for cooperation on major European projects, and disseminate good practices in the area of cooperation between the public and private sectors.

This cooperation is already taking shape. A group of 15 companies<sup>(2)</sup> is to set up the European Partnership for Education (EPE) in order to provide a response to partnership needs and an Educational multimedia and audio-visual materials working party will regularly bring together manufacturers able to co-produce and co-distribute the teaching products which Europe needs. In addition, at the last MIP-COM<sup>(3)</sup> meeting, some 40 European decision-makers identified a number of strategic points in relation to which the Foundation could have a role to play. ■

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(1) See Back to school on-line, RTD Info n° 17

(2) Apple Computer, Averbode éditeur, Belgacom, British Educational Software Association, Cisco, Deutsche Telekom, France Telecom, IBM, ICL, Microsoft, Oracle, Schoolsoft, Sun Microsystems, Portugal Telecom, l'Union des Radiodiffuseurs.

(3) Meeting at the conference entitled "A different way of learning", organised by the European Commission and Reed-Midem as part of the 13th International audio-visual film and programme fair (Cannes, 26.9.97).

# Rescuing valuable R&D know how

*Thanks to its participation in Copernicus-funded projects, a formerly state-owned, Romanian research laboratory specialising in surface treatment has turned itself into a viable export-led manufacturing company. In 1993, research staff from the now-derelict sewing-machine factory in Tirgu Mures created Plasmaterm, an employee-owned company which now turns over around ECU 400,000 a year.*



*Dr Zoltán Kolozsváry, managing director of Plasmaterm. "Copernicus helped us to our feet - we have ourselves to learn to walk, and then to run."*

**T**he predominantly Hungarian-speaking town of Tirgu Mures (Marosvásárhely) lies in the misty valleys of Transylvania, 300 km north of Bucharest and 400 km east of Budapest. Since 1990, it has suffered the loss of an entire manufacturing sector. Its precision-engineering factories, which produced spinning, weaving, sewing, and knitting machines, are closed and some 10,000 jobs have been lost. But one firm has survived. At the rear of the kilometre-long Matricon sewing-machine works stands a fading three-storey concrete block, inside which a remarkable transformation is taking place. It is home to Plasmaterm, a 70-strong

research and manufacturing firm specialising in surface treatment.

## ***Copernicus should not replace state subsidies***

Copernicus helped us to our feet - we have ourselves to learn to walk, and then to run," says managing director Dr Zoltán Kolozsváry. Admitting the crucial role that EU RTD support has played in Plasmaterm's survival, he is a firm believer in self-help. "The Copernicus programme should not be used indiscriminately to replace the vanished state subsidies for research. But what it can do is allow valuable laboratories to survive the transition into viable businesses. It is up to us to make the necessary changes in our structures, but where the EU can help is by linking us to colleagues in more developed countries, and making us part of an efficient information system, so that we can integrate ourselves into the world-wide process of technology development - and the global market."

Plasmaterm is now embarking on its third European collaborative project within the Copernicus programme. Since 1994, it has worked with partners in Britain, Hungary, Poland, and Germany to improve techniques of surface treatment. The main focus of the work has been to apply the process of plasma nitrocar-



*Plasmaterm inherited a unique expertise in surface treatment, along with a wonderful array of measuring and testing equipment, much of it home-made.*

burising<sup>(1)</sup> to low-alloy and carbon steel, to stainless steel, and, latterly, in combination with polymers. Its practical application will lie in improving orthopaedic implants such hip- and finger-joints. Project leader Professor Bell of Birmingham University is enthusi-

astic: "I've known Zoltán Kolozsváry for 30 years, and we are both world experts in surface treatment. The results of our projects have been very beneficial, considering the very small amounts of money that have been invested. The economic potential is tremendous."

The laboratory that became Plasmaterm was founded in 1965, as part of the Ceausescu government's push to create a home-grown technology sector. Starting with a team of four, it established an international reputation and registered several patents in low-temperature nitrocarburising. By 1990 the laboratory employed 200 staff. Then came the political turmoil, and research funding dried up. The parent company, Matricon, which in its heyday employed 6,000, stagnated. It was the staff's darkest hour. Wages went unpaid, morale sank, and the supervising ministry in Bucharest was paralysed. By 1993, Dr Kolozsváry had reached the end of his tether, and decided to make a "unilateral declaration of independence".

## ***"We all quit!"***

"I presented the situation to the work force, proposed that



*A former laboratory within the now-derelict Matricon sewing-machine factory, in Tirgu Mures, Plasmaterm is now an employee-owned company and 90% of production is for export.*



we form our own company to rescue the business, and 85% of the workers said 'yes'. Though they had not been paid regularly for months, each of them managed to invest some two weeks' pay - about \$30 a head at that time. So we had a capital of some \$5,000 - not much, but enough to make a start. To avoid being blocked by the head office, we then formed a company in secret, and I rang up my boss and simply announced 'we all quit!' It was an unprecedented feat accomplished, and could not be gainsaid, because although the staff were government employees, the site and equipment belonged not to the state but to Matricon.

