RTD info

Magazine on European Research

European Commission

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Inside the Seventh Framework Programme

Its past, progress and key players, and how it is viewed by its partners

SEVENTH FRAMEWORK PROGRAMME

Editorial

Today is the future!

The 50th anniversary of the Treaty of Rome, on 25 March this year, was an opportunity to remind people that Community research is also celebrating its half-century, and to measure the extent of progress made since the initial research devoted to coal and steel (ECSC treaty) and nuclear energy (Euratom treaty).

To state this more clearly: the 7th Framework Programme, which has been operational since 22 December 2006, is the most ambitious research programme in the world. Thanks to its structure and implementation, it provides innovation on many levels. Schemes like Marie Curie, ERA-NET and the European Research Council have been successfully carried out. The contribution made by the programme to the improvement of quality of life and economic growth is documented in its official records, which form an invaluable asset. The large increase in its budget, almost doubled, in terms of 'cruising speed' and on an annual basis, with regard to the previous programme, is, moreover, a strong political gesture in favour of research and its importance both today and in the future.

That is not all: the Commission has just provided fresh momentum to the creation of a campaign for the European Research Area. This is an important step towards the realisation of a genuine European policy, or possibly the start, (further to the need for an increase in Europeanisation), of a common research policy. History is being written today.

RTD info – Special FP7

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Inside the 7th Framework Programme

Numerous websites, conferences and publications have already been devoted to the 7th Framework Programme. How to participate, how it is structured and what new features it contains, are all questions broadly explained on CORDIS and EUROPA websites.

We therefore thought it would be of interest to offer *RTD info* readers a different, more human and more personalised approach by allowing the protagonists in European research, who have an opinion thanks to their various roles, to have their say.

In this edition, a series of 'internal' and 'external' interviews cover a variety of diverse topics, such as the history of research supported by the European Union, the objectives of the European Research Council, and the total integration of the international dimension within the 7th Framework Programme.

Analyses of Chinese, Japanese and Russian partners, firm proposals from the American essayist Jeremy Rifkin, a review of a new work on the European research policy, and several statements from project participants form the basis of this edition.

Building the ERA of knowledge and growth

Janez Potočnik, European Commissioner for Science and Research

European research is moving ahead with the Seventh Research Framework Programme (FP7). This linchpin of the European Research Area is the result of the research, academic and business communities working with the European institutions to produce a programme that responds to the EU's policy objectives to foster a competitive and sustainable Europe. It is a privilege to be responsible for this state-of-the-art research programme, but challenges do not stop here. The next step is to launch a debate on how we can realise an open, strong and dynamic European Research Area.

FP7 will continue with actions that have been successful in past programmes such as Marie Curie exchanges, fellowships and placements. We will be able to make research more easily available to small and medium-sized companies. Such companies often do not have the resources to invest in research, but they do have the capacity for innovation and this is essential for their growth and survival.

A 'Champions League' of European research

Besides this continuity, there are also some exciting new elements in FP7. One of these is the creation of the European Research Council (ERC). This is the first time that the EU has a dedicated mechanism to fund great ideas coming directly from its 'brightest' and best researchers. I like to think of it as a 'Champions League' of European research. Never before has there been a research funding mechanism at European level that does not require a consortium of partners from different countries, and does not have thematic priorities identified in advance. The ERC will select the most promising and interesting ideas, and decisions on what those are will be taken autonomously by the scientific community.

The European Technology Platforms, uniting researchers, industry and other stakeholders around a common vision and research agenda, will continue their important work and influence the priorities of FP7. The Joint Technology Initiatives will take the work of some Technology Platforms a step further, by creating a new type of public-private partnership.

We also support, for the first time, the development of truly European research infrastructures, to be available to all our scientists. By doing so, we will help to ensure that access to the necessary facilities is not an accident of geography.

Not an end in itself

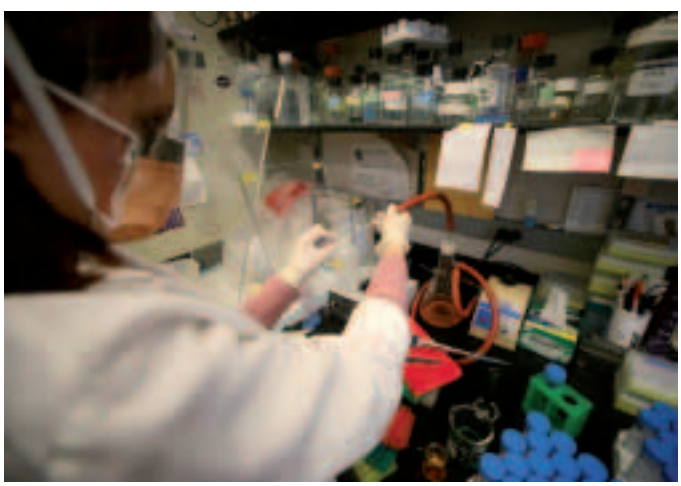
Creating the Research Framework Programme is certainly an achievement, but it is not an end in itself. The real work starts now, with researchers, scientists and companies investing in research and innovation. Research should be at the centre of our thinking about how to secure our long term economic, social and environmental future.

Knowledge and innovation for growth underpins all components of the Lisbon Strategy. Today's economy and citizens' wellbeing rely on the progress of knowledge and its transformation into new products, processes and services. But to be able to compete through knowledge, we need to keep research at the top of the political agenda.

We sometimes forget that knowledge is Europe's greatest resource. Europe does not have rich natural resources. We cannot compete with low wages, we are committed to a society with social security to protect the vulnerable and we care about the environmental legacy we leave for future generations. So our only real option is to make the best possible use of our well-educated people, our top-class facilities and our ability to turn knowledge into innovative services and products.

