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RTD info

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CANCER

A EUROPEAN PRIORITY

PHILIPPE BUSQUIN

European research sets a new course

OCEANOGRAPHY

Polarstern, a floating phenomenon

Editorial

Is science above the law?

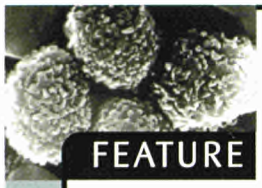
Britain has decided to allow research on stem cells obtained from human embryos, and Germany is to allow their import. This highlights yet again the different approaches the 15 EU Member States take on these fundamental issues. It also shows the importance and urgency of agreeing a European approach to such questions of 'science and society' – as the Commission proposed last December.

Life is now being objectified and marketed to such an extent that ethical considerations risk being overlooked. In a global context in which the winner is often the one who innovates fastest, there is a very real risk that in-depth reflection and public debate on science and technology will be brushed aside because it stands in the way of 'progress'.

Nobody would dispute the need to supervise and control technological developments which, though they may be designed to solve specific problems, end up changing society as a whole. But how can we control them? Society seems repeatedly to be presented with a fait accompli. Is this simply because morality is slower to change than reason?

The decisions which are being made increasingly reflect a tacit consensus among the 'experts' – who come mainly from the scientific and industrial communities, and are both judge and party to the affair. Science and industry are now in some sense laying down the law. Our values are changing to keep up with our scientific and technical knowledge. It is as if we have given up trying to control science and technology democratically, and have finally accepted that society must adapt to technology – not vice versa.

Bucking the trend, last year the Commission initiated a European dialogue on these developments, between representatives of research, and of society in the broadest sense. We should not, however, presume that the matter is now settled. The debate will go nowhere if these ideas are not discussed, developed and consolidated both nationally, and at an international level.



FEATURE **Cancer, a European priority**

Prevention, detection, treatment... Fundamental and clinical research are joining forces to fight a disease whose varied and complex forms present a challenge to the efforts of scientists and doctors alike. *RTD info* looks at the progress of the latest research strategies and the vital work of cancer information networks.

11 The Union's commitment

12 On every front

15 Spreading the cancer message

16 Because clinical research is fundamental

Sixth Framework Programme (2002-2006)

Following a political agreement at the Council of Ministers, and with its content and budget now set, the new directions taken are giving real shape to the European Research Area.

3 INTERVIEW

European research steers a new course

European Research Commissioner Philippe Busquin sets out the main thrust and summarises the thinking behind it.

6 **The home straight**

A preview of the Sixth Framework Programme due to be adopted this summer.

9 **Research 2002: the big November meeting**

All about the launch conference in Brussels.

20 PORTRAIT

The correct use of mathematics

RTD info meets Giorgio Israel (La Sapienza University, Rome), expert on the history of mathematics, humanist and philosopher who is concerned about the aberrations of the technosciences, the misuse of mathematics and the foundations for a new rationality.

22 **Digest**

Opinions, Letters, News in brief, Publications, Diary, Calls for proposals.

26 ENLARGEMENT

Partners in excellence

Thirty-four multidisciplinary centres of excellence in 11 candidate countries benefit from Union support. These new scientific and technological partners who will be strengthening the European Research Area are presented here complete with useful addresses.

30 OCEANOGRAPHY

A floating phenomenon

Polarstern, the star of German oceanography, spends its time sailing between the Arctic and the Antarctic. Its nine on-board laboratories are staffed by a succession of scientific teams studying such matters as climatology, marine biology, underwater geophysics and continental drift.

34 INTERNATIONAL RESEARCH

Indian resolve

After its spectacular success in the computing sector, India is now turning to other high-tech fields, such as biotechnology. It has just signed a mutual scientific cooperation agreement with the Union which marks a major departure from the usual notion of development assistance.

37 HEALTH

The mobile phone: friend or foe?

Are the electromagnetic waves emitted by mobile phones and other everyday on-line technologies damaging to health? Scientists are unsure, the WHO is cautious, and the Union is backing new research on this problem for science and society.

40 INNOVATION

Technology without borders

The specialised experts from the IRCs, which form a solid network throughout Europe, are helping SMEs with a high technological potential to conclude successful international cooperation agreements.

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Cover: Chronic lymphoid leukaemia - © D.Dantchev/INSERM

European research steers a new course

On 28 January 2002 the Council of Ministers adopted a joint position - taking into account the Parliament's opinion - on the Sixth Framework Programme. The priorities, implementing instruments and budgets have thus been decided. On the occasion of this key step,(1) Philippe Busquin, Commissioner responsible for research and principal instigator of the programme, explains the thinking behind it.

Philippe Busquin: 'At Union level, research needs its own policy and must set its own structured objectives which look to the future and are designed to reinforce its excellence.'

How would you judge the negotiating process between the Council, Parliament and Commission, which took up a large part of 2001? Do you recognise your initial project in the result?

Philippe Busquin: When I became Research Commissioner, just over two years ago, I proposed that research should be recognised as a vital area of Union policy. This was accepted and we have now set a new strategy within the integrated framework of a genuine European Research Area. The new framework programme was consequently conceived with a completely different objective in mind than the previous ones and was designed above all to be a structuring instrument in the service of this objective. As it was innovative, there were many discussions while it was being drawn up, but now that we are entering the final stage I feel that we have achieved very largely what we set out to do.

First of all in terms of resources. The Commission had set a maximum overall budget of €17.5 billion, an increase of almost 17%. Agreement was reached on this amount without lengthy discussions and that is clearly a very important and significant achievement.

Previous framework programmes prompted some pretty tough negotiating over the figures. Does that mean that the Union's political leaders now view research as more important than they used to?

I believe that mobilisation in support of the European Research Area acted as a kind of trigger. Research is now well and truly on the Union's political agenda. In the past European research was certainly seen as necessary, but there was the tendency for it to occupy a somewhat secondary role, for example by justifying it in relation to the needs of the Union's other policy objectives. This notion of research providing 'services' has of course not disappeared entirely.

But there is a new awareness that the knowledge-based society requires a much more pro-active, coherent and encompassing vision of the way Europeans manage this sector. At Union level, research needs its own policy and must set its own structured objectives which look to the future and are designed to reinforce its excellence. That changes the whole perspective.

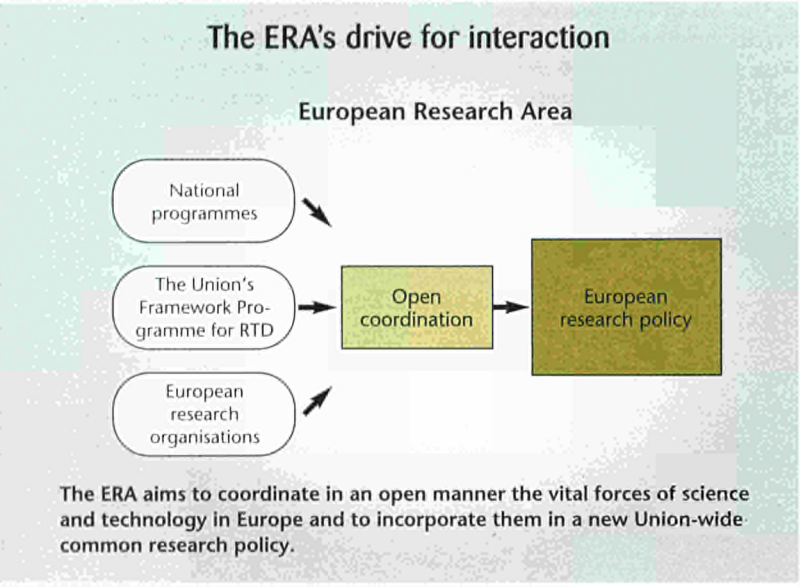
Which aspects of this new approach sparked the most in-depth debates?

Two major policy directions we proposed were discussed at length. Firstly, the principle of concentrating the research effort on selected priority fields. This requires a quite difficult political choice which had been largely

(1) The final decision will be made after a second reading at the European Parliament and when the rules for participation have been decided.

avoided in previous framework programmes, with the inevitable result that the research effort was spread too widely and too thinly. Concentration is essential if you want the added value of European research to integrate national potential and achieve the famous 'critical mass' required by scientific and technological progress in a global world.

I am pleased to say that the proposed priorities were all adopted and not in any way 'fragmented', although the debate clearly served to modify certain initial options.



The ERA aims to coordinate in an open manner the vital forces of science and technology in Europe and to incorporate them in a new Union-wide common research policy.

The second difficult choice of direction concerned the adoption of new implementing instruments, namely the creation of networks of excellence, the putting together of integrated projects seeking to achieve ambitious objectives of strategic significance, and the possibility of providing European support for joint research initiatives by certain Member States. I see these three points as decisive as they will make it possible to realise the framework programme's potential to act as a catalyst within the European Research Area.

There were many discussions to present and explain these three new instruments. It is only right to question change, but at the same time there is a need to overcome fears, doubts and inertia.

Did not the fears and doubts arise out of giving up what one already has for the unknown, namely of losing the traditional 'clientele' of the framework programmes - most notably SMEs - which were used to 'tailor-made' projects which are less ambitious than those you are announcing?

Indeed. And a perfectly clear compromise solution was found in this area. It was never my intention for the new instruments to absorb 100% of the framework programme's resources. I wanted them to be there, and with significant resources, but a whole area of the framework programme continues to be devoted to traditional missions of European research policy: measures in favour of SMEs, the mobility of researchers - with increased budgets in both cases - research to support Union policies (especially at the Joint Research Centre), international cooperation, etc. There is, moreover, an increased commitment to SMEs which will be allocated 15% of financing for thematic fields in addition to the specific measures for SMEs.

I would add that it is wrong to think that centres of excellence and integrated projects will become the preserve of 'large' countries, 'large' laboratories or 'large' companies. That is not at all the situation if you look at the many major European projects past and present which small but highly efficient academic or industrial entities have either led or participated in.

Also, the final stage in launching the new framework programme will be the discussion of the 'rules for participation'. It is at this stage that we will define the project assessment and selection criteria as well as the way projects will be required to operate.

Is the matter of the simplification of procedures going to come up for discussion again? They continue to be criticised.

Personally, I believe that many things still need to be simplified and, above all, the consortiums which manage projects should be given more autonomy and flexibility. Of course one must ensure that European public money is not squandered, but too much bureaucracy ends up devouring one of the researcher's most valuable possessions: his time. At present for example, project participants are asked to provide a detailed justification of the expected socio-economic benefits. It is almost as if they must draw up a business plan for their future innovation. Industry researchers often tell me that within their company not even research using own funds is subject to such a rule. Not all research is undertaken with the certainty of success. I fear that this kind of criterion will end up awarding points to those who can write well!

In your vision of the European Research Area you often stress the importance of fundamental research. Is it true to say you want to 'rehabilitate' it?

Europe already supports fundamental research in many ways, although it is true that even the treaties themselves associate the framework programmes with 'final' research which benefits competitiveness and quality of life in Europe. But such objectives are not in any way incompatible with the pressing need to develop fundamental research, quite the contrary in fact. I believe that everybody is beginning to understand that we are entering a society in which the creation of new knowledge is increasingly essential to keeping the economy turning. The world of industry understands this very well and is making increasing calls for 'upstream' support.

Apart from the launch of the new framework programme, set for the end of the year, how do you feel the European Research Area is shaping up?

The framework programme is one instrument - representing just 5.4% of global research funding in the Union - in its realisation. A whole series of levers must be activated to generate this dynamic of a new European research policy. Some of these levers are already present in this programme - with necessarily limited budgets - in the field of the mobility of researchers, the development of modern research infrastructures, dialogue between science and society, and the coordination of national activities and programmes.

On these and other points - and I am thinking in particular of intellectual property, the problem of the Community patent, and venture capital - much still remains to be done and over the past two years I have launched actions and initiatives which will strengthen during the coming months.

But is not the coordination of national research the Achilles' heel of the European Research Area?

I would not use that term, but I agree that it is a key concern. It is a matter of political will. The Commission has received a clear mandate to make a comparative evaluation of our research systems and this is now under way. We are proposing new instruments for cooperation and coordination. The ball is now in the Member States' court.

Also, in addition to the structural and organisational aspects of research, the Commission has laid two strong ideas on the table of the Spanish presidency. I believe these will give the European Research Area a clear and visible double goal, but it will take strong political commitment to achieve them.

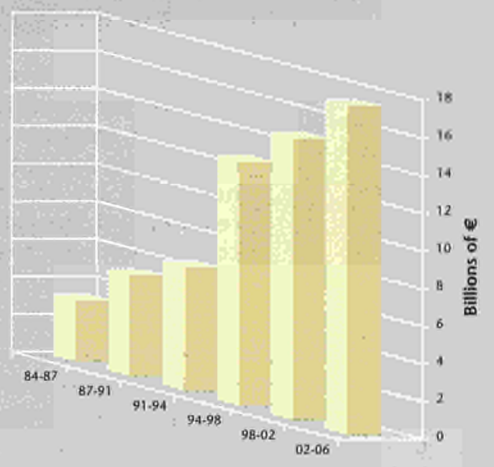
The first is quantitative. The Barcelona European Council in March 2002 has set the ambitious objective of increasing the Union's global research expenditure to 3% of GDP by 2010, which is one and a half times the present amount. This major boost will help us catch up with the United States and Japan. I would stress that this is not a matter of increasing public expenditure but of private sector investments in research. Annual R&D expenditure by European companies currently lags behind that of their US competitors by €70 billion.

Setting this objective is an ambitious challenge. Realising it is clearly not the job of national research ministers alone, but also depends on the commitment of many government players responsible for fiscal and industrial policy in every country.

The second objective is qualitative. We aim to create a Europe of knowledge and this clearly hinges on research and education policy. The dual mission of universities in this respect illustrates clearly to what extent these two fields are linked. All structures within the educational system must be involved in the training and mobility of researchers.

Growth of the European research effort

The budget for the Sixth Framework Programme is 17% more than for the Fifth Framework Programme. This represents a real growth of 9% after allowing for inflation. Calculated as an annual average compared with 2001, support for research will receive 3.9% of the Union's total budget over the coming years. Compared with total public expenditure on civil research by Member States, it represents about 6%.



Increases in global budgets for RTD framework programmes

What is your message to the research world at this particular moment in time?

The first funds will be available under the framework programme at the end of 2002. I imagine this is an opportunity which will interest a lot of people. They should start preparing now. We know the priorities and the instruments. They should not wait until the procedures are finalised before starting to explore their future projects.

I should like to address this message to researchers in the candidate countries in particular, because when it comes to adhesion research has a head start on other policies as the framework programme is already completely open to them. They must know that they are an inherent part of the European Research Area. ◗

The home straight

Following the political agreement of 10 December[1] between EU research ministers, the new generation of European programmes is fast becoming a reality. The budget and content of the new 2000-2006 Framework Programme have been set. The text is now with the European Parliament for a second reading and, providing that any proposed amendments do not require conciliation with the Council, the programme should be adopted this summer.

With increased resources and an innovative approach, the main focus of the Sixth Framework Programme (FP6) 2000-2006 is to create the European Research Area (ERA), for which it is one of the major tools. Its priority objective is to promote much greater integration of the European research effort and capacity and to enter a new era by implementing a coherent and concerted approach at Union level as a basis for developing genuine joint strategies.

While ensuring that a number of traditional actions under previous Framework Programmes continue (such as the active participation of SMEs), the new programme – allocated €17.5 billion – is structured around the three main targets of **concentrating and integrating** European research, **structuring** the European Research Area, and **strengthening its foundations** (see box).

Seven priority fields

The first and by far the most important of the target areas will be allocated three-quarters of the programme's total budget.

In the interests of efficiency and to avoid the risk of duplication or of spreading the research effort too thinly, Union support will concentrate on seven priority fields (see table page 8). These priorities are areas of research in which Union action can provide real added value by encouraging the complementarity and multidisciplinarity of resources and capacities at transnational level.

Six of these areas are crucially important for the competitiveness of the European economy:

- research on genomics and biotechnology and combating major diseases (€2.2 billion, or one-eighth of the total budget);
- information society technologies, allocated €3.6 billion (one-fifth of total resources);
- research linked to sustainable development and the environment – energy, transport, global change and ecosystems (€2.1 billion);
- nanotechnologies and nanosciences (fast developing and of major industrial significance), plus intelligent materials and new production processes (€1.3 billion);
- aeronautics and space (€1.1 billion);
- food safety and quality – a field of competence in which the Union's prerogatives are vital (almost €700 million).

New cooperation instruments

Within these priority fields of research, three *new instruments* for allocating Community aid have been introduced to encourage greater integration. They are:

– support for **networking centres of excellence** located in different countries – whether at universities, companies or research centres and organisations – with the aim of federating and integrating research on well-defined subjects in the medium or long term;

– support for **integrated projects** involving a critical mass of scientific and industrial partners with the focus on significant applications in terms of products, processes or services;

– Union participation in **specific cooperation programmes** for science and technology implemented jointly by several governments or national research bodies.[2]

These new instruments will be implemented progressively.[3] To ensure a smooth transition from previous programmes – in particular for SMEs – the Union will continue to support research and demonstration projects, coordination actions and concerted actions targeting more limited objectives, selected from the priority fields.