Plasmaterm inherited a unique expertise in surface treatment, along with a wonderful array of measuring and testing equipment, much of it home-made. It has used these assets to build up a business in contract materials testing and analysis, failure analysis, and of course surface treatment, including plasma nitrocarburising. Prestigious partners include ABB Kent Messtechnik and Cochran Boilers. The company's bread and butter is the lost-wax investment casting of small parts, such as wheels and bogies for miniature out-

door railways, and 90% of production is for export.

The early stages were not easy, and over half the previous staff had to be laid off. But by judicious trading, the company has managed to build up its asset base twenty-fold in its short existence. It has now reached the position where it can consider purchasing its premises and expanding into the forge next-door, creating 30 more jobs. Salaries are already a little above the national average, differentials are low, and younger graduates are joining the firm. The employee owners have been doubly rewarded: after a small loss in its first year, Plasmaterm has been able to declare two successive dividends equivalent to 100% and 150% of their original investment.

### ***Think globally - act locally***

The success of this transformation is due in no small measure to the polyglot Dr Kolozsváry's evident local pride, co-operative approach to management, and international perspective (he has just been elected President of the International Federation of Heat Treatment). Above all, his deep roots in the locality

have fuelled a fierce determination to ensure his laboratory's survival. At Plasmaterm, innovation continues apace. With several patents registered jointly with their European partners and a fourth international project now in preparation, the company's collaborative research effort matches its organisational transformation and economic expansion. As an innovative, exporting SME with a social conscience, Plasmaterm is just what Romania's economy needs. ■

(1) Plasma or glow discharge nitrocarburising is accomplished by applying an electric charge to iron objects in an atmosphere containing nitrogen, hydrogen, and carbon. The gas atoms become excited, emitting a pink glow, and react with the surface of the iron to create a hard, smooth layer composed largely of iron carbonitride. The method is environmentally safer than the previously common method of immersion in a bath of cyanide.

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## **Copernicus - promoting pan-European RTD**

The political upheavals in Central and Eastern Europe have caused severe disruption to the rich tradition of research and technological development that had developed there. Copernicus (Community of Pan-European Research Networks of Interdisciplinary Centres and Universities in Sciences) was established in 1991 to help salvage what could be salvaged, and to preserve an indigenous human resource base for sustainable development. Part of the EU's International Cooperation RTD programme, it supports collaborative RTD projects in areas of mutual interest, including manufacturing, and has a budget of ECU 209 million for the period 1995-1998.

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# Finding a common European language for geotextiles

*Since the mid-1960s, polymer geotextiles have found numerous applications in the construction of roads, canals, railways, tunnels and dams and in many environmental projects. But through lack of standards, manufacturers of these new fabrics were meeting problems in expanding their markets internationally. A European research project has paved the way to finding common measurement and testing methods.*

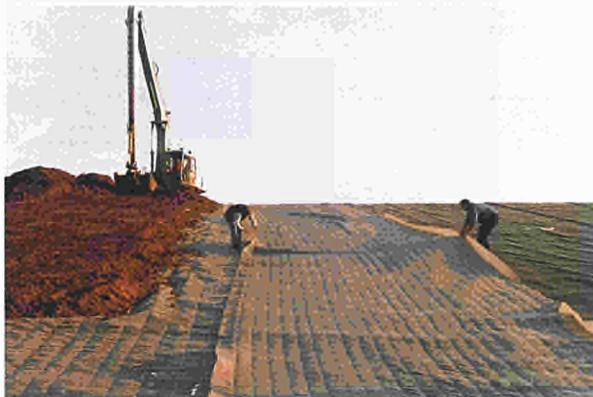
**G**eotextiles are woven or non-woven fabrics made mainly from polyester or polyolefine fibres or as extruded polyethylene grids. They are manufactured in grades ranging from coarse meshes to fine tissues. As reinforcing materials they are used to strengthen embankments — which can then be built steeper, so requiring less land — bolster coastal defences, and stabilise subsiding ground. They are used in road construction and under railway lines to prevent the coarse materials or the ballast sinking into the underlying soil. In landfills they provide drainage and ensure the protection of the impermeable liner. About a thousand square kilometres of these geotextiles are manufactured world-wide every year.

A study by the European Commission showed that the principal obstacle to trade in these versatile materials within Europe was the lack of common standards for manufacture and testing. This is now being addressed by the Construction Products Directive which aims to create a single market for building materials. To support the directive, the European Committee on Standardisation (CEN) was asked to devise standards for many construction products, including geotextiles.