Investing to create and preserve jobs

Research helped us to get where we are now, and it will help us move further forward, but only if we embrace it. That is why FP7 is important, although it is not enough on its own. There is an urgent need for Europe



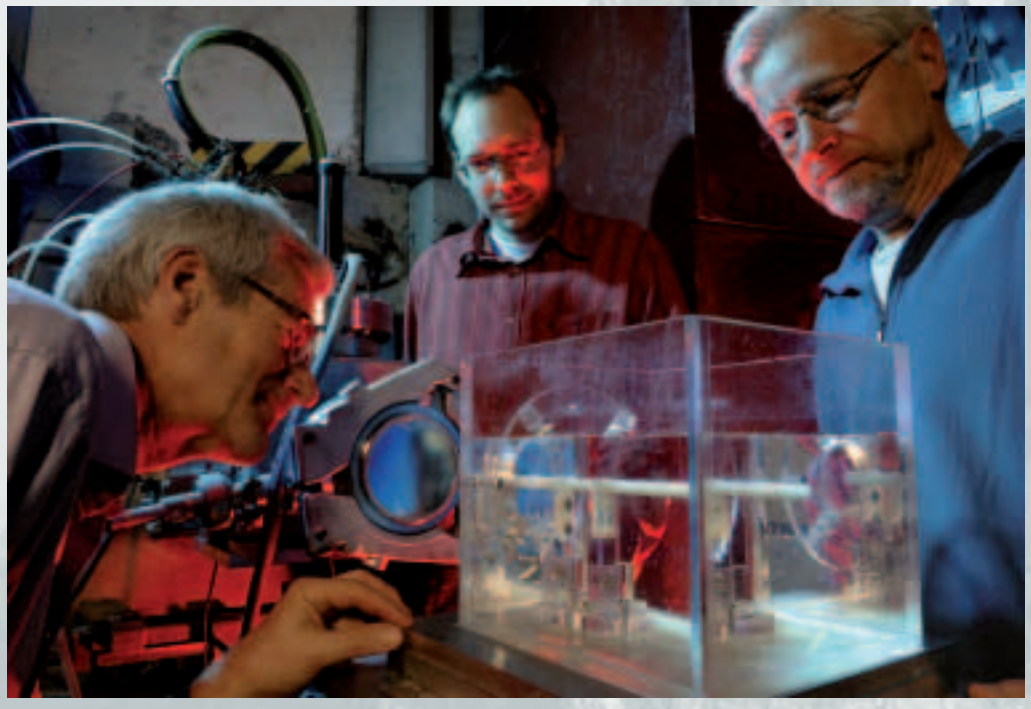
Janez Potočnik visiting the Institute for Transuranium Elements (ITU), Karlsruhe (DE).

to invest far more in education, research and innovation. This is not just a nice, modern idea. It is essential to create and preserve jobs.
Knowledge is an area where Europe can really make a difference. But, in building awareness of Europe's potential, it is essential that we act as one. By getting people, facilities and knowledge together, from across the EU and beyond, I want to create a true single market for scientists, a European Research Area.

No time to lose

The idea of a European Research Area (ERA) came about in 2000, the same year as the Lisbon Strategy. After seven years, now is the time to take stock of where we are. With increasingly global challenges to tackle, with a size and scope that leaves us no other choice but to join forces, we have no time to lose. We must avoid fragmentation and make it easier for researchers to coordinate their activities. For that reason, the main orientation of ERA should be issues such as infrastructures, researchers' mobility, joint national and European programming of research in areas such as energy or health and of course international and multi-disciplinary cooperation.
By creating an ERA, we can provide infrastructures that would be out of the reach of most national budgets and we can provide exchange programmes which bring researchers from all over the world to work together. But most of all we can do together what we cannot do alone. It is not only a debate about money I want to start, it is also a debate about how far we dare to go to create a true knowledge-based society. I want to see if we are ready to create a 'United States of Research' based in Europe. And here I do not mean 'states' just in the sense of countries or nation states or Member States. I mean states as in states of development, states of cooperation, states of innovation – in short, states of the future, united and working together.

"We must avoid fragmentation and make it easier for researchers to coordinate their activities." © CERN



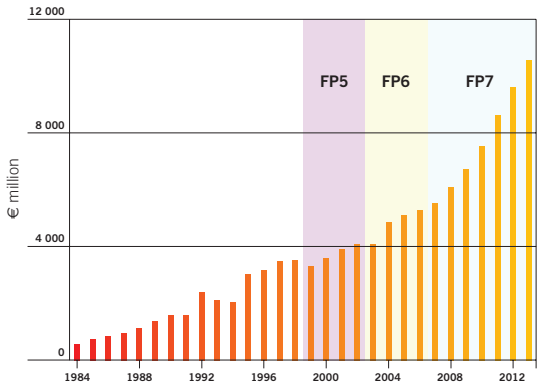
A 2020 vision of ERA

In the coming weeks, the Commission will publish a Green Paper which provokes debate about the 2020 vision of ERA and the main directions for the future. Thereafter, we will take the time to involve all those involved in the issues – scientists, policy makers, the business community and universities. The idea will be to bring forward concrete proposals to strengthen the European Research Area in 2008. Seven years on, awareness of the contribution of research to our development and well-being is even greater. I trust that the European research community will contribute actively to this debate. Together we can bring about some real changes in the European research landscape.