The new structure of the Sixth Framework Programme

Three main targets		
Integrating European research	**Structuring the ERA**	**Strengthening the foundations of the ERA**
Basic principles		
Concentration on the priority fields of research and implementation of new instruments (support for networks of excellence, integrated projects and joint initiatives by bodies in certain Member States).	To give horizontal policies (human resources, measures for SMEs, support for infrastructures) a structuring effect through stronger links with national, regional and other European initiatives.	Support for coordination of national programmes to ensure a coherent European research effort.

Society's expectations

Although these priorities have an undeniable economic dimension, they are also at the heart of the new focus on relations between science and society. The life sciences and health, the information society, the environment, food safety... are all central to the current questioning of scientific and technological development and the subject of public expectations.

The final priority field – 'Citizens and governance in the European knowledge-based society', allocated over €200 million – is very clearly also a subject of importance in this respect. This will enable the Union to support multi- and transdisciplinary research in the social, economic and human sciences, which contributes to the development of the knowledge-based society and the exploration of new forms of citizenship and governance.

Structuring and strengthening

In keeping with this science and society dimension, a budget of over half a billion euro will be devoted to anticipating the Union's scientific and technological needs and supporting common policies.

In response to undoubted expectations on the part of the scientific community, another innovation is the inclusion of a budget post of nearly €700 million to help create and develop European scientific and technological infrastructures.

Finally, more than €300 million will be set aside to help coordinate national programmes and make them mutually accessible, thereby laying the foundations of one of the key aims behind creating the ERA.

Adoption of the Sixth Framework Programme: timetable for the co-decision procedure

Previous steps	1st half of 2002	2nd half of 2002
During 2000 • EC consultations **Beginning of 2001** • EC proposals to CM and EP **End of 2001** • EP's opinion (amendments) • Adaptation of the EC's proposals	• Common position of the CM(1) • Second reading at EP • EC's opinion on EP's amendments	• **Scenario 1:** Approval by the CM(2) (qualified majority if EC agreement, otherwise unanimity) of EP's amendments • **Scenario 2:** Convocation of Reconciliation Committee within 6 + 2 weeks; adoption of a joint project within 6 + 2 weeks.

EC: European Commission - CM: Council of Ministers - EP: European Parliament

(1) Adopted on 10/12/2001, formalised on 28/01/2002.
(2) Qualified majority decisions of the Council require 62 of the 87 votes cast, with the following weighting attributed to the Member States: F – D – I – UK = 10 votes each; ES = 8 votes; B – GR – NL – P = 5 votes; A – S = 4 votes; DK – IRL – SF = 3 votes; L = 2 votes.

Traditional support

The innovations introduced by FP6 have not, however, been at the expense of the tried and tested 'horizontal' programmes of its predecessors. The budget allocated to human resources and mobility, for example, a crucial field for the ERA, has been doubled to €1.6 billion. Similarly, the financing of specific measures (cooperative and collective research) for SMEs is up by 24% to €450 million. In the field of international cooperation, there will be an additional budget for specific actions to match the €300 million already allocated under research actions.

The Joint Research Centre will concentrate increasingly on the implementation and follow-up of Union policies (health safety of products, industrial risks, environment and sustainable development, nuclear safety, combating fraud, European reference system, technological foresight). The Centre will have a budget of just over €1 billion, the same as under previous Framework Programmes.

Finally, FP6 includes a budget of almost €1.2 billion for research on nuclear safety, in line with the Union's responsibilities under the Euratom Treaty.

(1) Formalised in the Council's common position of 28 January 2002.
(2) This new instrument responds in particular to the strategy of the ERA and the application, to date 'dormant', of Article 169 of the Union Treaty.
(3) The rules of participation proposed by the Commission for the application of new instruments are being examined by the European Parliament and Council.

SMEs

Apart from the specific measures in favour of SMEs, the target has been set to allocate SMEs 15% - or about €1.7 billion - of the total available budget for research activities (priority fields). Under the previous programme their participation represented 10% of the budget.

To find out more

europa.eu.int/comm/research/nfp.html

Overview of new programme

(Common position adopted by the Council on 28 January 2002)[1]

Types of activity	Millions of euro			% of total		
1. FOCUSING AND INTEGRATING COMMUNITY RESEARCH			13 285[2]			75.9
Priority thematic themes of research[3]	11 205			64.0		
◗ GENOMICS AND BIOTECHNOLOGY FOR HEALTH		2 200			12.6	
- Advanced genomics and applications for health	1 150			6.6		
- Combating major diseases	1 050			6.0		
◗ INFORMATION SOCIETY TECHNOLOGIES		3 600[4]			20.6	
◗ NANOTECHNOLOGIES AND NANOSCIENCES, MULTI-FUNCTIONAL MATERIALS AND NEW PRODUCTION PROCESSES AND DEVICES		1 300			7.4	
◗ AERONAUTICS AND SPACE		1 075			6.1	
◗ FOOD QUALITY AND SAFETY		685			3.9	
◗ SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE AND ECOSYSTEMS		2 120			12.1	
- Sustainable energy systems	810			4.6		
- Sustainable surface transport	610			3.5		
- Global change and ecosystems	700			4.0		
◗ CITIZENS AND GOVERNANCE IN A KNOWLEDGE-BASED SOCIETY		225			1.3	
Specific activities covering a wider field of research	1 320			7.5		
- Supporting policies and anticipating scientific and technological needs		570			3.3	
- Horizontal research activities for SMEs		450			2.6	
- Specific measures in support of international cooperation		300			1.7	
Direct activities of the Joint Research Centre	760			4.3		
- Food, chemical products and health		212			1.2	
- Environment and sustainable development		286			1.6	
- Horizontal activities		262			1.5	
- Technology foresight; reference materials and measurements; public security and combating fraud	222			1.3		
- Research training; access to infrastructures	40			0.2		
2. STRUCTURING THE EUROPEAN RESEARCH AREA			2 655			15.2
- Research and innovation		300			1.7	
- Human resources		1 630			9.3	
- Research infrastructures		665[5]			3.8	
- Science and society		60			0.3	
3. STRENGTHENING THE FOUNDATIONS OF THE EUROPEAN RESEARCH AREA			330			1.9
- Support for the coordination of activities		280			1.6	
- Support for the coherent development of policies		50			0.3	
4. RESEARCH AND TRAINING IN THE NUCLEAR FIELD			1230			7.0
- Priority thematic fields of research		890			5.1	
- Controlled thermonuclear fusion	750			4.3		
- Management of radioactive waste	90			0.5		
- Radioprotection	50			0.3		
- Other activities in the field of technologies and nuclear safety		50			0.3	
- Activities of the Joint Research Centre		290			1.7	
TOTAL		17 500	17 500		100	100

(1) These figures are still subject to change during the final co-decision processes between the Council and European Parliament.
(2) Including €600 million for international cooperation activities and any amount following decisions of the European Parliament and Council by virtue of Article 169 of the Treaty.
(3) The aim is to allocate SMEs at least 15% of the total financial resources under this heading.
(4) Including a maximum of €100 million for the continued development of Géant and GRID.
(5) This amount includes €200 million for the continuation of the Géant and GRID projects.

Research 2002: the big November meeting

The Sixth Framework Programme for Research (FP6) (2002-2006) will be launched between 11 and 13 November this year. To mark the occasion, a vast 'multiple dimension' conference will be held at the Palais du Heysel in Brussels. In addition to the traditional programme presentation and details of how to participate, the event will also be a genuine forum for all those involved in research. A selection of some of the notable successes of European research will also be presented to a wider public.

- Every day there will be **plenary sessions** on the **thematic priorities** of the Sixth Framework Programme, as well as the **horizontal aspects** of the European Research Area, such as human resources and mobility, patents and intellectual property. **Practical sessions** will provide information on the rules and conditions governing participation in the Framework Programme.
- In addition to the Commission's programme there will be a **participants' forum** with a range of events designed and organised by researchers, associations and others on the subjects of their choice in the very broad context of the debate between science and society (see box).
- An **exhibition** with around 150 stands will present European research projects supported by the Union, with a specific area set aside for European and national research organisations. This opportunity to 'display' research will usefully complement the oral presentations and debates (see box). It should also help to promote the networking and integration of research activities in Europe.
- Finally, there will be twice-daily '**press briefings**'. Interviews can be arranged at the request of journalists and a press room will be at their disposal together with technical assistance for television crews.

Presenting a project?

Are you working at a national or European research agency and is your research open to foreign researchers? If so, why not present your initiative at one of the 50 stands at the '**Sixth Framework Programme' exhibition?**
Proposals will be selected with the aim of covering a wide range of activities, areas and countries according to the following criteria:
- their European dimension;
- the quality and originality of the material to be exhibited;
- potential interest to a wide public;
- the project's impact on European research.

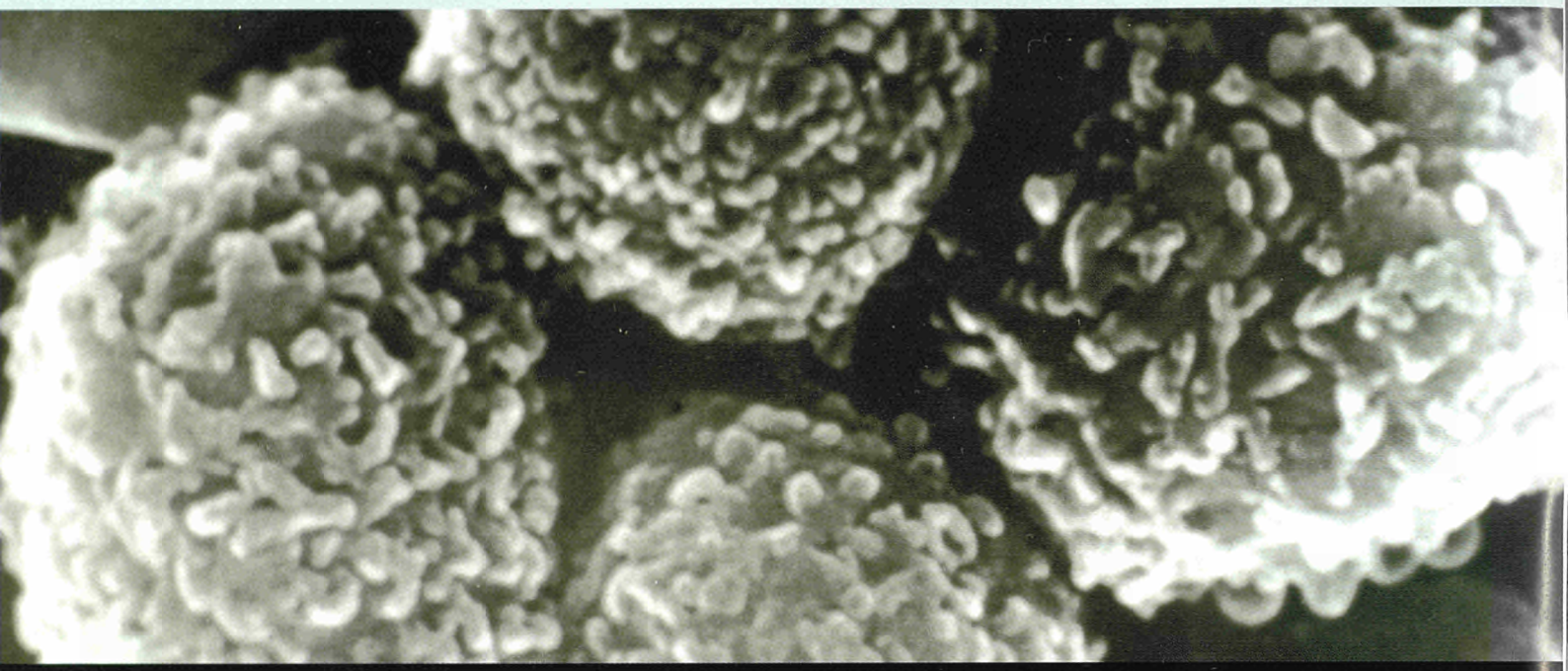
Requests should be submitted to the Commission using the appropriate form which can be downloaded from http://europa.eu.int/comm/research/conferences/2002 or requested by e-mail at rtd-conference2002@cec.eu.int
Closing date for applications: 31 May 2002.
Announcement of stands allocated: July 2002.

Organising an event?

Workshops, round tables, conferences and debates... Rooms with capacities ranging from 60 to 250 seats are available to those wishing to take part in the '**Participants' Forum**'. Preference will be given to proposals on topical subjects of interest to European research and society at large. Speakers should be good communicators and represent a variety of views and approaches in connection with a given subject. Young scientists are strongly encouraged to participate in these events, whether as organisers or participants.
Proposals will be selected to cover a range of scientific and technological areas, on the basis of the following criteria:
- interest of the subject;
- quality (competence and European/international scope) of the panel proposed;
- relevance to European society;
- contribution from European research or projects;
- involvement of young scientists.

Proposals must be submitted to the European Commission using a form which can be downloaded or requested by e-mail:
- http://europa.eu.int/comm/research/conferences/2002
- rtd-conference2002@cec.eu.int

Closing date for proposals: 30 June 2002. Announcement of events selected: September 2002.



A European priority

'Is the glass half empty or half full?' As ever, it all depends on how you look at it. After decades of cancer research, today progress at every level – prevention, detection and treatment – means that nearly one in two cancer patients is still alive five years after the initial diagnosis. 'For many pathological forms, cancer should no longer be seen as an inevitably fatal disease but as a chronic and potentially reversible one,' stresses Shahid Baig, director of European research programmes.

Yet the fact remains that oncologists are fighting a resilient foe which continues to take its toll: every year nearly 4 million new cases are diagnosed in Europe, and with 750 000 deaths it is the second cause of mortality among the EU population. Although this high mortality rate is partly linked to the ageing population, one in three Europeans is hit by cancer before the age of 75.

The main reason cancer is able to put up such resistance to researchers is that it is an extraordinarily complex disease. Behind its general mechanism (the uncontrolled division of a group of cells) are some very major differences. There are over 200 types of cancer, all with their own metabolic particularities about which we sometimes understand very little. For example, with testicular cancer the recovery rate is over 90%, while others can be more lethal (cancers of the lung, pancreas, ovaries, etc.).

The fight against cancer therefore requires a multi-pronged approach. Scientists are interested in every aspect of this family of diseases: its fundamental mechanisms, the molecules able to influence it at various stages, the increased effectiveness of surgery, the effects of radiation and hormone treatment, etc.

The Union's commitment

Governments throughout Europe have adopted cancer as a research priority and it is also a field in which the pharmaceutical industry invests heavily. It is against this background that the Union has become increasingly active over the last decade or more, seeking to integrate research activities to create a synergy effect.

The first field of cooperation is to support Europe-wide epidemiological studies to obtain a global view as a basis for developing and validating increasingly early and reliable methods of diagnosis.

It is also essential to support the various transnational networks set up in the fight against cancer. These guarantee the reliability and safety of scientific advances and enable all practitioners to benefit from the progress made and know-how acquired.

The interdisciplinary approach

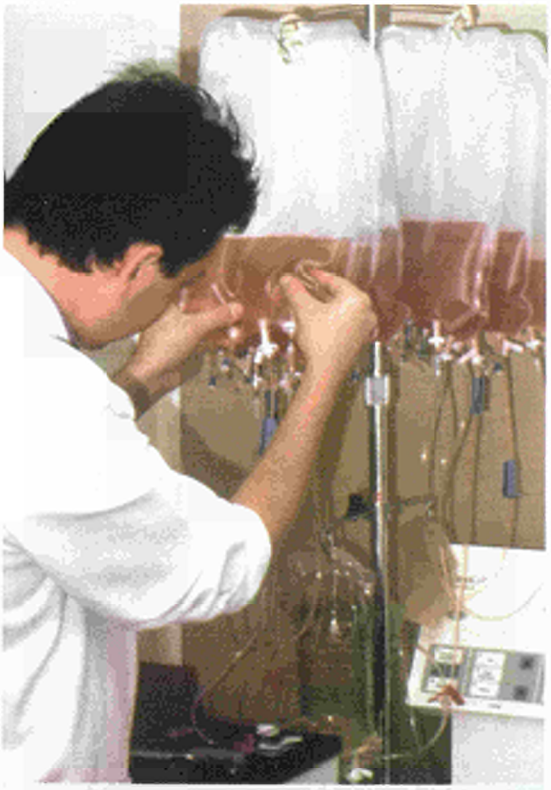
Equally important are integration between fundamental research and clinical research as well as integration between the disciplines (oncology, genetics, biochemistry, biophysics, surgery, etc.) involved in developing new treatments. The barriers between these disciplines must continue to be eroded.

The development of translational research is valuable in this respect, promoting an interdisciplinary approach and the flow of information between fundamental researchers and clinical practitioners. This rapid move from fundamental research to clinical applications has become a priority, not only because it is the patient's right to have access to scientific progress but also because, in a highly competitive international environment, a heavy price is paid for any delay.

Coordination

In the end, although hopes for a cure are increasing, it remains important to take into account the quality of life of patients who have to undergo often long and painful treatment. In this field too, oncology merits a European approach.

Within the European Research Area, the fight against cancer - identified as a priority by the 'Genomics and biotechnology for health' programme under the Sixth Framework Programme 2002-2006 - will be waged by increasing coordination between centres of excellence in Europe. It is now accepted that no single country can work in isolation and that compared with the United States, for example, where research by the National Institutes of Health is integrated nationally, European cancer research too often suffers from a duplication of research efforts.