## A need for research work

Although several national standards already existed, it soon became clear that much experimental work would be

required to develop a comprehensive set of reliable tests. The CEN committee responsible for geotextiles, TC-189, turned to the SMT programme for financial assistance to evaluate suitable testing methods. Nine tests were identified as needing developmental work, ranging from those for measuring the opening and water permeability of geotextile filters, to the ability



*About a thousand square kilometres of these geotextiles are manufactured world-wide every year.*

to withstand exposure to ultraviolet light, and resistance to degradation by chemicals and bacteria in the soil.

"A two-and-a-half-year work programme was approved, starting with detailed research tasks and culminating in international trials," explains John Greenwood, the project coordinator from ERA Technology, an independent contract research organisation in the UK. "We had the support of many university, industrial, government and independent groups. A total of 31 different organisations in 12 European countries took part in the work and many manufacturers donated materials."

## Towards a unified market

"The committee has now proposed a set of European Standards on geosynthetics for approval by CEN, including 13 proposals that have had support from the SMT project. Among these are tests previously used in national standards, tests with improved procedures, and some completely new tests."

The standards will form part of a range of formal requirements and associated test methods whose use will be mandatory throughout the European Union. A manufacturer will need to perform only one set of tests to put his product on the European market, so reducing development costs which would otherwise have been passed on to the customer.

The knowledge generated by the project has led to an agreement between the project partners and the corresponding US authorities for an exchange of technical information between European and US researchers. ■

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# A neutron treatment for cancer

*After almost 10 years of cooperation, Europe's top specialists meet around the high flux reactor at the Joint Research Centre in Petten to witness boron neutron capture therapy's first clinical trial.*

**T**he precise destruction of cancer cells. This is the aim of the boron neutron capture therapy (BNCT) clinical trial that started in the Netherlands last October. The target: glioblastoma multiforme, a very aggressive brain tumour that shows little response to traditional treatment and affects about 15,000 people in Europe every year.

The high flux reactor (HFR) at the Joint Research Centre (JRC) in Petten is at the heart of this initiative. "The HFR is a 45MW reactor, initially intended to conduct experiments on nuclear materials and fuels under European civilian programmes. Over recent years its field of application has expanded to cover medicine, and in particular radioisotope production and boron neutron capture therapy," explains Ray Moss, who heads the BNCT project at the JRC's Institute for Advanced Materials.

## **Alpha particles at the heart of the cells**

It was the American biophysicist G. L. Locher who, as early as 1936, first came up with the idea of the binary treatment now known as neutron capture therapy. When boron atoms are subjected to a low-energy neutron beam (thermal neutrons) the boron nuclei disintegrate into lithium and alpha particles with a combined kinetic energy of 2.5 MeV. If this reaction can be produced in the cancer cells, the energy is sufficient to destroy them, without damaging healthy neighbouring cells since the range of the particles is less than 10 microns.

"BNCT is only of clinical interest if a sufficient dose of thermal neutrons reaches the target cells and if the boron concentration is higher in the tumour than in the healthy neighbouring tissue,"



*Edith Cresson, at the inauguration of the Petten BNCT-radiotherapy centre: "We must progress from research based on technical performance to a research which is better focused on the hopes and needs of our citizens."*

explains Ray Moss. These two constraints explain the failure of the first BNCT trials in the United States in the 1950s and 60s.

"Since the early 1980s, we have increased our knowledge of the biology and physics of neutron capture therapy and made major progress in boron compounds and neutron beams," explains Wolfgang Sauerwein of Essen University (Germany), who has overall clinical responsibility for the whole European operation. The pharmacokinetic tests carried out over the past 10 years by the centres associated with the European research have made it possible to select a sodium-boron compound which lodges in the cancerous cells of brain tumours but not in the cells of a healthy brain. At the same time, researchers at the JRC and the Netherlands Energy Research Foundation (ECN), are now able to produce neutron beams of sufficient quality and intensity to reach cells located deep in the brain.

## **First clinical trials**

Four groups of 10 patients from five countries (Germany, the Netherlands, France, Switzerland and Austria) have been selected for this trial, which is being carried out under the control of the European Organisation for Research and Treatment of Cancer's New Drug Development Office and co-financed under the Biomed II programme. The project coordinator is Prof. Gabel at the University of Bremen. Between two and six weeks after surgical operation on the tumour in their country of origin, the patients - for whom conventional treatment no longer offers much hope - are hospitalised at Amsterdam's VU Hospital. For four days they travel to the HFR for a daily 20-minute treatment session carried out by specialists from Essen University, with the technical and scientific support of the JRC and ECN Petten. They then return to their home country where their condition is closely monitored. To date, five patients have received this treatment.