A new framework

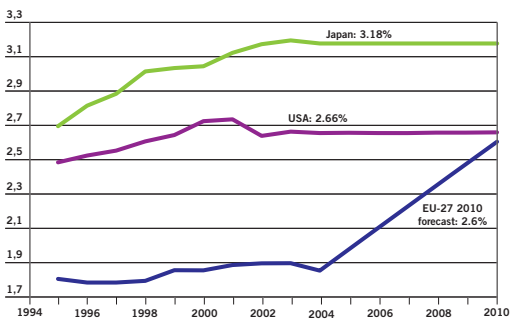
With a modified structure and simplified participation procedures, the Seventh Framework Programme (2007-2013) marks a change and brings a new dimension to European research. With a greatly increased budget (€ 2.7 million), and with a portion devoted to pure and exploratory research, the Seventh Framework Programme (FP7) occupies a unique place in European research and on the global stage. A quick appraisal follows.

1. Framework programme budget (1984-2013)



NB: Budgets in current prices. Sources: Annual Report 2003, plus FP7 revised proposal.

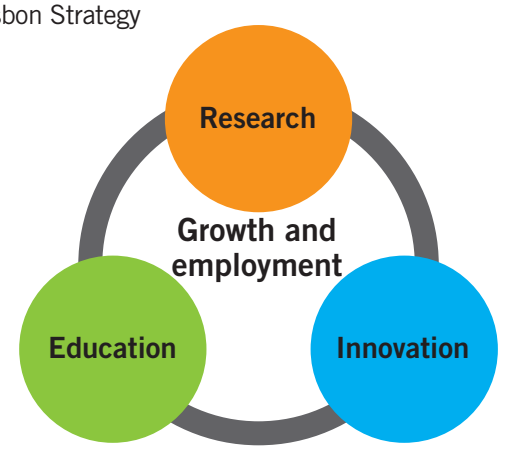
2. Filling the gap
(total expenditure on R&D as % of GDP, 2003)



Data: Eurostat OECD, Source: DG Research, European Commission

The Barcelona objectives aim to bring investment of 3% of GDP into R&D activities. (EU-27 extrapolation based on R&D intensity targets put forward by Member States in their respective National Reform Programmes)

3. Lisbon Strategy



Science & Technology contribute to the Lisbon objectives: economic growth, job creation, protection of the environment, social challenges, combating poverty, improvement of human health and quality of life (GSM, distance working, etc.)

Treble the investment

If you observe the history of framework programme budgets, you will notice that the budget for the FP7 is not only three times higher than that for the last framework programme, but also provides for a constant increase in financing, which will rise to €10.5 billion in 2013 *(see Graph 1)*. Too high for some, not enough for others, the budget has been the subject of debate amongst European political decision-makers but it is still higher than many expected.

In addition, the Seventh Framework Programme follows on directly from the Lisbon Strategy adopted in 2000 which was aimed at boosting growth and employment by means of three major pillars: economic competitiveness, social integration and environmental protection. Faced with somewhat stagnant growth and insufficient creation of employment, the assessment of this strategy remains mixed. Besides which, its objectives have often remained vague for numerous professionals, academics and company directors.
To relaunch the Lisbon Strategy, the Union took new measures in March 2002, within the scope of the Barcelona objectives. The idea is to back its greatest assets – innovation and cutting-edge technology – and to increase investment in R&D activities to 3% of GDP by 2010. If you consider the figures for 2003 *(see Graph 2)*, you will note that, at that time, the budget for R&D represented 1.93% of the GDP in the EU against 2.59% in the United States of America and 3.15% in Japan (even if some Member States, such as Finland and Sweden, are above the Barcelona objective).

New structure, different approach

To be more capable of taking up this challenge, the Seventh Framework Programme has a new structure, becoming both bigger and more integrated. It is based on four specific major programmes: 'Cooperation', 'People', 'Ideas' and 'Capacities', and a fifth, 'Euratom', on nuclear research.
Whereas the Sixth Framework Programme was aimed at reinforcing the technological basis of industry by contributing to the formation of the European Research Area (ERA), the 7th is heavily focused on the major research subjects, particularly within the 'Cooperation' section. The programme is, therefore, more flexible and able to meet the requirements of industry. Across new areas of knowledge there are also various partners within the same area who will be able to develop their research potential.

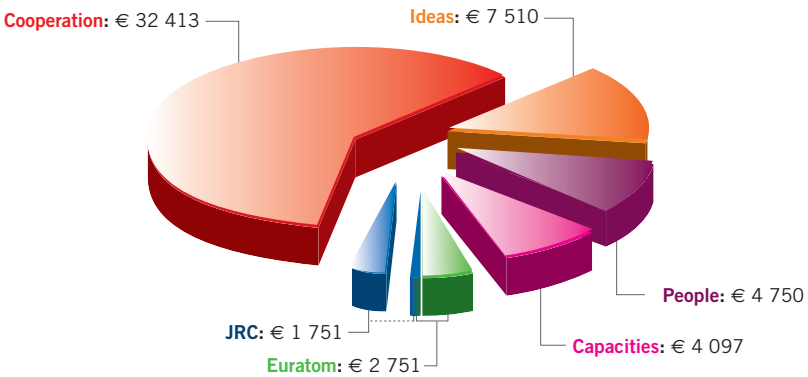
for European research

With regard to financing, the Seventh Framework Programme prioritises the 'Cooperation' programme, which is divided into ten main themes *(see below)*. If Europe wants to catch up with its competitors, it has to become an attractive global centre for research and innovation and has to provide its researchers with challenges of an international scale in order to better encourage them to excel in their planned careers. They can now contact a helpdesk for answers to their questions.