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The above example shows the preparation of a re-injection of lymphocytes to infiltrate a tumour, using a device which allows cells to be concentrated and washed.

European Cancer Forum

In May 2001, the Commission initiated the new *European Cancer Forum (ECF)* which meets several times a year. This provides continuous coordination between health officials responsible for financing research and the best scientific specialists with the aim of promoting complementarity and coherence between national research programmes both inside and outside Europe. The ECF is mainly interested in three aspects:

- epidemiological monitoring of the disease and the adaptation of prevention and research strategies;
- cooperation between European centres of excellence and more particularly their networking thanks to the new resources available under the EU's Sixth Framework Programme for RTD; and
- rapid transfer of knowledge between fundamental research and clinical practice.

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On every front

Cancer is a formidable disease which takes many forms. This is why research must be active on many fronts. Traditional strategies - surgery, radiotherapy and chemotherapy - are improving all the time. Genetics and immunology are bringing new and innovative prospects. And new screening and detection methods are making it possible to get to grips with the disease at an increasingly early stage.

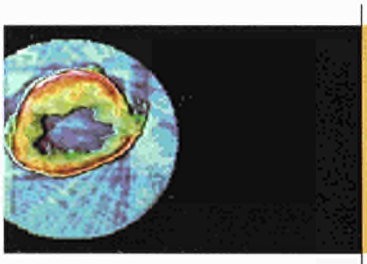
At the most fundamental level, many projects adopt a genetic approach to the disease. Progress in this field has been extraordinarily rapid and the recent sequencing of the human genome is a major step which should soon provide crucial keys to our understanding of tumour development.

This is the aim of the research conducted by Lauri Aaltonen of Helsinki University who is coordinating research by several European teams on Peutz-Jeghers syndrome or PJS. This is a hereditary disease whose symptoms include a distinctive face pigmentation and, most importantly, a pronounced predisposition to the sporadic appearance of tumours. This research has identified the gene (known as LKB1) which mutates to cause PJS and marks a potentially very important discovery at the fundamental level. 'LKB1 and the protein whose synthesis it controls evidently play a key role in the appearance of a whole family of very different cancers (intestine, breast, uterus, etc.),' explains Mr Aaltonen. 'This would not be the first time that a very rare hereditary disease has provided valuable information on much more common pathologies.' Another Helsinki laboratory has succeeded in creating a strain of transgenic mice (knock-out mice) in which this gene has been destroyed and which it is hoped will yield a lot of new information.

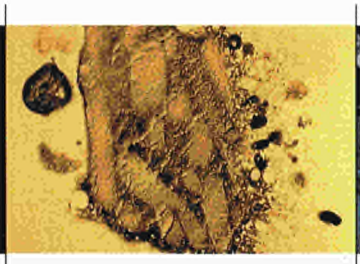
Cellular signalling

Sharing the same interest in the fundamental mechanisms of cancer, Jean-Marie Blanchard *(Institut de Génétique Moléculaire de Montpellier* – France) and his team have adopted another line of attack. They see cancer as essentially a 'cellular signalling' disease (see also box on the EMBL). Cells are constantly receiving very varied chemical messages which tell them what the body needs. The body may, for example, instruct cells to divide or to differentiate a given type to compensate for cells destroyed due to wear or injury. On the other hand, it may instruct them to reduce their activity or, if they serve no purpose, send them signals to self-destruct. The latter phenomenon - known as apoptosis or cellular suicide - was discovered less than five years ago and is the subject of intense study. It appears to be of extreme strategic importance: when cells behave in a way which is dangerous for the body and escape its control, the body's normal reaction is to prompt their auto-destruction. But in the case of cancer cells the instruction goes unheeded.

'We have studied the action of a particular molecule in cellular signalling, TGFß,' explains Jean-Marie Blanchard. 'This is a member of the growth factor family and acts as a kind of brake on cellular division. It has two very important roles. It slows down the cellular cycle during the development of the embryo, thereby synchronising the creation of body tissue and organs –

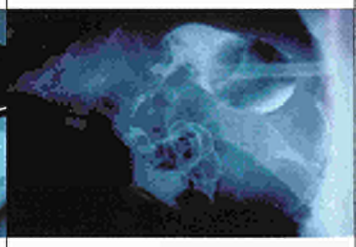


Screening
Image of a breast cancer obtained by tomovelography (ultrasonic scanner).
© D.Dantchev/INSERM



Biology
Auer bodies in a leukaemic myeloblast showing the linear arrangement of the proteic molecules which make up the crystal.
© J.Breton Gorius/INSERM

Surgery
Operative field of a pancreatic cyst.
© J.J.Duron/INSERM



Medical imaging
Cancer of the rectum.
© J.J.Duron/INSERM

requesting the most advanced to wait for the stragglers if you like. This molecule also contributes to the normal elimination of certain tissue by means of apoptosis. Cancer cells manage to escape the action of TGFß. Once we have understood how, we can seek ways of correcting this malfunctioning.'

Immunology

Immunology is another field which has seen dramatic progress over recent years. Our understanding is improving all the time of the many cells which make up our defence system, their role and above all the hundreds of molecules they use to communicate, detect diseases and combat them. This progress has brought many applications in oncology. Although some have been current practice for several years already, most of them are still at the experimental stage.

What does this immunotherapy consist of? Contrary to popular belief, the immune system does not only defend the body against external intruders, such as bacteria or viruses, but is also able to detect tumour cells because they have mutated in a way which has altered their molecular 'ID'. There are, however, situations where the white blood cells which protect us find it difficult to recognise and destroy the enemies and need help in accomplishing their natural mission.

One of the most promising strategies is implemented in two stages. First, the white blood cells are 'taught' to recognise the sick cells by putting them into contact with a tumour extract obtained by surgery. This is akin to 'vaccinating' the patient against his own tumour. These blood cells are then activated (or made aggressive) outside the body before being reinjected into the patient. If they are sufficient in number and the subsequent stages go according to plan, the white blood cells or lymphocytes will destroy the cancer cells.

This procedure, which will no doubt take some years to perfect, has one major benefit: in theory it also makes it possible to destroy any cancer cells lying elsewhere in the patient's body. We know that malignant tumours tend to form secondary tumours (see box) which have the same biological characteristics as the primary tumour. A melanoma which migrates to the liver, for example, retains its 'identity' which (at least in theory) would render it vulnerable to attack by the 'educated' white blood cells.

A number of European laboratories – in particular those working on the *Inducible melanoma model* project – are trying to develop transgenic mice expressing 'human' tumours to study their characteristics.

Other strategies are also based on a stimulation of the immune system. For example, it was discovered that the well-known tuberculosis (TB) vaccine BCG also acted on cancer of the bladder. When injected directly into the patient it provokes an inflammation (in other words the mobilisation of natural defences) which helps the tumour to regress. Immune signalling molecules – such as interleukine 2 and interferons – are mainly used to treat melanoma and cancers of the kidney.

Drug therapy
© B.Loret/INSERM

Fundamental research
Study of cancero genesis.
© J.Bara/INSERM

Tumours and cancers

The term cancer applies to a family of diseases with the common feature of an anarchic proliferation of a cell population. They multiply until they form a mass known as a 'tumour'. A tumour may be 'benign', or in other words non-cancerous. In this case it is usually sufficient to simply remove it and the patient is cured. If, on the other hand, it is 'malignant', or cancerous, it is able to invade and destroy surrounding tissue. It can destroy the whole organ on which it is growing and possibly spread to neighbouring organs. In some cases it can emit 'metastases' or small groups of proliferating cells which leave the original tumour and circulate through the blood or lymphatic vessels before attaching themselves to new organs which are then also attacked.

Detection

Another front of intense research activity is early and non-invasive detection. Many cancers can only be diagnosed with certainty by means of a biopsy which involves removing cells for analysis. For this to be possible, a suspect zone must first be identified and localised, which can be problematic. Scientists are therefore seeking to develop molecular markers, or molecules associated with cancers, which could be detected by a simple blood test. As the markers are released at the start of the tumour process, this would save time when making the diagnosis and avoid surgery which can impair the patient's quality of life. This type of research is already very advanced for prostrate cancer as PSA enzymes indicating the presence of the disease were identified some time ago and European efforts are focusing mainly on standardising the detetection methods. But research in this area is also being conducted on cancer of the bladder, colorectal cancer and breast cancer.

Surgery and radiotherapy

Traditional strategies such as surgery and radiotherapy are also continuing to benefit from advances in knowledge. In particular the prospect of technology-assisted surgery, which would be much more precise and systematic, is becoming a reality. Medical imaging too has progressed rapidly over recent years, opening up vast possibilities for early diagnosis.

This imaging should soon be able to assist practitioners, as illustrated by the results of research on breast cancer carried out by five European laboratories with EU support. 'We have developed a method of surgery guided by magnetic resonance imaging (MRI),' explains project coordinator Sylvia Heywang-Kobriunner of Halle University (DE). 'MRI – which is based on the circulation of the blood – enables us to detect suspect zones which may measure less than a centimetre in diameter. The other methods are much less sensitive. These lesions are not necessarily cancerous so biopsies are necessary to find out. Our method makes it possible to insert a needle into the precise zone and draw out the contents. This can then be analysed or even eradicated completely – or in any event up to 3 cm in diameter – and all under a local anaesthetic.'

Over the last three and a half years researchers have studied more than 500 lesions (about 25% of which were malignant), providing proof that the method works. 'This method offers many benefits,' insists Ms Heywang. 'Less damage is done to the breast, there are cleaner margins around the tumour, and the risk of residual tumours is avoided.'

A feat of molecular engineering

A diagram of the molecular structure of the 'Abl' protein. On the right, a simplified model in which the cord held by two fingers represents the cap structure and the heads of the red needles the location of the 'switch' function.

Last January, a team from the European Molecular Biology Laboratory (EMBL – Heidelberg, D), headed by Giulio Superti-Furga, announced the discovery of a molecular mechanism which is the cause of several types of lethal leukaemias. It has been known for several years that these pathologies are caused by a genetic defect in the 'Abl' protein which plays an important role in the signalling of proteinic information within the cell, in particular in controlling cellular division. Deficient Abl is comparable to a switch which you cannot turn off and which is constantly sending signals to cells to divide and thus spread.

Researchers in the laboratory have succeeded in dismantling the internal structure of artificial versions of normal protein, removing some of the constituents and then observing the ability to control the cellular division signal. They discovered that the 'switch effect' of the Abl proteinic molecule (when it is able to halt cell division) is linked to the presence of a cap structure, a sort of clamp that holds the cell constituents in the right places and without which the switch becomes blocked in the 'on' position.

This discovery of a mechanical model which explains the cause of the genetically defective Abl in some individuals is a breakthrough, opening the door to research on molecular engineering solutions to correct this absence of a cap structure.

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Spreading the cancer message

Collecting information on cancer is one thing, communicating it effectively is another altogether. A number of organisations and networks are responsible for this vital mission. Sometimes specialised and sometimes more 'generalist', they provide researchers, practitioners and the general public with information on the latest advances in knowledge and techniques. The Cochrane network and the International Agency for Research on Cancer are just two examples.

'Approximately 50% of all cancer studies are not published in the major journals and 20% are not published at all,' stresses Christopher Williams, oncologist and member of the Cochrane network. 'Researchers tend only to publish studies which produce results, and then principally in English. But research which has failed to produce results is also interesting – and not only to avoid duplication. It can often inspire innovative variations.'

The EU-backed Cochrane network consists of 14 groups in different countries. It aims to review systematically all therapeutic research on the treatment of cancer. 'It is no small task. It involves seeking out all studies – not only publications in English – on a given oncology subject.'

In layman's language

This work is essential for research. After all, what is the purpose of undertaking costly and complex studies if others have already explored the field? The network's aim is to create a genuine cancer library. 'We want our work to be accessible to the general public as well as professionals,' says Mr Williams. 'Our information, which generally consists of about 50 pages of 'hard science', is prefaced with a very brief summary and another rather more detailed text in layman's language for the benefit of journalists and consumer organisations. The library will be accessible on the Internet and everybody will be able to find information at the level they require.'

Causes and prevention

In Lyons, (F) the International Agency for Research on Cancer (IARC), an institution under the aegis of the World Health Organisation (WHO), specialises in research on the causes and prevention of cancer. The IARC regularly publishes articles and works for the benefit of specialists and its Internet site is a valuable source of information. 'We manage several cancer databases which are all accessible on the Web,' explains Nicolas Gaudin, the Centre's communication manager. 'One of these keeps a register of monographs on all known carcinogenic agents. Another gives the figures of international and in particular European cancer registers – in other words the epidemiology of the disease, an essential tool in defining strategies to combat it.

To find out more

- Cochrane Cancer Network and Cancer Library
  http://www.update-software.com/cancer/default.htm
  http://www.canet.org
- International Agency for Research on Cancer
  http://www.iarc.fr
  http://www-dep.iarc.fr/
- International Union Against Cancer
  http://www.uicc.org

'The aim is for our work to be available to the general public as well as professionals.'

A network's network

Many other structures contribute to the synergy of strengths or the pooling of resources.(1) Some are highly specialised, such as the European Cancer Resources Bank (ECRB) which centralises a number of rare cancer cell strains and is a valuable tool for researchers. Others are of more general interest. The most well known is the International Union Against Cancer (UICC), based in Geneva. This has been spearheading the fight against all forms of cancer for several decades now and organises conferences and training sessions.

(1) See next article on the key role of the EORTC

With 2 500 voluntary practitioners in some 360 hospitals, the European Organisation for Research and Treatment of Cancer (EORTC) is a major spearhead in the global fight against cancer. By organising rigorous clinical trials on a vast scale it has permitted major progress in the treatment of the most varied forms of the disease.

Françoise Meunier, EORTC director-general for the past 10 years.

Because clinical is funda

Double movement

'Translational research' creates synergies between specialists involved at every stage of the disease, by ensuring a two-way information flow: from the fundamental to the applied and from the applied to the fundamental.

The EORTC was set up 40 years ago by a handful of pioneering doctors working on a voluntary basis. It is not only one of the oldest experiences in creating a European research area but also one of the most successful. 'At first it was no more than a meeting of a select group of eminent and visionary oncologists without any mandate,' stresses Françoise Meunier, the organisation's director general. 'But given the urgency of the fight against cancer they were aware that one country alone would never be able to cope and that it was crucial to make the most of the potential offered by European coordination of clinical research.'

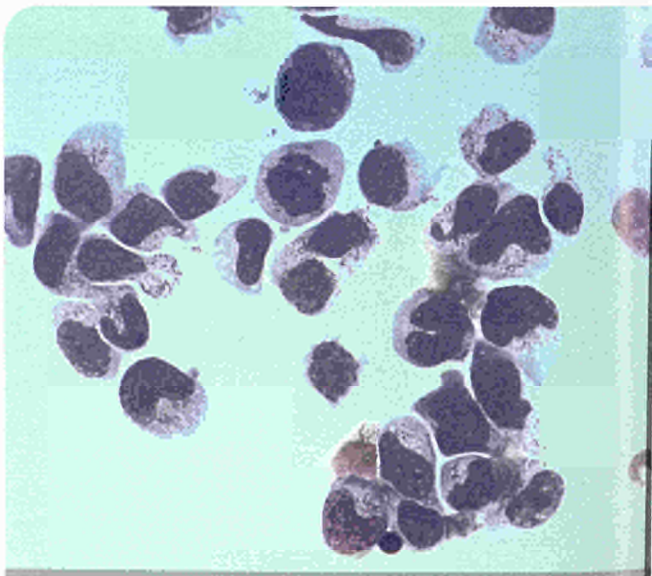
Survival and quality of life

What is EORTC's mission? To improve the treatment of cancer, by helping to develop new drugs as well as by defining optimal therapeutic strategies (surgery, radiotherapy and chemotherapy) and the best possible use of existing methods. Epidemiology and prevention - although also vital - are not within its scope: its chief task is to develop not just more effective treatment in terms of patient survival but also treatment which is able to improve their quality of life.

The network develops and implements rigorous clinical trials on vast numbers of patients throughout Europe. It is particularly necessary to have a wide field of experimentation for cancer – as combating it requires a mix of treatments based on a multidisciplinary approach, unlike AIDS, diabetes or hypertension, for example, which are usually treated by drugs alone. In oncology, a new treatment can lead to questions about the optimal way to administer it and, when it is approved by the authorities, about how it would ineract with other treatments. The process of clinical research is therefore crucial for implementing the results obtained in the laboratory and on animals.

With or without industry

To develop new medicines, it is very often necessary to work closely together with the pharmaceutical industry, which looks to the EORTC network to develop clinical trial strategies for innovative treatments and to test them at European level. The institution offers its formidable know-how while retaining its independence in terms of analysing the data and guaranteeing the validity of the results.



Lymphocytes in culture, taken from a tumour.
© C.Mathiot/INSERM

Although research progress is measured in terms of 'cancer survival', EORTC has always been interested in the quality of life of patients who often have to undergo long and painful treatment.

research mental

The development of reference treatments also involves carrying out a large number of tests which do not necessarily involve industry, and which could at times be contrary to its interests. As Françoise Meunier stresses: 'Drug manufacturers do not need to know, for example, whether a total or partial removal of the breast is preferable, whether radiation or surgery is best for prostrate cancer, or if a course of chemotherapy is best over four or six cycles. It is only so-called academic – in the sense of non-commercial – clinical research which can answer these questions of therapeutic strategy. Around 70% of clinical trials carried out by the EORTC are without industry partnerships. That is why it is essential to continue funding this multidisciplinary clinical approach in Europe, carried out totally independently and most often on a voluntary basis.'