"The aim of the present study is to assess the toxicity of the treatment and establish the tolerance of the healthy tissue," explains Wolfgang Sauerwein. "Our primary objective is to determine the maximum permissible boron-neutron dose. Of course if a therapeutic effect could be observed that would be wonderful, but we will not begin to focus on actually combating cancer until a later stage, during the phase II trials." ■

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# Combating the cowards' weapon

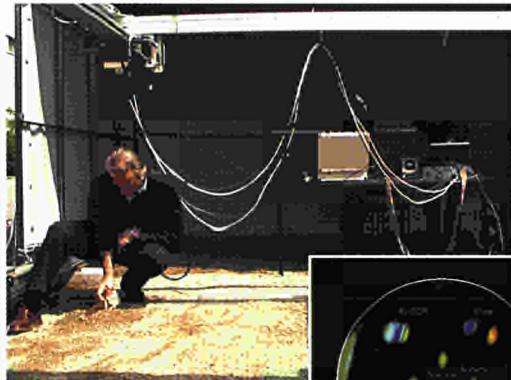
*Europe intends to be at the forefront of the campaign against anti-personnel mines. The JRC in Ispra is developing a data base on land mines and testing sensors designed to detect them. At the same time, ECU 12.3 million is to be made available for research into developing a multi-sensor device, supported by the Esprit programme.*

Some 110 million anti-personnel mines have been laid in 70 countries. They kill or maim 26,000 people every year, most of them children. It costs between three and ten Ecu to manufacture such a device - and 100 times more to detect and deactivate it. At the end of 1997, the Nobel Peace Prize was awarded to the campaign against anti-personnel mines and 123 countries signed the Ottawa Convention banning the production and use of this "cowards' weapon". But the European Commission did not wait for this international unanimity before tackling the problem by financing not only de-mining operations but research activities too. For it is estimated that using current technology it would take 10 centuries (and ECU 25 billion) to de-mine the planet.

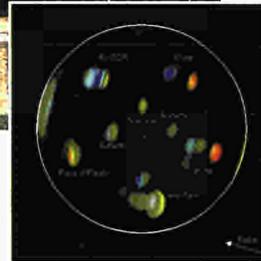
## Collecting and combining

For several years now, the Joint Research Centre's (JRC) work in Ispra has involved both research and information, playing a pivotal role in bringing together researchers, industrial partners and de-mining organisations, the better to define needs in this field. It is currently compiling a database devoted exclusively to anti-personnel mines (LMIS - Land Mines Information System) which will collect as much data as possible on minefields and de-mining operations, the technical characteristics of mines, the nature of soils, and the types of sensor to be used in different situations.

The JRC's Advanced Techniques Unit tests remote-controlled radar sensors able to detect and identify anti-personnel mines. "We combine metal-detectors with infrared and microwave sensors," explains Alois Sieber, Head of the Advanced Techniques Unit. "This associa-



*Radar test to identify various objects, laid on the ground, including an anti-personnel mine (visible at the bottom of the two pictures).*



*The goniometric equipment at the JRC in Ispra (EGO Laboratory) will be used to develop the ability to interpret remote-detected data on the presence of anti-personnel mines in various kinds of soil.*

anti-personnel-mine detectors is due for publication in March 1998. This call, which has been allocated ECU 12.3 million<sup>(1)</sup> to fund projects, is based on standards developed by the JRC. The Centre will lend its scientific and technical assistance to the selected companies, making its testing laboratories and other infrastructure available to them<sup>(2)</sup>.

This ambitious research programme should make it possible to develop de-mining techniques which are more effective and less costly, safer and faster. For the people of the former Yugoslavia, Afghanistan, Angola, and many other countries, this means the hope of being able to work, go about their day-to-day business, and watch their children play without the constant threat of danger. ■

(1) From the financial supplement to the Fourth Framework Programme for Community research.

(2) European Microwave Signature Laboratory (EMSL), EGO (European Goniometric Facility) and European Electromagnetic Test Facilities.

tion of complementary methods produces a mass of data, the analysis of which permits the identification of all kinds of anti-personnel mines. Metal detectors alone are no longer enough, as many mines are made of plastic. Infrared and microwave methods, on the other hand, prove very effective in locating and identifying this type of mine, even if they are buried."

At the JRC's laboratories each type of anti-personnel mine has its fingerprint taken. This is then used to test different kinds of sensors, both inside and outside the laboratory, in reproducible environmental conditions, and in various soil types. In May 1997, the JRC carried out a preliminary series of measurements using different kinds of sensor, with the assistance of three European companies: one Dutch, one German, and one French.

## A multi-sensor device

The Esprit programme's call for proposals for the development of multi-sensor

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