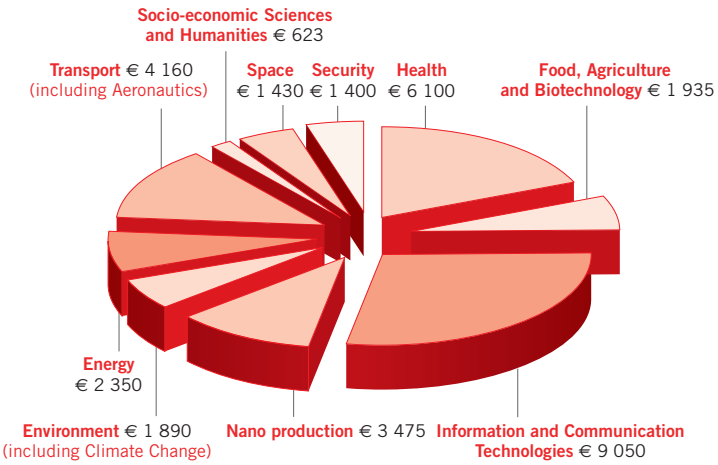
In addition to these structural changes, it is necessary to emphasise the appearance of two new elements aimed at simplifying everything to do with the support and financing of the projects.
Following from suggestions by the researchers, a specific 'Ideas' programme is entirely dedicated to frontier research considered an important driver for growth. A new structure, the European Research Council (ERC) has been created under the responsibility of the Commission. The ERC represents the first pan-European agency for the financing of research and supports the most ambitious and innovative fundamental research projects. Another innovation is the Joint Technology Initiatives (JTI) mainly concerned with areas of research which require considerable investments to ensure long-term success *(see next page)*. The JTIs rationalise the procedures for participation and financing by combining private investment with public financing.

Moreover, for the sake of providing continuity with the Sixth Framework Programme, the Seventh Framework Programme reinforces activities which have proven to be successful. This is the case with the ERA-NET system, which is aimed at bringing together European, national and regional research programmes and Marie Curie initiatives which are aimed at forming international networks and increasing researcher mobility.

The breakdown of FP7
(€ million)



The Cooperation Programme breakdown
(€ million)



Added value for researchers and SMEs

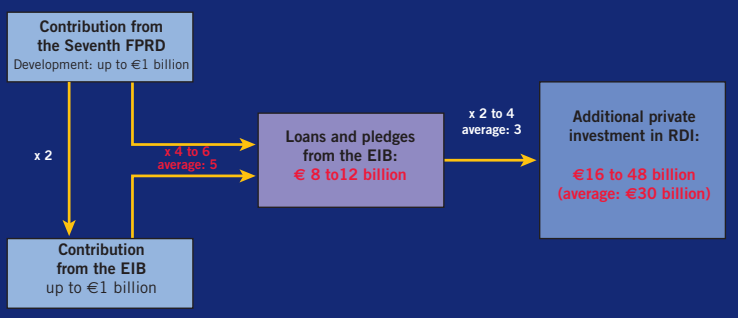
To deal with the concerns of numerous researchers (in a way victims of their success), who had participated in previous framework programmes, the Commission carried out some fundamental work to simplify the participation procedures. From now on, the application procedures will be simplified and preliminary checks will be reduced. The researchers will have greater flexibility, particularly during health crises (bird flu, infectious diseases, etc.).
More autonomy, not only for researchers but also for SMEs which are called on to become more involved in R&D. Representing 99% of the European industrial fabric and creating 80% of jobs in certain sectors, such as textiles, SMEs are an essential part of the European economy. Within the context of the Seventh Framework Programme, they can profit from research projects and allocate 15% of the annual budget to R&D as well as higher rates of finance rising to 75%. In addition, of the ten specific themes in the 'Cooperation' programme, emphasis is placed on information and communication technologies (ICT) which, with increased use, promise amongst other things faster product development, a reduction in costs and overheads and more reliable and effective dealings with customers and suppliers.

A higher budget for the better integration of researchers and industrialists in the major challenges facing the Union; this is what is proposed by the Seventh Framework Programme. In 2009, an initial report will be drawn up to evaluate the objectives to be adjusted or pursued.

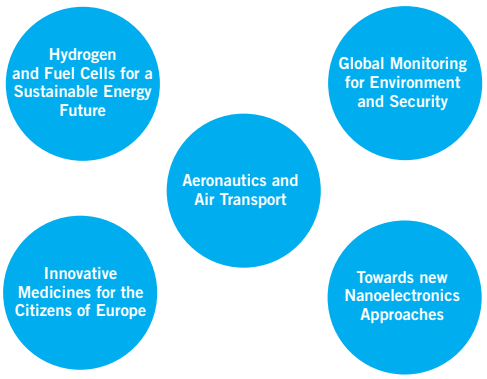
Research facilities: How do you obtain 30 billion from just one?

On the basis of an ingenious finance system, the Seventh Framework Programme plans to generate an additional €30 billion within 5 years through the leverage of research facilities (RSFF, Risk Sharing Finance Facility). The RSFF is a new financial tool proposed by the European Investment Bank (EIB) and the Commission to encourage the banking sector to take more risks in financing technological enterprises. A total of €1 billion is provided by the Community budget (provisioning) to which €1 billion is added by the EIB, i.e. a total amount of €2 billion per year, allowing a volume of €10 billion in loans over 5 years. Since the EIB finances an average of 1/3 of the total cost of the project, an additional €20 billion will be provided by private finance. Therefore, in total, this will make €30 billion which should be mobilised for R&D.

Simplified diagram of leverage effects



Joint Technology Initiatives



How do you receive information about and participate in the Seventh Framework Programme?

Enquiry Service
http://ec.europa.eu/research/index.cfm?pg=enquiries

The FP7 Enquiries Service represents both an innovation and a simplification: just one contact point with rapid follow-up and professional monitoring of the questions received and the responses given.