A complex and painstaking approach

How is a clinical trial conducted? One may want to determine, for example, whether or not it is useful to follow irradiation of a prostrate cancer with a course of hormone therapy. A trial of this kind,(1) conducted in three distinct stages (see box), involves recruiting a large number of patients – sometimes several thousand – while respecting information and transparency requirements as well as international standards and national laws. Some are treated by the conventional means used to date and others by experimental treatment. The two groups (selected by a procedure known as randomisation) are carefully monitored to compare the results in terms of toxicity, survival and quality of life.

Many difficulties must be overcome. An experienced and international network with a sufficient 'critical mass' to identify therapeutic improvements – even if for just a few percent of the cases treated – is vitally important.

Ideally, several countries should participate in stage three to reduce the influence of local bias and recruit patients within a reasonable time frame. But the data must also remain homogeneous and the technical content and quality assurance procedures must be of the highest standard.

Finally, any legal problems posed by the existence of different national legislation and ethical committees need overcoming. 'For

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(1) About 100 clinical trials of this kind are permanently under way under the aegis of the EORTC.

EORTC, a multidisciplinary platform

Much progress has been made over the past 40 years. Today, EORTC is a unique European institution, also recognised by the prestigious US National Cancer Institute (NCI) which, since 1974, has co-financed the analysis centre, home to its only office outside the United States. In addition to 'translational' and applied research, the organisation works with the computerised management of clinical data, quality of life, and the economic value of therapies, statistics and methodology.

And in the past decade, the headquarters has increased its personnel from 28 to 134, including 100 university graduates. EORTC has its own foundation (Queen Silvia of Sweden is its president) and receives financial backing from most of the European national leagues against cancer as well as the European Commission (for specific research projects), private donors and the pharmaceutical industry (to evaluate new drugs). Its network of 2 500 members includes surgeons, oncologists, radiotherapists, immunologists and specialists from other disciplines. They all provide their services free of charge.

2002, Europe against cancer meeting

On the occasion of its 40th anniversary, EORTC is holding a 'Scientific Strategy Meeting' in Brussels from 26 to 28 March 2002. The meeting will look at the current state of cancer research and seek to lay the foundations for future developments in clinical research by EORTC.

To find out more

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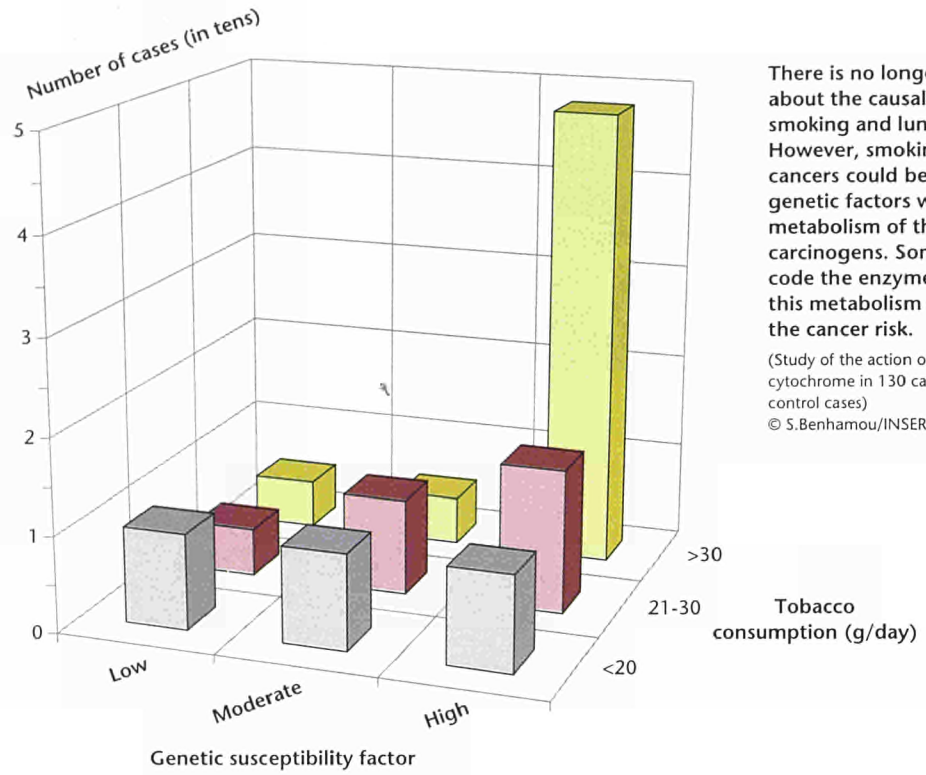
Correlation between lung cancer, smoking and the genes



There is no longer any doubt about the causal link between smoking and lung cancer. However, smoking-related cancers could be influenced by genetic factors which affect the metabolism of the tobacco carcinogens. Some genes which code the enzymes involved in this metabolism could affect the cancer risk.

(Study of the action of the CYP2D6 cytochrome in 130 cases and 170 control cases)
© S.Benhamou/INSERM

the same trial, seven different insurance policies must be taken out (with different premiums) due to the lack of harmonisation of the legal obligations in different countries. The trial is sometimes finished before the legal problems concerning a country's participation have been sorted out. This evident drawback effects European innovation and competitiveness in treating cancer.' (2)

The 'translational' approach

It is sometimes difficult to persuade doctors to participate in clinical trials as respecting protocols can be very time consuming. 'For an individual cancer specialist working at a hospital it is often easier not to take part. An investigator has to spend more time with the patient, explaining to him all matters concerning the treatment of his illness, obtaining consent, setting up a team to carry out the trial, collecting and communicating the data, and sorting out legal and insurance matters to get the necessary approval to proceed.'

Fewer than 5% of cancer specialists currently take part in clinical trials, approximately the same percentage as for cancer patients – despite the fact that treatment in a research context (whether or not you are in the group receiving experimental treatment) can mean closer care, more rigorous treatment, an improved quality of life and better survival prospects.

(2) All quotations are by Françoise Meunier.

The three obligatory stages in a clinical trial

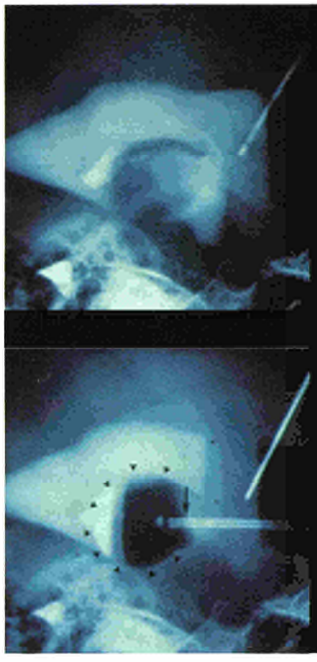
Stage I – A new experimental treatment – previously tested in a laboratory on cell cultures and animals – is tried out on a small number of patients (between 10 and 40). Doctors seek the best way of administering it, in complete safety for the subject, and determine the maximum tolerated dose.

Stage II – The trials, generally including between 40 and 80 patients, assess the effectiveness of the experimental treatment tested on different types of cancer.

Stage III – If a stage II trial has shown that a treatment has an anti-cancer effect, the conventional or standard treatment (the one most commonly applied in a given pathological situation) is then compared with an innovative treatment which it is hoped will prove more effective and/or less toxic.

The fact is clinical research does not enjoy the same prestige as fundamental research. 'The researcher who discovers a new molecule is much more fêted than the researcher who discovers in what doses and in what circumstances it must be administered. The institutions which finance health care (social security, mutual associations, insurance companies, etc.) are also reluctant to support clinical research, despite the fact that it can improve the management of health care systems, for example by reducing redundant or obsolete treatment, or by enabling a more efficient allocation of resources.'

Fortunately, the fundamental/clinical divide is now closing and the move 'from mice to men' is attracting growing interest among decision-makers and the authorities. Removing this barrier is moreover the principle behind 'translational research' which is developing rapidly due to recent progress in molecular biology and genomics. This approach involves bringing together specialists to cooperate at every stage of the process - from the test tube to the hospital bed - while ensuring a two-way information flow: from the fundamental to the applied and from the applied to the fundamental, thereby creating a synergy effect.



Only independent clinical research can evaluate treatment strategies which can take different forms.

Above, an example of microsurgery. The upper image shows the cerebral ventricles with a tumour impression in the posterior part of the third ventricle. The bottom image shows the tumour cyst (indicated by a small arrow) whose liquid has been removed using the pump that remains in position.

A genuine 'clinical bank'

This is the spirit which inspires EORTC. Once the trial results are obtained, the organisation seeks to disseminate them in a way which enables members of the medical profession in Europe and elsewhere to be continuously informed of the latest discoveries and the most promising strategies. It does so through scientific publications, conferences and courses. EORTC's analysis centre in Brussels also maintains a database on more than 130 000 patients who have taken part in clinical trials over the past 40 years. Every year, an additional 7 000 files are added to this data centre which many researchers consult regularly. ' EORTC is working on a project to compile a pan-European tumour bank with samples of tissue taken from cancer patients included in clinical trials,' explains Ms Meunier. 'The purpose is for researchers to be able to re-evaluate the tissue samples if one day new markers are discovered or new tests developed which make it possible to refine treatment and validate certain hypotheses by possible correlation with the patients' clinical data.'

Clinical trials and ethics

EORTC respects the ethical rules laid down in the Helsinki Declaration, drawn up by the World Medical Association. This fundamental text is a moral charter whose objective is to provide recommendations for doctors and others involved in medical research on human beings. It also includes studies carried out on personal data or non-anonymous biological samples.

www.wma.net/f/policy/17-c_f.html

The patients speak

Although progress in research is often discussed in terms of 'cancer survival', EORTC has always been interested in a vital human aspect: the quality of life of patients. Some treatments or strategies improve patient comfort a great deal, even if they have no effect on the cancer's development. The evaluation of quality of life is based, in particular, on 'validated articles'. In-depth questionnaires – with a common section for all patients and another which is specific to a particular cancer type – are available in 42 languages and enable patients to express how they feel before, during and after the trial. These documents are valuable instruments developed by the organisation and are available to practitioners and researchers.

The correct use

Professor of the history of mathematics at the University of Rome's La Sapienza, Giorgio Israel is concerned about the way he believes mathematics is being hijacked by the technosciences.

Selected bibliography

- *The Invisible Hand, Economic Equilibrium in the History of Science* (with B. Ingrao), Cambridge, Mass., The MIT Press, 1990.
- *Il Mondo come gioco matematico. John Von Neumann, scienziato del Novecento* (with A. Millán Gasca). La Nuova Italia Scientifica, 1995.
- *La mathématisation du réel.* Essai sur la modélisation mathématique, Paris, Le Seuil, 1996.
- *Le jardin au noyer, pour un nouveau rationalisme,* Paris, Le Seuil, 2000.
- *The Biology of Numbers. The Correspondence of Vito Volterra on Mathematical Biology* (with A. Millán Gasca), Basel, Birkhäuser, 2002.

Giorgio Israel is a member of the International Academy of the History of Sciences, the executive committee of the International Commission on History and Mathematics, and director of the University of Rome 'La Sapienza' Centre for Research on the Methodology of Sciences. He is a former lecturer at the Ecole des Hautes Etudes en Sciences Sociales (Paris).

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Rome, La Sapienza – Department of Mathematics: One would imagine this Mecca of cerebral abstraction, within one of Europe's most prestigious universities, to be inhabited by some rather austere intellectuals, which is why meeting Giorgio Israel comes as something of a surprise. At the age of 57 and with a young son on whom he clearly dotes, he is a man of many interests, turning his inquiring mind to such matters as the state of the world, contemporary humanism and the history of science and its subservience to technology.

Giorgio Israel is not just a mathematician – he is also a recognised historian. He specialises in exploring the discipline's long secular development and the relationship between mathematics and other sciences. In particular, the professor is concerned at the way it is being distorted in certain disciplines. He accepts that the computer is a marvellous tool which, besides opening up extraordinary possibilities for scientific research, is now irreplaceable - just as the pen used to be for writing. But just as a hand and a pen left to themselves cannot write anything intelligible, so the use of the computer must be governed by conceptual structures.

Giorgio Israel – 'The worst thing would be to believe that scientific rationality is reason's sole means of perception.'

Correlation is not a law

Giorgio Israel draws his examples from two fields in which he has made a particular study of 'mathematisation'. 'The distortion is particularly evident in economic and life sciences. The ever-growing memory, calculating capacity and speed of computers today makes it possible to process vast quantities of data and arrive at correlations and models which are accepted as *scientific laws.* But a correlation is not an explanation and nor is it a law, and the role of science – as forged during the great adventure of mathematical physics, from Newton to Einstein - is first of all to explain the structure of phenomena.

'When economists reduce the functioning of society to equations, they are failing to respect scientific rigour, he believes. 'They forget that their science is placing a vital variable, namely human freedom, in a concrete historical context, and that this cannot be "mathematicised" because historical time cannot be reduced to mathematical time.'

The distortion is no doubt less severe in biology. By seeking correlations one can imagine hypotheses and that is certainly not without purpose. 'But an all-powerful mathematics is nevertheless dangerous as the results are largely uncertain and often contradictory. In many cases there is a tendency to ignore the negative results which could weaken the hypothesis. A particularly sensitive field is at stake here: scientific probity.'

Finding the causes

This tendency to use mathematical models to shore up the 'truth' rather than to analyse the phenomena and explain the facts is particularly worrying. 'In his *Principia Mathematica,* Newton states that the mission of the

# of mathematics

philosophy of nature is to seek causes,' explains Giorgio Israel. He believes that we are now witnessing the disappearance of this unitary system of knowledge which expired with the theory of relativity and quantum physics. 'Today, only physics seems still to be bound to this scientific model, but it is no longer at the heart of big science, being less attractive to younger generations who prefer other fields close to the life sciences or business sciences. Research in mathematics is drying up. A number of my colleagues have adapted to this by undertaking practical research with immediate applications, for which there is a demand.'

The technoscientists

Giorgio Israel believes that the reason for the change is our immersion in the world of technoscience. The compression of two terms into a single neologism is significant: science and technology are now one. We have come a long way from the philosophy of the Enlightenment when scientists could be viewed as society's rational guides. Technoscience embodies a split personality: half researcher, half businessman.

'What we are witnessing at present in the field of cloning is very symbolic. To my mind this race to create life is madness. It is a complex problem with implications which should not be taken lightly. We are seeking to introduce into nature disturbing factors and new organisms, the effects of which are still unknown.'

In addition, anything related to the engineering of life can already pose questions of identity which our society seems to want to ignore. The case of the surrogate mother is one example. 'The child will have two mothers. Scientists should take time to reflect in the face of such a situation as it is a problem of concern to us all, one which for the first time in history calls into question the cement which has always held humanity together, namely parental ties.'

Dostoevsky and Einstein

In the face of the ambiguous directions taken in the name of science, Giorgio Israel opts for answers founded on reason. The title of his latest work *(Le jardin au noyer, pour un nouveau rationalisme)* suggests, however, that to his mind reason is not a simplistic concept: 'The worst thing would be to believe that scientific rationality is reason's only means of perception. For me a novel by Dostoevsky is just as much a manifestation of rationality as a work of history or psychology. And science, which advances by means of trial and error as well as seemingly irrational intuition, is just one form of many forms of knowledge.' ◗

Tell me...

Opposed to placing too much faith in artificial intelligence, Giorgio Israel likes to cite this anecdote as related by the great philosopher of science Karl Popper (who died in 1994). 'In a famous lecture, Alan Turing(1) said: *Tell me what you think a computer cannot do and I will make one which can do exactly that.* I answered him by letter: what do mean by tell me? Perhaps I need to give you a description, because in that case it would be an easy challenge. Clearly what must be avoided is the description itself. There is one thing a computer certainly lacks and that is initiative. And I do not know how one can describe initiative. Your challenge is therefore a bluff. Yet any child and even any puppy is full of initiative.'

(1) Alan Turing (1912-1954) was one of the pioneers of the computer and a major advocate of machine intelligence.

News in brief...News in brief...News in brief...News in brief...

Calls for proposals

EOI: express your interest

In anticipation of the Sixth Framework Programme (FP6), at the beginning of April the Commission will be launching a new call for *expressions of interest* accessible to all Europe's research players. The purpose is to permit the most targeted preparation possible of programmes designed to implement the strategic priorities defined in the seven thematic fields adopted for the integration of research (see page 8).

Ideas submitted must relate to scientific and/or technological proposals which correspond to the implementation of two of the new instruments under FP6: the networking of centres of excellence and the implementation of integrated projects guaranteeing a critical mass for research.

This call for *expressions of interest* is set to close on 5 June 2002, although the date has not yet been confirmed. Check the *Research* site for updates.

europa.eu.int/comm/research/index_en.html

Mobility: Wise Moves

The transition from the Fifth to the Sixth Framework Programme does not mean that mobility is coming to a halt. In the period to 2005, the European Commission will continue to offer financial assistance to young pre- and postdoctorate researchers in all scientific fields for three types of activity: participation in high-level scientific conferences; visits to university or industrial research centres or institutions (Marie Curie fellowships); and access to specific research training networks.

Interested? The *Wise Moves* site on the CORDIS server gives access to three databases with details on all current calls.

www.cordis.lu/improving/opportunities

Science and society: activities in 2003

There is one month's grace for the call for proposals (the last under the Fifth Framework Programme) in the field of *Increasing public awareness of science,* which will now close on 15 April 2002 and not 15 March. The call concerns actions relating to dialogue with the public, the role of the media and scientific communicators, and the organisation of events as part of *European Science and Technology Week 2003.*

www.cordis.lu/improving/calls/rpast_200201.htm

NIS researchers

The INTAS programme (East-West scientific cooperation programme linking the Union and the New Independent States of the former Soviet Union) offers young researchers from the Central and Eastern European countries interesting support in the form of grants to visit Western institutions. The closing date for applications is 25 April 2002 for grants awarded in November 2002. There is also a periodic call open for researchers seeking to attend scientific conferences (next selections: 15/04/2002, 15/07/2002 and 15/10/2002).

www.intas.be/mainfs.htm

Objective 3%...

Up from 1.9% to 3% of GDP by 2010! This represents a 50% increase in the Union's total research effort - mainly achieved by relaunching private investment in R&D. The ambitious objective proposed by Research Commissioner Philippe Busquin (see interview page 5) has been endorsed by the European Council of heads of state and government held in Barcelona under the Spanish presidency on 15 and 16 March 2002.

At the beginning of February the informal Council of Research and Industry Ministers, meeting in Gerona (ES), decided that setting such a target would be an effective means of enabling Europe to make up for its *innovation deficit.* Twenty days later, at a meeting of the ECOFIN Council in Brussels - attended by Commissioners Pedro Solbes Mira (economic and monetary affairs), Frits Bolkestein (internal market) and Michaele Schreyer (budget) - the Member States approved a set of very concrete recommendations to increase private investment in research and improve Europe's capacity to innovate.

On the eve of the European Council, two of its members, Tony Blair (UK) and Wim Kok (NL), addressed a joint letter to Spanish Prime Minister José Maria Aznar, holder of the Union presidency until June. In it they present a document entitled *Overcoming the European Paradox* which sets out practical measures for the Community and the individual Member States designed to enable Europe to overcome its weakness in exploiting its excellent research potential. The two heads of government also call for the concept of the *European Research Area* to be enlarged to include increased promotion of innovation, especially in the field of implementing intellectual property rights and by strengthening links between the world of research and economics.

Research is therefore increasingly at the centre of Union strategies, as is likely to be confirmed by the Barcelona European Summit. The 3% target - which would bring Europe up to the level of its US and Japanese competitors - could then become the motor behind the European Research (and Innovation) Area over the coming decade.

Publications

Brochures, leaflets, reports, studies

- **The European Research Area – A common strategy for science and technology in the service of society** – Brochure – Available in DE, EN, FR research@cec.eu.int
- **Imagine, Show, Discuss – European Science and Technology Week** – Brochure – Available in DE, EN, FR research@cec.eu.int

- **Europeans, science and technology – Survey report** – Special edition of RTD info on the results of the Eurobarometer survey – Available in DE, EN, FR research@cec.eu.int

- **European bio-entrepreneurs. Examples of start-up companies in the biotech sector** – Brochure indridi.benediktsson@cec.eu.int

- **Local initiatives to combat social exclusion** – Leaflet marthe.leonidou@cec.eu.int
- **European research in the stratosphere 1996-2000** – Study georgios.amanatidis@cec.eu.int

- **Scientific policies in the European Union: integrating the gender dimension, a factor for excellence** – Report nicole.dewandre@cec.eu.int
- **Photovoltaics: an energy resource for the European Union** – Brochure helpline-energy@cec.eu.int
- **Research and Technological Development Activities of the European Union – 2001 Annual Report** (downloadable) europa.eu.int/comm/research/report2001.html

Project reports

- **European defence restructuring: military and public view** – EUR-OP
- **Reconstructing the means of violence: defence restructuring and conversion** – EUR-OP
- **The restructuring of the European defence industry** – EUR-OP
- **Socio-economic projects in energy and environment** – domenico.rossetti-di-valdalbero@cec.eu.int
- **Reviewing flexibility. A systems approach to vocational education and training** – EUR-OP
- **Antimicrobial resistance research** – EUR-OP
- **Unconventional medicine** – ursula.holler@cec.eu.int
- **Generic RTD activities and research infrastructures** – manuel.hallen@cec.eu.int
- **Impact of major transport infrastructures on the quality of urban shape** – EUR-OP
- **Meteorology during peak pollution episodes** – EUR-OP
- **Radar hydrology for real time flood forecasting** – EUR-OP
- **Wood assess project. Systems and methods for assessing conservation state and environmental risks for outer wooden parts of cultural buildings** – EUR-OP
- **Life cycle assessment on forestry and forest products** – EUR-OP

Conference reports

- **Governance: an academic contribution** – Published under the auspices of the Italian Embassy in Brussels – ambit.bxl.scientifico@attglobal.net
- **Groundwater ecology – A tool for management of water resources** – EUR-OP
- **Review of heat treatments of wood** – EUR-OP

The publications mentioned are a selection. A complete list of scientific publications from the RTD programmes is placed on the research website every two months: europa.eu.int/comm/research/pub_rtd.html

Printed publications accompanied by the mention of an e-mail address are free and can be obtained by sending a message to the address given.

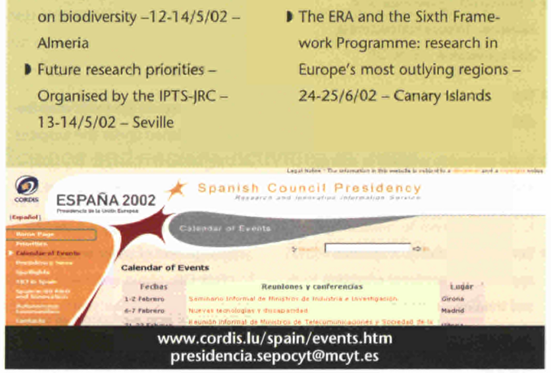
EUR-OP (Office for Official Publications of the European Communities) means that the printed versions must be purchased. To order copies please visit the website at: eur-op.eu.int/general/en/s-ad.htm

News in brief...News in brief...News in brief...News in brief...

Diary

Research meetings under the Spanish presidency

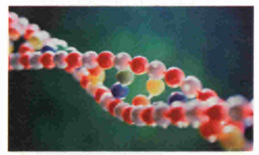
- Poverty-related diseases: European platform on clinical trials – 19-20/4/02 – Barcelona
- European ethical group – 19-20/4/02 – Barcelona
- Social sciences: European policies and institutions – 6-7/5/02 – Barcelona
- Strategic platform for research on biodiversity –12-14/5/02 – Almeria
- Future research priorities – Organised by the IPTS-JRC – 13-14/5/02 – Seville
- Science and the environment: accepting research risks to reduce societal risks – 30-31/5/02 – Murcia
- Technologies for sustainable land and sea transport – 4-6/6/02 – Valencia
- Women and science – 5/6/02 – Madrid
- The ERA and the Sixth Framework Programme: research in Europe's most outlying regions – 24-25/6/02 – Canary Islands



Other events

- **Third European Forum for Innovative Enterprises** – 8-9/4/02 – Stockholm (SE) www.thirdforum.org/
- **The Physics Congress** 02 – 7-11/4/02 – Brighton (UK) – www.iop.org/
- **Gate2Growth annual conference** – 9-10/4/02 – Stockholm (SE) www.e-unlimited.com/
- **Drug Discovery Technology** – Europe 15-18/4/02 – Stuttgart (DE) www.drugdisc.com/stuttgart/
- **Intertraffic 02** – 15-18/4/02 – Amsterdam (NL) www.show-info.nl/intertraffic/
- **IFAT 02 – waste disposal and the environment** – 13-17/5/02 – Munich (DE) www.ifat.de/english/
- **Cultural Heritage Research: a Pan-European Challenge** – 16-18/5/02 – Cracow (PL) www.heritage.ceti.pl/background.html
- **5th International Congress and Trade Fair 'Water: Ecology and Technology'** (ECWATECH) – 4-7/6/02 – Moscow (RU) www.sibico.com/
- **Dissemination Conference of Current European Research on Rice** 6-8/6/02 – Turin (IT) eurice.elu@spm.it
- **Biomass for Energy – Industry and Climate Protection** – jointly organised by ETA-Florence, WIP-Munich & BWE – 17-21/6/02 – Amsterdam (NL) munich.de/conferences/biomass/amsterdam_02/amsterdam.html
- **Towards an integrated infrastructure for measurements** – 18-19/6/02 – Warsaw (PL) europa.eu.int/comm/research/growth/warsaw/index_en.html
- **Inter02 – Research and Scholarship in Integration Processes:** Poland-USA-EU – 19-22/6/02 – Lódz (PL) inter02@krysia.uni.lodz.pl
- **New trends in water and environmental engineering for safety and life: eco-compatible solutions for aquatic environments** – 24-28/6/02 – Capri (IT) www.capri02.com
- **1st World Wind Energy Conference and Exhibition** – jointly organised by ETA-Florence and WIP-Munich 2-6/7/02 – Berlin (DE) www.world-wind-conference.org/
- **INTERFORST (International Trade Fair For Forestry And Log Timber Technology)** – 10-14/7/02 – Munich (DE) www.interforst.de/english/

- **International Conference on Project Management** – 31/07 – 02/08/02 – Singapore (ML) www.ntu.edu.sg/MPE/ProMAC02/
- **Kansai' 02 – Integrating Regional and Global Initiatives in the Learning Society** – 12-15/8/02 – Kyoto (JP) in3.dem.ist.utl.pt
- **Conférence internationale sur l'échantillonnage de l'ADN – International DNA Sampling Conference** 5-8/9/02 – Montreal (CA) www.humgen.umontreal.ca/conference/fr



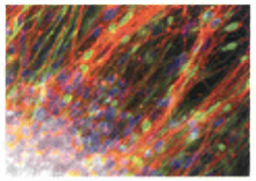
- **Eastern Enlargement of the EU – Implications for development strategies and development co-operation in the 21st Century** 19-21/9/02 – Ljubljana (SL) www.eadi.org/generalconference.htm
- **International Conference on Soils under Global Change – a Challenge for the 21st century** September 02 – Constanta (RO) m.dumitru@icpa.ro
- **PV for Europe – Conference and Exhibition on PV Science – Technology and Application** – jointly organised by ETA-Florence and WIP-Munich – 7-11/10/02 – Rome (IT) www.wip-munich.de/conferences/pv/rome_02/index.html
- **Colour of Ocean Data** – Organised by the Flanders Marine Institute – 25-27/11/02 – Brussels (BE) www.vliz.be/en/acruv/cod/
- **Genomics and Forest Tree Stress Tolerance Short Course** – Course – 11/02 – Chania (GR) adoulis@maich.gr

New on the Web

- **RDT *info*, Revista de la Investigación Europea** *europa.eu.int/comm/research/rtd-info_es.html*
  Beginning with the current issue, a Spanish version of the articles published in RTD *info* will be available on the Research DG's Europa site. The complete issue can be downloaded in pdf format.
- **Science and society in Europe – How to bridge the gaps?** *europa.eu.int/comm/research/press/2001/pr0612en.html*
  This Research DG site gives the full results of the *Europeans and science* Eurobarometer survey carried out at the request of the European Commission (see also the special edition of RTD *info* as mentioned under *Publications*).
- **The Union and space policy** *europa.eu.int/comm/space/index_en.html*
  This new site dedicated to space provides details of all aspects of the Union's initiatives in the field of space, in particular, thanks to the new coordination links introduced by the European Space Agency.
- ***SciDev.Net:* science for development** *www.scidev.net/*
  SciDev is a remarkable site set up by the scientific team from the magazine *Nature*, with support from the British Welcome Trust. The idea was born in Budapest in 1999 at the world conference on science organised by Unesco and the International Council for Science (ICSU). Since it was launched in December 2001 it has operated as an independent gateway providing quality information and debate of interest to researchers, policy-makers and NGOs who want science and technology to be used to help developing countries.
- **Industry seeks women researchers** *europa.eu.int/comm/research/science-society/women/wir/index_en.html*
  Public or private research? In both cases women play an insufficient role. The Commission's *Women and science* group has to date mainly studied the role of women researchers in public institutions. A group of experts has now embarked on similar studies in the private sector. As part of the new Science and Society Action Plan they will study the situation of women in European industrial research and identify new avenues to be explored to increase their presence. For the latest developments, go to *http://www.cordis.lu/rtd2002/science-society/women.htm*

The latest news on Europa/Research

- **Decoding the genome of the Schizosaccharomyces pombe yeast is opening the way to major medical developments** – 21/2/02 *europa.eu.int/comm/research/press/2002/pr2002en.html*
- **ECHO project: high-tech research to save and archive documentaries on Europe** – 7/2/02 *europa.eu.int/comm/research/dossier/do0702fr.html*
- **Improving mobility in the city through research (European Parliament)** – 30/1/02 *europa.eu.int/comm/research/press/2002/3001en.html*
- **Ozone and UV over Europe: no sign of improvement** – 22/1/02 *europa.eu.int/comm/research/press/2002/2201en.html*
- **Descartes Prize 2002 – €1 000 000 for outstanding scientific achievements** – 21/12/01 *europa.eu.int/comm/research/press/2001/pr2512en.html*
- **Stem cells: Statement from the European Life Sciences Group** – 20/12/01 *europa.eu.int/comm/research/press/2001/pr2112en.html*



- **Commission establishes Group of scientific experts on the fight against biological and chemical terrorism** – 12/12/01 *europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/01/1810|0|RAPID&lg=EN&display=*
- **Towards a Common European Railways Research Strategy: EU Commission Launches European Rail Research Advisory Council (ERRAC)** – 26/11/01 *europa.eu.int/comm/research/press/2001/pr2611en.html*

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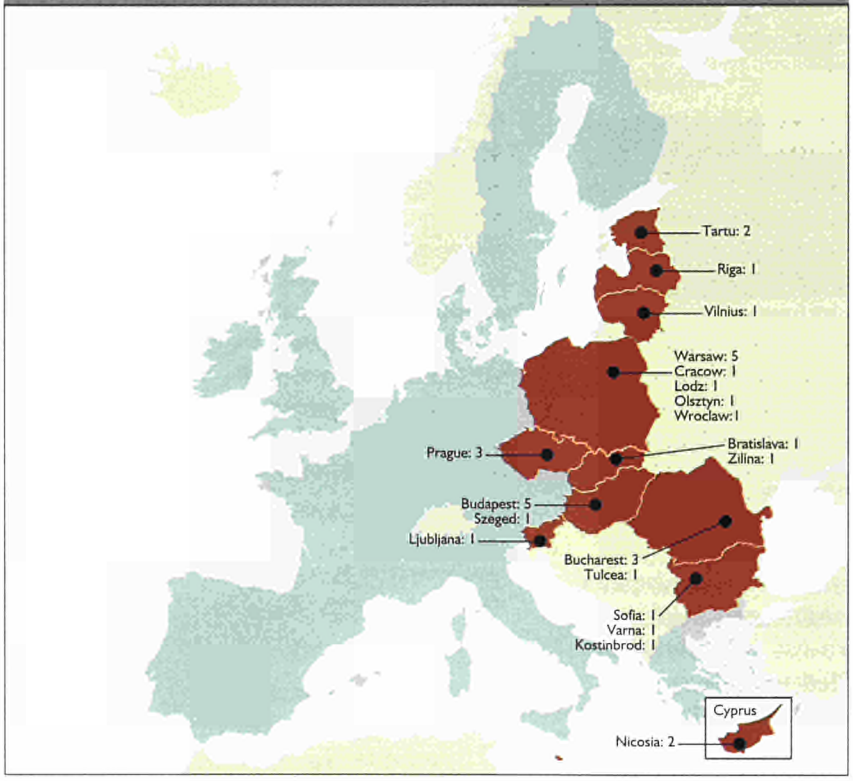
Partners in excellence

With Union support, 34 multidisciplinary centres of excellence in 11 candidate Member States are now fully operational. Together they form an advanced platform for integrating their scientific and technological potential in the European Research Area.

There is much to criticise in the regimes which for decades shackled Central Europe's former people's democracies behind the Iron Curtain. But at least these systems had 'faith' in science, even if it was often used as a tool in the service of their image and politics. The *denationalisation* in the decade which followed the fall of the Berlin Wall dealt a heavy blow to this scientific know-how and the reputation for scientific excellence in these countries suffered terribly.

Today it is a major European challenge to restore this research potential, particularly in the light of their future Union membership. At a conference in Budapest in March 1997, Jürgen Rüttger, German research minister at the time, suggested that the Fifth Framework Programme should include the creation of a network of centres of excellence covering the candidate countries.