CORDIS "Find a call"
http://cordis.europa.eu/fp7/dc/index.cfm

For more information

http://ec.europa.eu/research/fp7/
http://cordis.europa.eu/fp7/

The Seventh Framework Programme in the history of European research

The Seventh Framework Programme didn't just fall from the sky. It is another chapter in the long history of the European research policy. Conceived at the same time as the European project, this policy has developed considerably over the last thirty years. A product of its history, the Seventh Framework Programme is also characterised by the introduction of certain new developments, which show which direction it may evolve towards in the future. In the history of the European research policy, a small number of ideas have played a key role. It has often taken years for these ideas to be finalised, and for them to produce results. Michel André, an adviser in the European Commission's Directorate-General for Research, tells the story.

The adviser in the European Commission's Directorate-General for Research, Michel André, has been closely associated with all European Union research policy developments over the last twenty years. Committed to reflecting on this policy, he is also very interested in its history.
© European Commission

How long has the European research policy been in existence, how did it come about and how has it developed?

The European Union's research policy is as old as the European Union itself; as old, more precisely, as the European project, as the initial elements appeared with the creation of what was known at the time as the 'European Community', at the end of the 1950s. Both the European Coal and Steel Community (ECSC) and 'Euratom' treaties - in the fields of coal and steel, and nuclear energy respectively - aimed at building Europe, the former to avoid a return to the wars of the past and the latter to safeguard the future; both included provisions for research.

The third treaty, setting up the European Economic Community (the EEC or 'Common Market'), did not include anything like this. However, one of its general articles allowed for the launch, during the 1960s and 1970s, of a certain number of research programmes in areas considered priorities at the time, like energy, the environment and biotechnology, etc.

When and why did the framework research programme come about?

The Framework Programme came about at the start of the 1980s, with a view to putting a little order into an increasing profusion of activities by placing them, as the name suggests, in a single 'framework'. This was done while putting in place, as the name also suggests, a medium-term 'programme', with a budget covering several years, rather than just one. This was a 'French style' approach to planning, which will not come as any surprise: in the Directorate-General for Research, as in the Commission as a whole at the time, the French played an important role. The Research Commissioner at the time, Etienne Davignon, 'converted' this concept into a policy plan, together with a number of other ideas, such as that of the first grant programme for researchers, or the first major European programme in IT technology, ESPRIT.

How, and in what direction, has the Framework Programme evolved?

It has evolved in three main ways: a continuous increase of the budget, from several hundred million euros up to €7 billion per annum in the Seventh Framework Programme; an extension of the Union's activities in new scientific and technological fields; and the diversification of mechanisms, types of financial support and intervention methods with the regular introduction of new formulas resulting in the present-day portfolio which covers both projects and transnational networks for collaboration in research, individual grants, specific measures for small and medium-sized enterprises (SMEs), support schemes for cooperation and coordination at various levels as well as studies and conferences.

Have there been any historic moments in its past, any developments that are especially important?

We generally refer to two, both of which are associated with institutional aspects and the decision-making process. This is not completely unexpected, bearing in mind the importance of these matters in European affairs.

The first moment was when the research policy appeared in the treaty with the inclusion of a specific chapter on this subject, in the Single European Act of 1987. This chapter merely put together a certain number of provisions that already existed, without really rationalising them, while giving a legal status to existing practices. In a new treaty, there would certainly be much simpler and more logical ways of achieving the objectives. However, from a political and institutional point of view, this was a fundamental development.

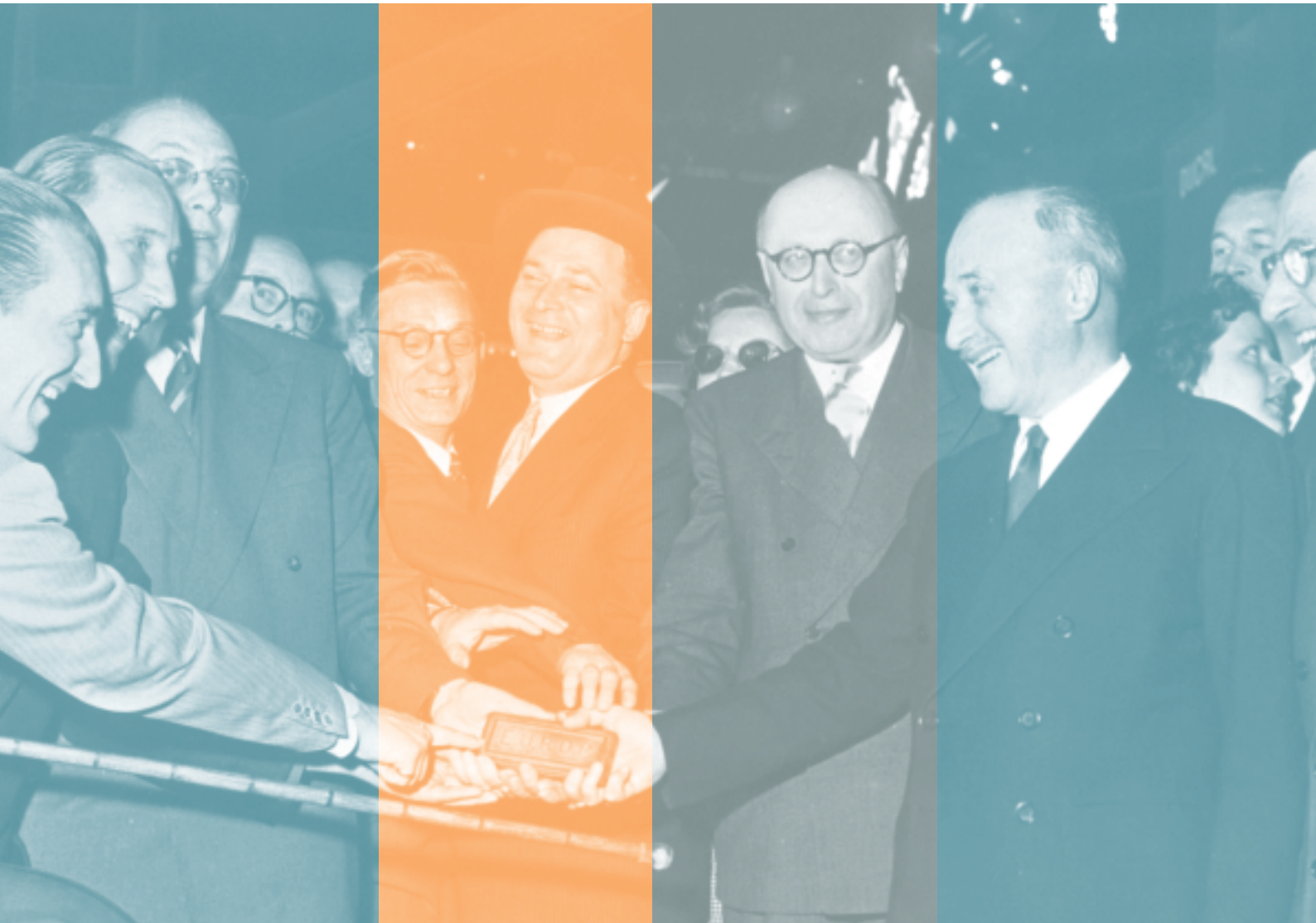
Less spectacular, but at least as important, was the decision in the Amsterdam Treaty (1997) to adopt the Framework Programme at the Council of Ministers by a qualified majority vote (the Framework Programme is adopted in "co-decision" by the Council and the European Parliament). Up until then, they had been 'trapped' by the constraints relating to unanimous decisions, which allowed a single Member State to veto the whole decision. Adopting a decision by a qualified majority limits the tendency to reach agreement on the basis of the greatest common denominator, which was getting smaller as the number of member countries grew and their diversity increased.

What impact has the Framework Programme had in the past, and what impact does it have at the present time, with regard to research in Europe?

A much more important impact than is generally acknowledged, especially in terms of finance. It has often been stated that the European Union's Framework Programme only covers a very limited part of the funding for research in Europe. The First Framework Programme represented a tiny fraction of the total public funding for research in Europe at that time, and the Seventh only accounts for 5% of this total in Europe today.

But we should not be thinking strictly in accounting terms. If we consider 'free' funds, that is to say, the funding used not for payment of the basic salaries of researchers or the construction and functioning of laboratories, but for research projects, the proportion is very different. In a country like France, European financing accounts for half of the 'incentive' credits, while many research departments at British universities are heavily dependent on funding from the Union in order to function. In countries like Spain, Portugal or Greece (not to mention the ten new Member States in Eastern Europe), the Framework Programme plays a role that

1957. Opening of the common market for steel. On the right, Jean Monnet displays the first ingot of European steel.



is just as important as national funding, in terms of global funding for research.

What are the consequences of this?

You cannot put such large amounts of money on the table without producing results. Between the national programmes and the Framework Programme there is a 'two-way mirror' effect. To a certain degree, the research priorities of the Framework Programme reflect the priorities of the Member States. But the reverse is also true: often, it is in terms of the priorities defined at European level that the Member States determine their own. Of course, taken as a whole, research activities and policies in Europe could be, and should be, better coordinated. Simply due to the fact that it exists and that it has a funding capacity, the Framework Programme does, however, exert a de facto coordination effect that should not be underestimated.

Similarly, it is difficult to deny its impact in terms of bringing the least advanced countries up to date in this field. If Spain and Portugal, for example, have made such spectacular progress with regard to research, it is thanks to the intelligent use to which these countries have put European funding: structural funding, but also funding from the Framework Programme. The same should apply to the twelve new Member States.

Since the Treaty of Amsterdam (1997), the Framework Programme has been adopted by the Council of Ministers on the basis of a qualified majority vote. This "limits the tendency to reach agreement on the basis of the largest common denominator, which is getting smaller, as the number of member countries grows and their diversity increases".
© European Commission

Considered from a historical point of view, what does the Seventh Framework Programme look like?

In many respects, the Seventh Framework Programme is a direct extension of its predecessors and represents a continuation of their activities. With this Framework Programme there are, however, two new developments, which have major implications for the European research policy. The first is as follows: for a long time now, in the name of the principle of 'subsidiarity' (meaning that, at European level, only the things that cannot be done at a lower level are undertaken), the Framework Programme has basically supported research projects and networks involving transnational collaboration. The core of the Seventh Framework Programme will still be the provision of support for these kinds of projects and networks. According to another principle that has been strictly respected up until now, this support will be provided for research on predetermined topics and subjects in applied, finalised or directed research fields, corresponding to the Union's major policies in the fields of health, energy, the environment, etc.

With the creation of the European Research Council (ERC), the Union will, for the first time, also be supporting fundamental research projects carried out by individual teams, which are proposed by researchers on subjects of their choice, covering the whole field of knowledge, including the social sciences and humanities. This is a very significant development, because it implies a broader and more flexible appreciation of 'European added value' than that which existed before. It also implies the abandonment, if not of the 'subsidiarity' criterion as such, then at least of a narrow, rigid and formal interpretation of this criterion; the ERC, in effect, does the same work as national research councils, but at a European level.

Etienne Davignon, the Research Commissioner who, at the start of the 1980s, moved the concept of the Framework Programme into the political arena.
© European Commission

And what is the second new development?