Centres of excellence in the candidate countries



Developing links, increasing attractiveness

Following last year's call for tenders by the Commission as part of its policy on international research cooperation, 34 scientific or technological institutions[1] were selected (out of 184 applicants) to lay the foundations of such a network. Today the Union actively supports this network in developing the scope and range of its activities. The total aid package of €24 million has been allocated to the individual centres according to the actions they propose on developing external links and increasing their attractiveness while, at the same time, meeting the economic and social needs of the regional environment. Examples of actions include the organisation of European conferences and seminars, welcoming scientists from other countries, doctorate and postdoctorate training (including study visits to other institutions) and twinning with other centres.

This address book of excellence in the candidate countries is a valuable tool, opening the door to ensuring their research potential becomes an inherent part of the European Research Area and their participation in the future Framework Programme.

Contact
Jitka Vennekens, Research DG
jitka.vennekens-capkova@cec.eu.int

(1) In addition to the ten Central and Eastern European countries, this group also includes the independent state of Cyprus.

BULGARIA

SOFIA

Bulgarian Information Society for the 21st Century (BIS-21)

Bulgarian Academy of Sciences – Central Laboratory for Parallel Processing

Activities: information technologies in case of emergency and forecasting of damaging air pollution levels; reliability of nuclear reactors at the Kozloduy plant; multimedia applications for Slavonic languages.

Contact: Ivan Dimov

- ivdimov@bas.bg
- saturn.acad.bg/
- www.bas.bg/clpp

VARNA

Centre for sustainable development and management of the Black Sea Region (CESUM-BS)

Bulgarian Academy of Sciences – Institute of Oceanology

Activities: approach to the environmental, economic and social problems of the basin, which ranked among the most threatened expanses of water in the world.

Contact: Snejana Moncheva

- snejm@mail.varna.techno-link.com
- cesum-bs@io-bas.bg
- www.cesum-bs.io-bas.bg
- www.io-bas.bg/

KOSTINBROD

Bulgarian Centre of Excellence in Plant Biotechnology (Excellent Plant Biotec)

AgroBioInstitute - Centre for Plant Biotechnology

Activities: applied genetic engineering in the field of plant biotechnology in collaboration with plant breeding institutes and stations in Bulgaria.

Contact: Atanas Atanassov

- geneng@mtel.net
- www.geocities.com/PicketFence/Garden/9151/

CYPRUS

NICOSIA

Centre of Excellence in Agriculture and Environment

Agricultural Research Institute of Cyprus (ARICY)

Activities: viruses in citrus fruits; molecular marker technology; integrated pest management.

Contact: Ioannis Papadopoulos

- papado@arinet.ari.gov.cy
- www.ari.gov.cy/aricy.htm

Centre of Excellence on Computational Finance and Economics (HERMES)

University of Cyprus – Center for Banking and Financial Research

Activities: wide-risk management for large financial institutions; investment valuation and decision-making in a situation of uncertainty; macroeconomic modelling of emerging financial systems; performance of financial institutions; the structure of household portfolios; computational financial modelling.

Contact: Stavros Zenios

- zenioss@yahoo.com
- www.hermes.ucy.ac.cy

CZECH REPUBLIC

PRAGUE

Advanced Research Centre for Cultural Heritage Interdisciplinary Projects (ARCCHIP)

Institute of Theoretical and Applied Mechanics of the Czech Academy – Associated Research Centre for Historic Structures and Sites

Activities: research on the problems of safeguarding European cultural heritage – especially in the EU candidate countries – and their inclusion in social and economic sustainability measures.

Contact: Milos Drdacky

- drdacky@itam.cas.cz
- www.arcchip.cz/#About

EU Centre of Excellence (MEDIPRA)

Academy of Sciences – Institute of Experimental Medicine

Activities: cell biology and pathology; neuroscience; developmental toxicology and teratology.

Contact: Eva Sykova

- sykova@biomed.cas.cz
- uemweb.biomed.cas.cz/Index.htm

Machine Intelligence Research and Application Centre for Learning Excellence (MIRACLE)

Technical University in Prague – Faculty of Electrical Engineering – Department of Cybernetics

Activities: intelligent decision-making and control, computer vision and machine perception; data warehousing; industrial production system integration and production planning information systems.

Contact: Vladimir Marik

- marik@labe.felk.cvut.cz
- cyber.felk.cvut.cz/MIRACLE/html/index.html

ESTONIA

TARTU

Regional Centre of Excellence in New Functional Materials, their Design, Diagnostics and Exploitation (ESTOMATERIALS)

University of Tartu – Institute of Physics

Activities: technologies for informatics; photonics; medicine and environmental services.

Contact: Kristjan Haller

- haller@fi.tartu.ee
- www.fi.tartu.ee/ce/introduction.htm

Genetics for the next millennium (GENEMILL)

Estonian Biocentre

Activities: molecular and cell biology applied to medicine, genetics and environmental protection.

Contact: Richard Villems

- rvillems@ebc.ee
- www.tymri.ut.ee/index1.html

HUNGARY

SZEGED

Regional Initiative for Improvement of Quality of Life through Research, Education, and Innovation in Molecular Cell Biology (BIOREGION-SZEGED)

Hungarian Academy of Sciences – Biological Research Center (BRC)

Activities: leading-edge research on understanding the role of genes and gene products in the cell functions of microbes, plants and animals.

Contact: Dénes Dudits

- dudits@nucleus.szbk.u-szeged.hu
- www.szbk.u-szeged.hu/bioregion.html

BUDAPEST

BRIDGE (scholarship between East and West)

Collegium Budapest – Institute for Advanced Study

Activities: humanities, social sciences and theoretical natural sciences.

Contact: Gábor Klaniczay

- collegium.budapest@colbud.hu
- www.colbud.hu/main/index.html

EURO-NEURO-NETWORKS (Serving regional integration, higher education and welfare of society in the field of neuroscience)

Hungarian Academy of Sciences – Institute of Experimental Medicine

Activities: networking in neuroscience; creating/establishing the Central European Brain Research Training Centre; bridging the gap between theoretical and applied neuroscience; transferring gene technology from West to East; increasing public awareness.
Contact: Sylvester Vizi
• esvizi@koki.hu
• www.koki.hu/cntrofexc.html
• www.koki.hu

Centre of Excellence in Information Technology, Computer Science and Control (HUN-TING)
Hungarian Academy of Sciences - Computer and Automation Research Institute (SZTAKI)
Activities: computer science; information technology; applied mathematics; operations research and decision support systems; cellular non-linear networks; signal processing; artificial intelligence; intelligent manufacturing and business processes.
Contact: Peter Inzelt
• inzelt@sztaki.hu
• www.sztaki.hu/sztaki/coe/

Condensed Matter Research Centre (KFKI-CMRC)
Hungarian Academy of Sciences - Research Institute for Solid State Physics and Optics
Activities: study of solid and liquid materials including their structure, properties and synthesis.
Contact: Agnes Buka
• ab@power.szfki.kfki.hu
• www.kfki.hu/~cmrc

Mathematics in information society (MATHIAS)
Hungarian Academy of Science – Alfréd Rényi Institute of Mathematics
Activities: algebra; algebraic logic and geometry; analysis; combinatory and discrete mathematics; convex and computational geometry; information theory; number theory; probability and statistics, etc.
Contact: Dezsó Miklós
• dezso@renyi.hu
• www.renyi.huçl

LATVIA

RIGA

Centre for advanced material research and technology (CAMART)
University of Latvia - Institute of Solid State Physics
Activities: computer modelling of advanced materials; semiconductors, insulator materials and thin film structures; advanced dielectrics for multifunctional applications; materials for ophthalmology and vision science; solid-state ionics and devices.
Contact: Andris Sternberg
• stern@latnet.lv
• www.cfi.lu.lv

LITHUANIA

VILNIUS

Cell biology and lasers: towards new technologies CEBIOLA
Vilnius University - UNESCO Associated Centre of Excellence for Research and Training in Basic Sciences
Activities: biophotonics and quantic light processes applied to biology; science and technology in optics.
Contact: Benediktas Juodka
• benediktas.juodka@cr.vu.lt
• www.mif.vu.lt/unesco/

POLAND

WARSAW

Advanced materials and structures (AMAS)
Polish Academy of Sciences - Institute of Fundamental Technological Research (Centre of Mechanics and Information Technology)
Activities: mechanics of solids, structures, fluids and biomaterials; engineering acoustics including non-destructive testing methods and ultrasonic applications in medicine; information technology; mechatronics; robotics and ecologically oriented construction engineering.
Contact: Zenon Mroz
• zmroz@ippt.gov.pl
• www.ippt.gov.pl/amas/

Physics and Fabrication of Low Dimensional Structures for Technologies of Future Generations (CELDIS)
Polish Academy of Sciences - Institute of Physics
Activities: solid-state physics, and in particular the physics of semiconductors and magnetic materials on the nanometer scale.
Contact: Jacek Kossut
• kossut@ifpan.edu.pl
• info.ifpan.edu.pl/celdis/

High pressure: a competitive method for the advancement of multi-disciplinary research and industrial applications (HIGH PRESSURE)
Polish Academy of Sciences – High Pressure Research Center
Activities: nitrides technology for blue-light optoelectronics; nanocrystalline ultra-hard materials; pressure-induced structural changes in biological materials and food processing; application of pressure-tuned laser diodes in medicine; synthesis of nanopowders under high pressure in the presence of microwaves.
Contact: Witlod Lojkowski
• wl@unipress.waw.pl
• www.unipress.waw.pl

Stefan Banach International Mathematical Centre of Excellence (IMPAN-BC)
Polish Academy of Sciences - Institute of Mathematics
Activities: public-key cryptography and computational number theory; information theory and its applications to physics, finance and biology; mathematical modelling and analysis of cellular populations; non-linear systems and control; mathematics of finance and stochastic control; approximation structures in Banach spaces; symplectic singularities and applications; visual modelling.
Contact: Feliks Przytycki
• feliksp@impan.gov.pl
• www.impan.gov.pl/Excellence

Excellence in molecular biotechnology – getting European dimension (EMBEU)
Polish Academy of Science - Institute of Biochemistry and Biophysics PAS
Activities: molecular modelling of protein structures and protein-protein interactions; new variants of recombinant proteins; molecular studies on plant development; plant-pathogen interactions; plasmid genomics; applied fungal genetics; mitochondrial diseases, etc.
Contact: Wlodzimierz Zagorski-Ostoja
• cemb@ibb.waw.pl
• www.ibb.waw.pl/Centr-Dosk/C-D-mol.html

CRACOW

Molecular Biotechnology - Integration of Education and Research (BIER)
Jagiellonian University - The Jan Zurzycki Institute of Molecular Biology
Activities: biochemistry; biophysics; cell biology; plant physiology; microbiology and immunology.
Contact: Kazimierz Strzalka
• strzalka@awe.mol.uj.edu.pl
• www.mol.uj.edu.pl/bier.htm

WROCLAW

Centre for advanced manufacturing technologies (CAMT)

Wroclaw University of Technology - Institute of Production Engineering and Automation

Activities: machine tools, robotics & assembly; design methodology; production engineering; manufacturing automation; manufacturing and quality.

Contact: Jan Koch

- jankoch@itma.pwr.wroc.pl
- www.camt.pl

OLSZTYN

Food Safety - a challenge for processing food of plant origin (CENEXFOOD)

Polish Academy of Sciences - Institute of Animal Reproduction and Food Research - Division of Food Science

Activities: safe plant breeding for food processing (influence of environmental factors, etc.); plant material as a source of functional products and ingredients; benefits and risks of food processing; new methodologies to assess the wholesomeness of food.

Contact: Halina Koslowska

- haka@pan.olsztyn.pl office@pan.olsztyn.pl
- www.pan.olsztyn.pl/cenexfood/
- www.pan.olsztyn.pl/index0.html

LODZ

Designed molecules and macromolecules, their assemblies and biological functions (DESMOL)

Polish Academy of Sciences Centre of Molecular and Macromolecular Studies

Activities: asymmetric synthesis of complex organic molecules; NMR techniques of studying molecular structure of biological interest; synthesis of macromolecules with desired topologies leading to materials for high-tech applications ranging from medical diagnostics to electronics; etc.

Contact: Przemyslaw Kubisa

- pkubisa@bilbo.cbmm.lodz.pl
- www.cbmm.lodz.pl

ROMANIA

BUCHAREST

Function and Dysfunction Of Blood Vessels (BLOOD VESSELS)

Romanian Academy - Institute of Cellular Biology and Pathology Nicolae Simionescu

Activities: transcytosis in normal/pathological states; alterations in atherosclerosis and diabetes: their therapeutic control.

Contact: Dr Maya Simionescu

- simionescum@simionescu.instcellbiopath.ro
- simionescu.instcellbiopath.ro/

European integration of the Romanian mathematical research activity (EURROMMAT)

Romanian Academy - Institute of Mathematics Simion Stoilov

Activities: operator theory and functional analysis; operator algebras; differential equations and optimal control; mathematical physics and partial differential equations; algebraic geometry; complex analysis; algebraic and differential topology; continuous media mechanics; potential theory.

Contact: Radu Purice

- purice@imar.ro
- pompeiu.imar.ro/~eurrommat/Programme.php3
- pompeiu.imar.ro/

Interdisciplinary research and applications based on nuclear and atomic physics (IDRANAP)

Horia Hulubei National Institute for Physics and Nuclear Engineering

Activities: nuclear methods for studying environmental pollution components; applications of nuclear physics methods to biology and medicine; radioisotopes and radionuclide metrology; nuclear physics methods for study; analysis, and characterisation of materials; nuclei far from stability; decay modes; cosmic rays; and facilities.

Contact: Dorin N. Poenaru

- poenaru@ifin.nipne.ro
- www.nipne.ro/

TULCEA

Deltas and Wetlands (DELWET)

Ministry of Water and Environment Protection - Danube Delta National Institute for Research and Development

Activities: biodiversity conservation and sustainable development of deltas and wetlands.

Contact: Mircea Staras (Mr.)

- mstaras@indd.tim.ro
- www.indd.tim.ro/Excelenta/Centru.htm
- www.indd.tim.ro

SLOVAKIA

ZILINA

Centre for Transportation Research (CETRA)

University of Zilina

Activities: operation and economics of transport; transport management; management science and informatics; transport and transport infrastructure design and construction; mechanical engineering in transport; transport electronics; forensic engineering.

Contact: Ladislav Skyva

- cetra@utc.sk (optional: skyva@frtk.fri.utc.sk)
- www.utc.sk/cetra
- www.utc.sk/

BRATISLAVA

Centre for reduction of negative impact of environmental factors on human health (STRESSNUTS)

Slovak Academy of Sciences - Institute of Experimental Endocrinology

Activities: resistance to negative consequences of mental and somatic stressors; cardiovascular risk in persons exposed to chronic stress conditions; influence of chronic stress on mental health (drug treatment of depression and reduction of the incidence and severity of anxiety and affective disorders); negative behavioural responses (alcohol and drug abuse) to changes in social environment; diagnostic and therapeutic procedures in patients with hypertension, obesity and diabetes; endocrine disturbances induced by nutritional factors and environmental pollution.

Contact: Daniela Jezova

- ueenjezo@savba.savba.sk
- nic.savba.sk/sav/inst/ueen/ce.htm

SLOVENIA

LJUBLJANA

NMR spectroscopy in combination with computational methods on systems of biological interest (SLONNMR)

National Institute of Chemistry - NMR Centre

Activities: structural and theoretical chemistry; analytical chemistry and ecology; organic and inorganic materials; biotechnology and chemical engineering.

Contact: Janez Plavec

- janez.plavec@ki.si
- www.ki.si/opisi.html

An icebreaker and scientific vessel operational at temperatures as low as minus 50°C, the *Polarstern* is at sea 320 days a year. The summer months find it in the Arctic Ocean and autumn and winter in Antarctica.

A floating

An icebreaker weighing 11 820 tonnes and a multi-purpose vessel for geophysicists, oceanographers, climatologists and biologists – that's the Polarstern, the star of European polar research. RTD info reports on the latest feats of this tool of excellence and its scientific fitter, the Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung (AWI) of Bremerhaven.

Whether transporting heavy equipment to scientific stations in Antarctica, collecting plankton in the Arctic Ocean, measuring air movements in the upper atmosphere over the poles, or studying deep ocean currents under the ice floe, the *Polarstern* is equipped for the job. This unique vessel is both a powerful icebreaker and a genuine floating laboratory.

The specialists in maritime hydrodynamics from the Hamburgische Schiffbau-Versuchsanstalt GmbH who designed this impressive vessel certainly thought big. Its 14 000 kW engines - equivalent to a supertanker with four times its tonnage - drive two propellers which allow the vessel to cut through ice 1.5 metres thick at a speed of five knots an hour.

With a crew of 55, the *Polarstern* is operational at temperatures as low as minus 50°C. Since it was launched at the Kiel shipyards in 1982 it has been at sea 320 days a year, completing 27 missions in an almost unvarying routine: summer in the Arctic Ocean and autumn and winter in the Antarctic.

A first-class scientific machine

This activity at the two extremities of the globe is a considerable maritime feat. 'If we want to arrive early enough to benefit from the southern summer, we must reach the continent of Antarctica at a time when the icebergs are particularly numerous along the coast, especially if we plan to penetrate the southern Weddel Sea, covered by an ice sheet,' explains glaciologist Hans Oerter.(1)

(1) All the scientists quoted work for the Alfred Wegener Institut (AWI).