That is the introduction of other methods of implementation, apart from the direct management of funding and projects by the Commission's services. The ERC will be made up of an independent scientific council and an executive agency of the Commission acting under the Commission's control, but operationally autonomous from it. Joint Technological Initiatives (JTIs) will be implemented by *sui generis* structures that bring the Commission and the private sector together, and support activities for SMEs, Marie Curie mobility grants and certain logistical and administrative aspects will become the responsibility of a second executive agency. This evolution can be explained both by the increase in funding for the Framework Programme, without a corresponding increase in the Commission's manpower, and willingness on the part of the Commission to concentrate on political and legislative tasks.

How could the European research policy evolve in the future?

One could quite reasonably assume that the trends I have just mentioned will continue. Many elements are pushing us in the direction of a European research policy that has ever increasing funding, is more diversified, covers all aspects of research and is implemented under the control of the Commission, but not directly by the Commission.

Such an evolution affords a wealth of promises, but it is not going to be without risks and dangers. By venturing beyond the field where the European research policy has been tried and tested, we are gambling on the fact that the same will apply to other fields and aspects. The evolution towards forms of implementation

other than direct management by the Commission represents a challenging enterprise. We must conserve and pass on the unique wealth of knowledge and experience accumulated by the Commission over 40 years of research policy and 20 years of managing Framework Programmes. We must succeed in creating conditions guaranteeing the same level, as is the case with direct management by the Commission, on the one hand of independence and protection with regard to pressure from private interests and attempts at re-nationalisation and *juste retour*, and on the other hand of competence and professionalism.

This history also shows us that ideas do not belong to anyone

Can research become a real common European policy?

Some people think this is possible, but I don't believe it will occur. Certainly, research is not a traditional area of sovereignty, like taxes, defence and currency, or of strong national sensitivity, like employment or education. But there is nothing in the evolution of the institutional debate and in the Constitution that would lead us to think that we could go in this direction. The pressure resulting from the need and the awareness of national authorities that many research activities should be conceived and executed at European level should however lead to the gradual *de facto* 'Europeanisation' of an increasing volume of activities.

This *de facto* Europeanisation does not exclude the reinforcement of links and cohesion between what is done at European level and what is undertaken at national and regional level. Indeed, in all scenarios, even the evolution of Europe in a more 'federal' direction, these levels will remain operational. The European Research Area project therefore still retains its significance.

Where does this idea of a European Research Area come from?

It goes back a very long way. It was first suggested during the 1970s, by Commissioner Ralf Dahrendorf, then forgotten; it was 'rediscovered' (largely independently) in the 1990s, by his distant successor, Antonio Ruberti. It was however a third Commissioner, Philippe Busquin, who transformed it, at the beginning of the year 2000, into the policy project it has now become. It should be noted that all three Commissioners were academics, closely linked to the scientific community; it may be assumed that this made them more aware of the 'area' dimension for circulating and exchanging ideas. On the other side, another intellectual 'family' of Commissioners, more orientated towards the world of business (like Altiero Spinelli and Etienne Davignon) placed more emphasis on support for industrial policy and the Union's own activities.

The establishment of the European Research Area is a major political objective of the Commission. After an initial phase driven by Philippe Busquin (right), Janez Potočnik, the current Commissioner responsible for Science and Research, is relaunching the process. © European Commission.

And what exactly does it consist of?
Initially, it was thought that the European Research Area was made up of two components: on the one hand, a 'large European research market' where researchers, knowledge and technology would circulate freely; on the other, an area for the coordination of national activities, initiatives and policies. The creation of the ERC and the cautious development of a European policy for supporting infrastructures show that there is a third dimension: the European Research Area is also an area for the implementation and funding of Europe-wide initiatives.

How did the idea of a European Research Area, rejected and forgotten about on two occasions, come to be endorsed by the European Council in March 2000? This is something I have tried to explain and relate elsewhere[1]. After a much publicised start, the European Research Area project has clearly run out of steam, and the present Commissioner, Janez Potocnik, is currently attempting to re-launch it.

Have other ideas had a similar history?
Yes, there have been plenty of them. For example, the idea that provides the basis for the creation of the ERC, which is that of a 'European NSF' (the equivalent in Europe of the American National Science Foundation), has been floating around in scientific circles for a long time. That of creating a 'European MIT', which forms the basis for the EIT (European Institute of Technology) project, has been put forward on at least two occasions, during the 1960s and in the 1980s. The 'Joint Technology Initiatives' are the latest manifestation of the idea of a major sector-wide technological programme, illustrated, with certain nuances, by the Esprit programme, the 'projects of technological initiative' proposed for the Third Framework Programme (but which never saw the light of day), and the major 'Integrated Projects' of the Sixth Framework Programme.

What does the past teach us about the European research policy?
It teaches us that, with regard to research policy and many other fields, ideas are few. I have mentioned the idea of a European Research Area and certain others, but there are many more examples. For instance, I have also discovered that what is usually referred to as the 'Riesenhuber criteria', had already been defined in practically the same terms in a document submitted by Altiero Spinelli at the start of the 1970s. These criteria, named after the former German research minister with whom they are associated, justify, in the name of 'subsidiarity', an action at European level rather than at national level.

In reality, the history of the European research policy could almost be described as that of the gradual development of a small pool of ideas formulated thirty years ago, that, broadly speaking, we continue to exploit today.

Any other lessons?
This history also shows us that ideas do not belong to anyone. Of course, certain people have played a particularly important role: European Commissioners like Altiero Spinelli, of course, Ralf Dahrendorf, Etienne Davignon, Antonio Ruberti and Philippe Busquin; national research ministers, starting with Hubert Curien, who has been a key figure in the construction of European research; but also scientists, for example the Nobel Prize winners, John Kendrew and Ilya Prigogine, or senior civil servants like Paolo Fasella, a doctor and biologist, who was Director-General for Research at the European Commission for fourteen years. But all in all, the history of the European research policy is the product of a collective and complex procedure involving, apart from certain individuals, many other elements: institutional factors, political context and economic developments, the part played by the pressures and expectations of the scientific community, etc.