A German tradition

The Foundation Alfred Wegener Institute for Polar and Marine Research is by far the biggest European research centre in its field, with a staff of 700 and an annual budget of €84 million. Set up in 1980 by the AWI of Bremerhaven, the Foundation has also included the Potsdam Research Unit, since 1992, and the Biological Institute of Helgoland and the Wadden Sea research station at Sylt, since 1988. It is headed by geologist Jörn Thiede and is devoted to three disciplines: geology, climatology and marine biology, the latter comprising two departments, one for pelagic or surface species and the other for benthic species which inhabit the ocean depths. In addition to the *Polarstern*, the AWI has a fleet of four oceanographic vessels and a permanent network of polar bases linked by satellite.

The names of these bases alone evoke the rich history of German polar research: Koldewey, on the island of Spitzberg off the Greenland coast, is named after the navigator and explorer Carl Koldewey (1837-1908) who led the first German expeditions to the North Pole; the Dallmann international station in Antarctica, which operates in the southern summer only, is not far from the territory explored in 1873 by the former whale hunter Eduard Dallmann (1830-1896); and the Neumayer permanent station, also in Antarctica, is named after George Von Neumayer (1826-1909) who headed the International Polar Commission from 1879.

To find out more: http://www.awi-bremerhaven.de/

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During each southern summer, about 14 million square kilometres of the ice cap melt in Antarctica, triggering huge movements in oceanic water masses about which we still understand very little.

phenomenon

But the *Polarstern* is both a technical marvel and a powerhouse. Its first-class scientific equipment includes a meteorological observatory, deep-sea sounding devices to study marine currents, capture systems and a marine biology aquarium, seismological devices to study the geophysics of seabeds, and dredging devices to gather samples from the ocean depths. About 50 researchers and technicians are employed in the vessel's nine laboratories on each mission.

Scientists from all over Europe are able to participate in a wide range of research projects thanks to the *Polarstern*. 'In 1998 alone, our institute participated in 31 projects financed by the Union, and almost a quarter of the scientists who sailed on recent expeditions came from outside Germany,' notes Catherine Audebert, who is responsible for the administration of European programmes at the AWI. 'Fourteen of these projects concerned marine biology and ten climate change and the polar ozone layer. The rest studied underwater geophysics, one of our institution's major specialities.'

Continental drift

Alfred Wegener (1880-1930) – to whom the AWI owes its name – was a key figure in this field of research. It was on observing the interlocking shapes of South America and Africa that he first formed the idea of *continental drift*. The hypothesis initially met with somewhat ironic scepticism and it was not until the latter half of the 20th century that progress in geophysics confirmed his intuition: more than 200 million years ago, the earth did indeed consist of a single continent - *Pangea* - which later broke up.

We now know that this drift is still occurring in the tectonic movements which are slowly separating the plates bearing the continents along 60 000 km of the huge ridge which runs beneath the waters of the Atlantic, Pacific and Indian Oceans. This impressive underwater mountain range, sometimes rising to several thousand metres in height, is the site of often intense but variable seismic activity, such as in Iceland. The inexorable

About 50 researchers board the *Polarstern* for each trip. Opposite, collecting ice samples and the sounding balloon to measure ozone levels during a mission in the Arctic.

tectonic movements also create depressions or faults in the ridge which are like open 'cracks' through which molten magma can flow, adding to the earth's sub-oceanic crust.

Surprises at Gakkel Ridge

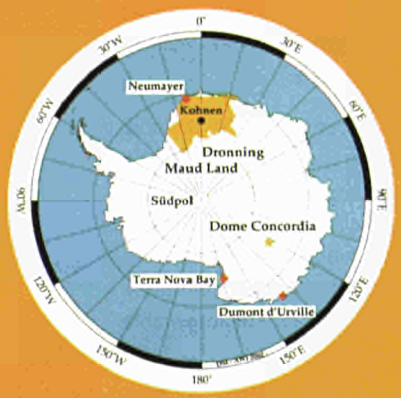
Underwater geophysics is a subject of topical scientific interest. The *Polarstern's* latest expedition to the Arctic Ocean (31 July - 7 October 2001), on which it was accompanied by the US icebreaker *Healy*, was carried out under the Amore (Arctic Mid-Ocean Ridge Expedition) international programme with the mission to study the 1 800 km-long Gakkel Ridge. Lying at a depth of 5 000 metres below the polar ice cap, this northern segment of the North Atlantic Ridge had never been mapped; to do so was the principal mission of the Amore expedition.

This underwater geography mission used seismographs on board the European icebreaker which are able to measure the speed at which signals emitted by a small artificial explosion on the surface are reflected back from the ocean floor. The faster they return, the shorter the distance. In this way it is possible to map the relief of the seabed.

Seismographs are also able to detect natural explosions caused by underwater volcanic activity, and such readings have produced some notable surprises. Previous measurements had established that the Eurasian and North American Plates, separated by the Gakkel Ridge, were moving apart in this region at the rate of just a few millimetres a year (compared with almost 10 centimetres a year for the Pacific Ocean Ridge). This suggested reduced activity. But the Amore mission's recordings showed that, on the contrary, the Gakkel Ridge was a site of intense seismic activity. Dredging the seabed confirmed this observation by bringing to the surface basalt which is typical of active volcanoes.

What could be the explanation for these seemingly contradictory data? That would be the job of the geophysicists. There is very keen interest in this kind of research

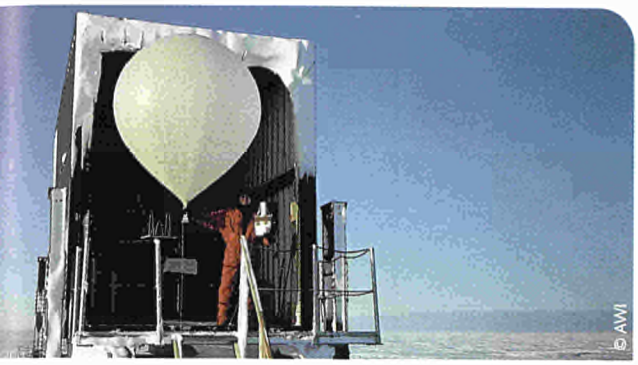
Climate archives



The thickness of the ice cap which covers Antarctica has built up over several hundreds of thousands of years. By drilling down into the ice to take samples it is therefore possible to obtain information on past air composition and climate. This is the aim of researchers with the European Project for Ice Coring in Antarctica (EPICA), supported by the Union and European Science Foundation.

A new drilling site has been selected at Dronning Maud Camp, about 500 kilometres from the Neumayer base. An initial drilling operation to a depth of 100 metres was completed successfully during the southern summer of 2000/2001. Over the next five years researchers hope to be able to penetrate to a depth of between 600 and 800 metres, enabling them to reconstitute the palaeoclimate of 500 000 years ago. The *Polarstern* has a key logistic role in the EPICA programme. It transports equipment to the Neumayer base, which is a five to ten days journey by sea from the Dronning Maud Camp, and brings back the ice cores in refrigerated containers to Europe for analysis.

http://www.antarctica.ac.uk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because, as geophysicist and mission member Wilfried Jokat explains, 'The Gakkel Ridge is the ideal site to test the forecasts of models of the expansion of the oceanic crust at the site of ultra-slow ridges.'

Secrets of the deep

Exploring underwater mountain ranges was not the only task for the *Polarstern*. Scientists on board the vessel - which was making a return trip to the exact centre of the North Pole after a ten-year interval - were also able to study variations in ice thickness. Their results were awaited with particular interest as, during the summer of 2000, a US expedition had described the existence of increasingly large 'water holes' (known as polynya) in the ice. This was interpreted as a possible effect of global warming.

The *Polarstern's* findings offer some reassurance. The frequency and size of the polynya were found to be comparable to the situation in 1991. Although the average thickness of the ice floe has decreased from 2.5 metres to 2 metres, this alone does not allow for any firm conclusions. Any confirmation of change in the planet's climate must be based on the combined action of the atmosphere, the oceans and the ice masses.

Every summer about 14 million square kilometres of ice sheet melt in the Antarctic triggering huge movements of oceanic water masses, about which we know very little. Researchers on board the *Polarstern* had the necessary equipment to study them. 'We use on-board probes, which are able to measure water temperature and conductivity, to tell us about salinity. This enables us to understand better the phenomenon known as *Thermohaline Circulation* whereby convection on a huge scale causes polar waters to affect the global climate,' explains climatologist Eberhard Fahrbach. Other devices are deposited at sea and then collected during the return voyage. Finally, certain icebergs are equipped with emitting buoys enabling their movements to be monitored by satellite to provide valuable data on ocean currents. At a time when global warming is causing growing concern, the *Polarstern* is one of the tools enabling the secrets of climate change – sometimes concealed deep beneath the polar ice caps – to be revealed.

Aurora Borealis

This is the name of a new ice-breaker which will spend all year in the mid-Arctic region. This scientific vessel will make it possible to carry out unique and highly precise polar research, and to participate in the international oceanographic drilling programme. The *Aurora Borealis* is an excellent example of the synergy between national research programmes.

Europe in the cold

Together with the French Institut Polaire, the AWI is the only European organisation working at both poles. Belgium, Italy and the United Kingdom also have research programmes in Antarctica, a region uniquely dedicated to scientific exploration since the international treaty was adopted in 1991. Denmark, Sweden and Finland concentrate on Arctic regions.

Contacts

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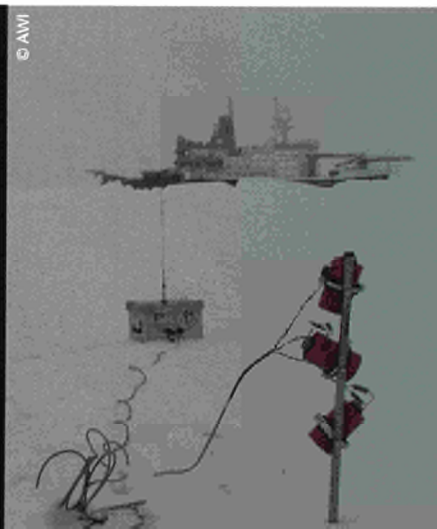
Life at the heart of the ice

Some surprising microscopic animals and algae, such as diatoms, live inside the ice floe. Under certain conditions these algae are so numerous that the ice takes on a brownish hue from their photosynthetic pigments. But how have they been able to adapt to such extreme living conditions? This is one of the subjects being studied by the AWI molecular biology research group, led by Linda Medlin: 'The *Polarstern* is an essential tool for collecting phytoplankton from polar waters,' she explains. 'We have learned how to grow a polar diatom species which will enable us to study its genetic expression. One of our aims is to understand what genes are expressed solely in the diatoms which live in these regions, and which ones allow them to withstand freezing.'

Opposite, the geophysics station on board the *Polarstern*. With nine laboratories, the ship is equipped with a meteorological observatory, sensors to study ocean currents, an aquarium for marine biology and seismological and dredging devices.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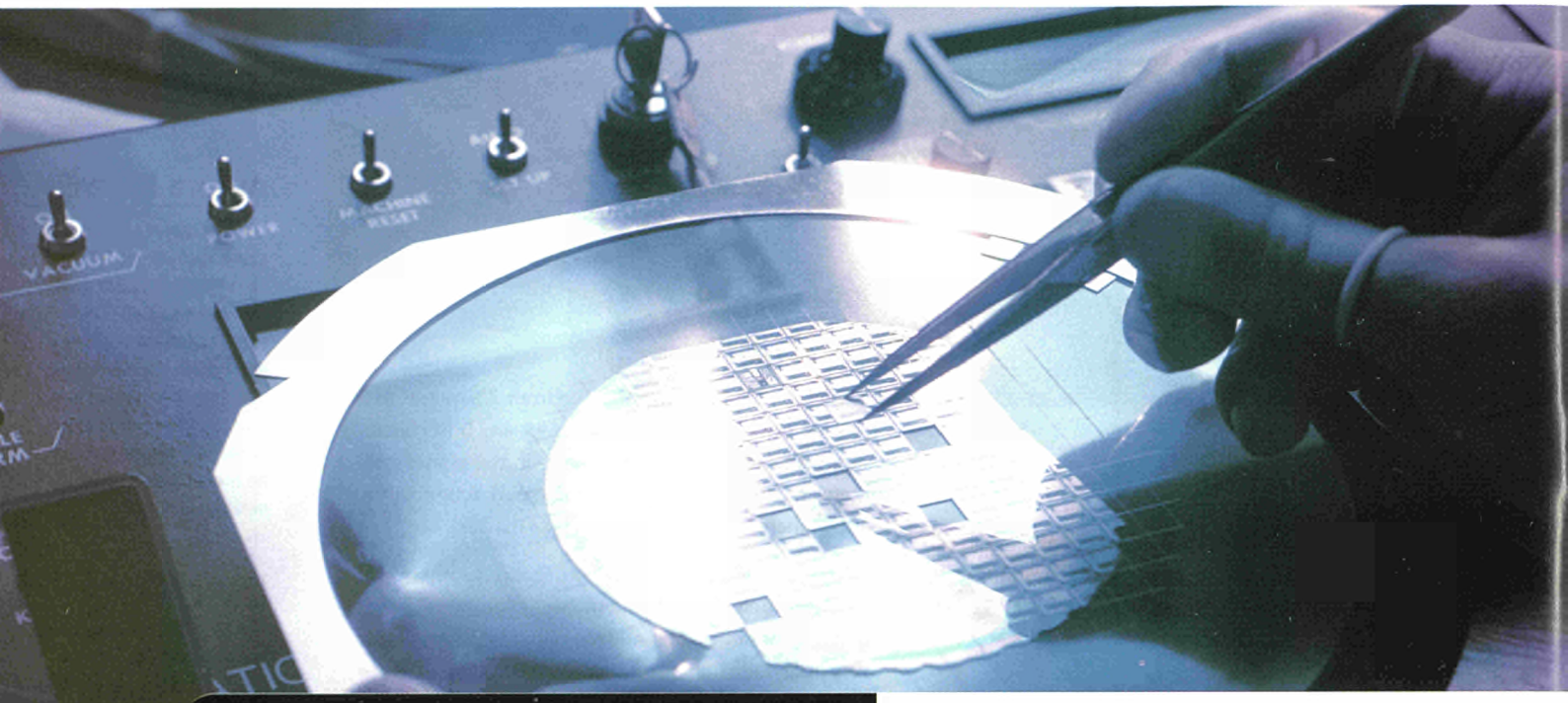


Indian resolve

Since independence, India has concentrated on research to accelerate its development - with impressive results in a number of high-tech fields. Yet, despite its growing importance as a centre of scientific excellence, India still has some way to go. We profile this enigmatic nation, a nation with which the European Union is establishing closer cooperation.

A new kind of cooperation

The signing of a scientific cooperation agreement marks a new high point in relations between India and Europe. Development assistance has given way to cooperation between equals for the mutual benefit of both parties

'With this agreement we are looking at India in a radically new way. We have just signed up for projects of global importance with a full partner.' Daniel Descoutures, responsible for scientific links between Asia and the European Commission, stresses the new direction represented by the recent ratification of a scientific and technological cooperation agreement between the Union and India, signed in New Delhi in November 2001.

This latest step deepens a cooperation which dates back to an initial agreement concluded in December 1993. Since then, India has participated in many projects in partnership with European researchers,(1) but they were intended explicitly for developing countries receiving financial support from the Union. Most of the 55 Indo-European projects implemented in this framework - allocated funds of €22.5 million - have been in traditional fields of cooperation such as health, agricultural production, food industries, sustainable management of resources - in particular the problematic issue of water - and the impact of climate warming on farming practices.

Between equals

India, a genuine world centre in a number of high-tech and scientific fields, can no longer be viewed simply as a developing country. The new five-year renewable agreement is a partnership between equals on subjects of advanced research. Indian institutions, scientists and industrialists can participate in - or even coordinate - thematic projects under the Sixth Framework Programme, just like their European counterparts. In return, Union organisations and researchers can participate in Indian programmes and generally enter into any form of cooperation and participate in existing programmes. Researcher exchanges, seminars and access to high-tech installations can all be organised. Furthermore, as the agreement states, this will be 'without transfer of funds'.

Representatives of the two parties will sit on a management committee which will meet annually to propose research subjects, examine

Like all of India's major research centres, the Indian Institute of Science (IIS) in Bengalore and the Centre for Cellular & Molecular Biology (CCMB) in Hyderabad are virtual carbon copies of their European or US counterparts. Except for one 'detail': each has its own power plant and autonomous water supply. This is because the public networks are unable to guarantee continuous access to these basic resources. The contrast is characteristic of India itself, a nation which has reached the highest international level in some scientific fields while in other areas it is lagging seriously behind in development.

From planned research...

On gaining independence in 1947, Nehru's India turned to science to meet national needs and began to build up or renew its scientific and university infrastructure. In this planned economy, it was the federal government which decided priorities as it sought to meet huge needs in the fields of agriculture, health, energy, education, industry, and also military expenditure.

Major investments were made in electronics, material sciences, atomic energy and space technology. 1974 brought the first underground explosion of a nuclear device, soon followed by the launch of the first artificial satellites for scientific, meteorological and telecommunication purposes. The range of specialities – nanomaterials, computing, pharmacy, microbiology, meteorology, neurosciences, seismic research, etc. – continued to broaden while the structures remained unchanged. Universities and scientific institutes depended almost entirely on government money, often through government programmes with virtually no contacts with an industry which did not invest in R&D.

... to partnership with industry

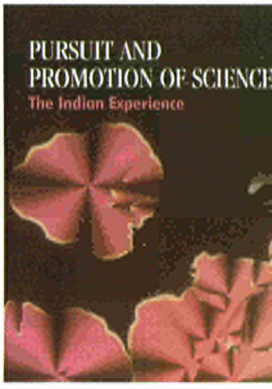
It was not until July 1991, when the government embarked on major economic reforms and liberalised trade and investment, that cooperation between industry and the universities could really take off. Between 1988 and 1994 research or expertise contracts between industry and the Council of Scientific and Industrial Research (CSIR)[1] tripled in value. It was now not unusual for a university professor to take a year's sabbatical to help a private firm set up its research centre. Business incubators in fields such as biotechnology, data processing and pharmacy flourished around university campuses. Major university towns created technology parks where new and innovative companies could enjoy fiscal benefits as well as a reliable infrastructure (electricity, water, telecommunications) free from the burdens of Indian administrative red tape. Dr Matha, director of the prestigious IIS in Bengalore, believes that this was 'undeniably the result of the change in Indian government policy in the early 1990s'.

(1) The equivalent of agencies such as the CNRS in France or the MPG in Germany.

Internet

Three excellent sites to find out more about science and technology in India

- www.meadev.nic.in/science/intro.htm
- www.indusscitech.net/
- www.research-in-india.8m.com/research.html



Published by the National Science Academy, New Delhi, 2001

proposals and launch calls for tender. Cooperation in fields such as nanotechnologies, advanced materials, civil aviation and computer software can all be expected.

Science and diplomacy

'The agreement was generally inspired by the conclusions of the Lisbon European Summit which stressed the importance of knowledge for the 21st century economy... which is very much in line with the beliefs expressed many times by Indian politicians,' continues Daniel Descoutures. 'Clearly Europe will not be able to create its own research area without drawing on external expertise. Also, some key questions for science and society – such as genetically modified organisms or climate change – require a global response. Countries such as China, Russia, the United States – and India – must be involved. These subjects require a joint scientific base.'

In addition to the purely scientific benefits, there are also diplomatic considerations. India is comparable in size to China and is the world's largest democracy. It is a member of the WTO and has experienced several years of sustained growth. The conclusion? 'India is rapidly becoming a key world player and Europe needs strategic allies within international forums which discuss the rules of international trade, intellectual property agreements and the Kyoto Protocol.' *The principle of mutual interest,* which is stressed on a number of occasions in the text of the agreement, also addresses the realities of the world.

(1) In the framework of the European INCO (1994-98) and INCO2 (1998-2002) programmes -- see www.cordis.lu/inco2/src/wp_en.htm

Contact: Daniel Descoutures, Directorate-General for Research
daniel.descoutures@cec.eu.int

A government department specialising in biotechnology embodies the government's resolve to concentrate on the life sciences.

Indian Silicon Valley

The success of the Indian software industry is a perfect example of Indian efficiency, the level of excellence earning the country around 15 billion dollars in export revenue in 1999. After disappointing attempts at manufacturing computer hardware, India decided to concentrate on developing software solutions, a field in which it soon excelled, thanks to its long tradition of mathematics. 'We managed to develop efficient programmes despite inefficient computers,' researchers like to say.

Over recent years these technologies (which 'restored pride to India', to quote R.A. Mashelkar, director of the CSIR) have been the subject of a specific national policy, starting in 1985 with the lowering of customs duties on software and hardware and followed by 'forced' computerisation of the public sector and the creation of a specialised government department. The department's official mission is to 'make India a superpower in the field of information technology by 2008'. A company such as Infosys is testimony to this resolve. This Bengalore software and computer consultancy firm symbolises India's ability in this field, recording almost 99% of its turnover with foreign customers, including 70% in the United States and 20% in Europe.

This international reputation in the field of high technologies must not, however, be reason to forget the huge contrast between the success of Indian science, on the one hand, and the unsatisfied fundamental needs of Indian society, on the other. The population has reached the billion mark and is continuing to grow. The steady increase in agricultural production achieved by the 'green revolution' of the 1960s has ceased after having caused huge ecological damage. The environment is also suffering from the effects of uncontrolled urbanisation.

Faith in life sciences

Biotechnologies can bring solutions in the fields of health (diagnostics and vaccinations), agriculture (productivity, resistance to drought and pests, livestock health) and the environment (water treatment/purification). Back in 1986, India was one of the first countries to put its faith in what was still an emerging sector by setting up a specialised government department, as it had done previously for space and information technologies.

Today, India has built up some very promising potential in the life sciences. But is it perhaps about to follow the example of information technology in becoming an 'off-shore' sector, or will it be the spearhead of sustainable endogenous development?

Two-way traffic

Excellent universities, but too few posts for its scientists... The Indian brain drain to the United States – and more recently Europe also – shows no sign of slowing. Yet, at the same time, many multinationals are being attracted to India for its intellectual resources, motivated workforce and competitive salaries. Companies such as Monsanto, General Electric, Intel, Microsoft, IBM, Siemens and Dupont have all set up research and development centres in India over recent years. So much so that Indian researchers have no hesitation in describing their country as the future 'world centre for R&D'.

The mobile phone: friend or foe?

Three out of five Europeans use their mobile phones every day. The question is: Are the electromagnetic waves emitted by these phones and their base stations harmful to health? There is no scientific evidence to confirm this but, true to the principle of 'better safe than sorry', a number of research projects are now trying to confirm that they are hazard-free.

Without knowing or noticing it, we have long been immersed in a veritable electrosmog covering a very wide frequency spectrum. These emissions come from televisions, microwave ovens and electric shavers as well as surveillance systems, computers or, quite simply, the electricity grid. More recently, an increasingly constant companion has been making its contribution to the electrosmog: the mobile telephone.

Does constant and increasing exposure to this kind of radiation constitute a danger? No, the experts have always claimed, as the intensities of these fields are far too low to raise the temperature of human body organs - and below this level no harmful effect has ever been shown. Mobile or cell phones, for example, emit only very weak microwave radiation (less than 2 watts). However, unlike other devices, they create an electromagnetic field in the immediate vicinity of the ear and brain.

What are the biological effects?

Initial suspicions mainly concerned the carcinogenic potential of microwaves. However, the many research projects on the subject have to date provided no evidence of any link between normal exposure to the radiation emitted in radiofrequencies by mobile phones and the appearance of malignant tumours.(1)

But cancer is not the only health risk evoked in connection with mobile phones. In France, the recent Zmirou report(2) stresses that 'scientific data indicate in a way which it is difficult to dispute the existence of varied biological effects (electroencephalogram profile, reaction time) for energy levels which do not cause an increase in local temperature', without being able to conclude that this poses any threat to health. Various symptoms - memory or attention problems, tiredness, headaches, hearing problems - are sometimes reported. In some individuals these seem to correspond to a kind of 'electromagnetic hypersensitivity' attributable to the intense use of mobile phones or proximity to the transmitter masts which serve as their base stations.

Targeting ultra-low frequencies

In another scientific report commissioned by the European Parliament,(3) Dr Gerard Hyland of the Department of Physics at Warwick University concludes that European recommendations do not go far enough as they are based solely on the thermal

(1) This view is corroborated in particular by the World Health Organisation, the British authorities (Stewary report) and the British Medical Association.
(2) Available at www.sante.gouv.fr/
(3) Available at www.carolinelucasmep.org.uk/publications/pdfs_and_word/stoa.doc

Given present uncertainties about mobile telephones, it is better not to leave them too often in the hands of children.

influences of electromagnetic fields. He believes that brain activity and the neuroendocrine system could also be adversely affected by the pulsed microwave signals emitted by mobile phones.

A number of studies are now looking at this largely unexplored field of pulsed radiation. Emitted at extremely low frequencies, it is produced by televisions and high-tension lines as well as mobile phones. Scientists are wondering if these waves could have an effect on the electromagnetic field (generated by the movement of calcium, magnesium and other ions) of our own body. In which case, when exceeding a certain level of intensity could this phenomenon increase the probability of child leukaemias? The World Health Organisation (WHO) opts for prudence in recommending that pulsed radiation should be considered as potentially carcinogenic for very young individuals and advocates further research.

Reference system required

'Everybody accepts that at high levels there is a very real and perhaps serious biological effect. But at very low levels there is, as yet, no evidence at all of harmful effects. However, this does not remove a degree of uncertainty as, if there are effects, their incidence is very low and very difficult to distinguish from other factors. To obtain the sufficient resolution to detect these effects requires large-scale epidemiological studies, such as the Interphone project which meets these requirements,' explains Laurent Bontoux, expert at the Commission's Joint Research Centre (JCR). The Union is currently financing a number of research projects in this field(4), but they are relatively recent and must be continued in the long term before their results can be usefully evaluated. The results of the vast Interphone epidemiological study are the most eagerly awaited.

To complement these European research projects, the JCR is trying to create a scientific and technological reference system as a means of quantifying the radiation emitted by mobile phones and their base stations, so that scientists will at least be *speaking the same language*. 'The majority of the research participants will be getting together to define common standards with which to measure exposure to this kind of radiation,' continues Laurent Bontoux. 'This is an absolute precondition for an increasingly in-depth evaluation of health risks.'

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Some European research projects...

Interphone

This is an epidemiological study covering 13 countries and launched in 2000 by the Centre international de recherche sur le cancer (CIRC) in Lyons.* Allocated €4 million in funding and coordinated by Dr Elisabeth Cardis, this project is examining the correlation between the use of mobile phones and the appearance of tumours of the brain, auditory nerve or parotid gland (salivary gland located in the cheek). Results are due to be published in 2004.

** See RTD info n°27, September 2000*

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COST coordination

The pan-European COST initiative, which coordinates national research projects in this field, has already published two reports on the current state of knowledge of risks linked to exposure to electromagnetic fields. The overall conclusions were that there is, at present, no evidence of damaging effects on health, although they did identify new areas of research for a more rigorous risk analysis.

Last September the COST 281 Action was launched to study the effects of electromagnetic fields (EMF) linked to the new UMTS (third generation of mobile phones), Bluetooth (the infra-red communication standard for mobile phones) and WLAN (wide band network using radiofrequencies) technologies. About 50 researchers are working on this programme which covers 18 countries at an estimated cost of €75 million over five years. Its first action was to organise a conference comprising US, Japanese and Korean scientific bodies, last October.

'As the technology is evolving very quickly, it is essential to have a good understanding of the interaction of biophysical and biological mechanisms with electromagnetic fields so as not to have to start from zero with each technological innovation,' explains Peter Wintlev-Jensen who supervises this research at the Information Society DG. 'Also, the effects this research is studying are so difficult to evaluate that extensive studies based on a large statistical base are essential to reaching any credible conclusions.'

In addition to this new initiative, COST also serves as a discussion forum for researchers, industry and the public authorities, and is setting up working groups to look at more specific questions, such as effects of exposure on children.

cost.cordis.lu/src/action_detail.cfm?action=281

(4) Under the 'Environment and health' key action.

Better safe than sorry

Each country is responsible for setting its own permissible levels of exposure to electromagnetic fields. Most of these national standards take their lead from the WHO recommendations.

WHO/ICNIRP standards

	European power frequency		Mobile phone base station		Microwave frequency
	Electric field (V/m)	*Magnetic field (μT)*	*Power density (W/m²)*	*Power density (W/m²)*	*Power density (W/m²)*
Frequency	50 Hz	50 Hz	900 MHz	1.8 GHz	2.45 GHz
Public exposure limits	5 000	100	4,5	9	10
Occupational exposure limits	10 000	500	22,5	45	Not attributed

Five examples of standards recommended by the WHO, based on scientific evaluations by the International Commission on Non-Ionising Radiation Protection (ICNIRP).

The WHO estimates are based on the scientific evaluations carried out by the International Commission on Non-Ionising Radiation Protection (ICNIRP). In 1996, following fears linked in particular to the growing use of mobile phones, the two organisations decided to launch a major research programme known as the International EMF Project. The aim was to take stock of the current state of knowledge and data collected in this complex field by the many scientific agencies and institutions worldwide.

Five examples of recommended standards were subsequently drawn up (see table). These give limits for the general public and for occupational exposure (for which the permissible levels can be higher). These thresholds are based on the principle of prudence. Exceeding them, certainly if only temporarily, does not mean there will be an inevitable damage to health but rather that one is entering an area which could possibly present certain risks.

GSM and SAR

For emissions linked to the specific case of mobile telephone use, the ICNIRP has defined a complex standard known as the Specific Absorption Rate (SAR), which indicates the risk of heating to which the upper part of the body is exposed. Depending on wave frequency and the composition of the materials the waves cross, telephone power and operating mode and the position of the base station, the SAR should not exceed 2 watts per kilo on average for the head and trunk.

A 1999 EU Council recommendation adopted this standard as a basis in seeking to limit exposure of the population to electromagnetic fields within the 0 GHz to 300 GHz range.(1) Last October, the Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) considered that given the present state of knowledge there was no justification for revising present exposure limits.(2) According to this opinion, 'subjective symptoms affecting some individuals possibly exist, but not enough information is available on the levels of exposure producing such effect or the features underlying individual susceptibility'. The Committee did not, however, give an opinion on any link between exposure to electromagnetic fields and cases of leukaemia in children.

Reference site

www.who.int/peh-emf/EMFversions.htm

(1) In the interests of prudence, some Member States have adopted lower values than those recommended by the WHO for the exposure of their populations to base stations.
(2) This opinion can be consulted at europa.eu.int/comm/food/fs/sc/sct/out128_en.pdf

Perform-A

This project, co-financed by the Union and industry, is studying the carcinogenic effects of radiofrequencies on animals. Rats and mice are being exposed to GSM 900 and 1800 MHz signals in the laboratories of the Swiss Federal Institute of Technology in Zurich (Switzerland) and at the Fraunhofer ITA (Institute of Toxicology and Aerosol Research) in Germany. Meanwhile, laboratories in Vienna and Turin are trying to reproduce and confirm previous experiments - notably by Dr Rapacholi who, in 1997, showed an increase in lymphoma incidence in a line of hypersensitive mice exposed to GSM waves for 18 months.
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Reflex

In vitro experiments are being conducted at 11 European laboratories to demonstrate the action of microwaves on cellular processes - in particular, genotoxic effects, cellular differentiation, gene expressions - or the immune system.
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Ramp 2001

Research on the non-thermic biological effects of microwaves on nerve cells, for both GSM mobiles and the future third generation of mobile phones.
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Guard

Study of the effects of mobile phones on hearing and the associated cognitive functions in animals and man.
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15
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Technology without borders

It is not always easy for high-tech SMEs to gain a foothold in foreign markets or to find partners outside their own country. To help them to make a success of international cooperation, the Innovation Relay Centres (IRCs) offer a network of experts active throughout Europe.

The Berlin printer Oktoberdruck AG wanted to digitise its production line. Thanks to an 'exploratory grant' from the Esprit programme it managed to locate a small Greek software firm, Zenon SA (a partner in the European D-Print project), which had developed an integrated digital printing concept and was seeking to distribute it on the European market.

The two firms signed a technology transfer agreement which was perfectly suited to Oktoberdruck's needs. In 1999, it invested €500 000 in its pre-press department. Since then it has invested nearly €3 million in new machines and a company-wide integration of the computer network, thereby successfully managing the changeover process.

Finding one another

There are many similar opportunities for European partnerships, but few ever see the light of day. This is quite simply because the potential partners never meet, or if they do they fail to conclude what is often a very complex technological cooperation agreement.

The network of Innovation Relay Centres (IRCs), supported by the Union's Fifth Framework Programme, aims to increase the prospects of success for such partnerships. With about 1 000 technology experts at 250 European offices in the Union and candidate countries, it provides effective logistical support for technology transfers between SMEs on a scale which is rarely seen anywhere else in the world.

Each IRC is deeply rooted in the local industrial fabric and research networks while at the same time connected up, via intranet, to a trans-European network with extensive databanks at its disposal. Working closely together with their clients, the IRC experts draw up details of technology demand and supply and circulate them throughout the network.

Rapid response

Potential contacts are often identified very quickly. After that the future partners can communicate directly. Their respective IRCs remain on hand if their services are needed, such as to provide a technical, economic – for example, to raise finance – or legal evaluation.

Oktoberdruck's first contact was with the Berlin Chamber of Commerce which directed it to the IRC for northern Germany which was itself in contact with a Greek IRC which knew Zenon. 'We assisted the two firms during their first meetings and in negotiating their contract,' explains Eckhard Behrendt, adviser at the German IRC. His Greek colleague provided similar assistance to his client, especially on matters of intellectual property.

Downstream of European programmes

'Special interest groups' comprising several IRCs focusing on technological specialities (aerospace, nano- and microtechnologies, new materials, biotechnologies, etc.) are a second strategic aspect of the IRC network. They provide a link between the 'Innovation cells' which, within European programmes, are responsible for promoting the exploitation of the results achieved by Union-backed research.

For the Hanover Biotechnica Fair (DE) in October 2001, for example, the network set up the CellExploit project in partnership with the 'innovation cell' of the Cell Factory key action (Quality of Life Programme). Detailed prospecting by the Biotechnology Special Interest Group resulted in the production of a very practical multimedia catalogue of technological opportunities. ◗

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