Last but not least, what this history teaches us is to what degree the construction process for Europe, which is very fast when observed from a distance and from the outside, proves to be slow when examined more closely and from the inside. A large number of texts written thirty or forty years ago could have been written last night. The diagnosis is the same as it is today, and the remedies recommended are identical. The fact is that situations only evolve very gradually, and ideas take a long time to be formulated, understood, assimilated and accepted, and an even longer time to be finalised and to have a discernible effect on the real world.

'We must conserve and pass on the unique wealth of knowledge and experience accumulated by the Commission over 40 years of research policy'

Michel André,
Adviser in the European Commission's Directorate-General for Research.

(1) "L'Espace européen de la recherche: histoire d'une idée", Revue d'histoire de l'intégration européenne, 2006, Volume 12, Edition 2

European Research Council

Scientific excellence only

Scientific excellence and cutting-edge investigation will inspire the work of the European Research Council (ERC), the body billed as the first pan-European funding agency for frontier research. That is the message from Ernst-Ludwig Winnacker, the man who will be the ERC's Secretary General until June 2009.

Ernst-Ludwig Winnacker, Secretary General of the European Research Council. © DGF

The ERC is a brand new feature of the EU's Seventh Research Framework Programme (FP7), stewarding the 'Ideas' part of FP7 with a budget of 7.5 billion euros for 2007-2013. Winnacker, the German molecular biologist and Professor of Biochemistry at the University of Munich, speaks in his new Brussels office about the ERC's plans to make a big name for itself in the research world – by funding outstanding younger and more experienced researchers from potentially any field in the A to Z of scientific disciplines.

What is the rationale behind the 'Ideas' part of FP7?

The rationale is to fund frontier research, investigator-driven research identifying people and projects in any field of science one can think of, including engineering, humanities, everything. The hope is that, through serendipity and hard work, results are achieved that can eventually flow into the innovation process. Scientific excellence – that's the criterion.

The only other condition is that you have to work in Europe. If you are in Tallinn, and can convince the peer reviewers that this is the place to be for your work, then that is fine. Or you could move to somewhere else in Europe if the project so requires. You could also be a Chinese scientist in Shanghai who wants to work in Europe. If this person presents their case well enough, basically it can be done. And there are lots of European researchers working in the US – some could be encouraged by the scheme to come back.

So the conditions are to work in Europe and to be good. Anybody who feels courageous enough to say "yes, I am the best, I would win here" should apply.

The prospective grantees decide whether they send in an application, and they have to convince the review panels that they are good and that the host institution is the place to do the proposed research. There is no political reason why you have to do it in a particular place. You have to convince the panels that you and the host institution together are the best thing that can happen.

We have set up 20 peer review panels to study project applications covering the whole spectrum of science from A for archaeology to Z for zoology.

What is the ERC's launch strategy?

We want to competitively fund frontier research and to this end envisage two funding streams/instruments. The first provides for ERC 'Starting Grants' to permit early independence for young scientists between two and nine years after their PhD. A first call for proposals has already been announced with a deadline for applications of April 25. Starting Grants will be anything up to € 400 000 for whatever the researchers need - their salary, their supplies, everything, so that they will be totally independent.

The second funding stream relates to ERC 'Advanced Grants' for more established investigators in the later stages of their profession, where a call for proposals will be announced in spring or summer 2007.

How independent will ERC be?

ERC is a separate executive agency and scientifically it is completely autonomous. The distribution of grants by EU Member State or host institutions is not pre-determined in any way. If all the money happens to go to Britain – that is fine, nobody cares – as long as the condition is scientific excellence.

Moreover, the number of people on the ERC's Scientific Council – 22 – is significant, because it is not 25 or 27 which would indicate to some people that each EU Member State has a seat. In fact, some countries have more than one seat, and some countries have no seat at all. The members are all highly distinguished scientists. This is typical for the entire organisation – the sole basis is scientific excellence.

How can you be sure of attracting the best research talent in Europe?

The reason is that we offer a programme that is simple, best-practice and not bureaucratic. In the rest of the FP there are many niches where

Frontier Research

"The term 'frontier research' reflects a new understanding of basic research. On the one hand it denotes that basic research in science and technology is of critical importance to economic and social welfare, and on the other that research at and beyond the frontiers of understanding is an intrinsically risky venture, progressing on new and most exciting research areas, and is characterised by an absence of disciplinary boundaries" – ERC

you can do investigator-driven research, but it's not explicitly said and it's probably more bureaucratically organised, and we try to be as un-bureaucratic as possible.

Of course we have to establish a reputation and that takes a while. The US National Science Foundation is more than 50 years old, the German Research Foundation is 87 years old, and we are just a few weeks old. We hope to establish ourselves rapidly, because we can foster support from the scientific community in Europe and across the world and because we – the panels and so on - use mechanisms that have been optimised worldwide.

Will it be controversial if the ERC is seen to be competing with national research councils?

Hopefully it does [compete]! That's what we wanted all along, that's what everybody wanted - excellence through competition. So there is no controversy. It's always controversial in some senses to set up something new, because people have to understand it and people may be afraid of the change. But as far as the ERC is concerned, everybody is happy that something new happens.

It is also clear that the innovation process requires input from many places and it is a cyclical process that has to be fed with new ideas from creative people before this knowledge is then transformed into jobs. This innovation cycle has to be fed at all stages and we are filling one of those spots.

And what sort of European 'added-value' will the ERC bring?

The ERC will spend around €1 billion per year on average. The national councils spend some €22 billion. But the national funding agencies are limited in their activities. Even though they have 20 times more money, they do not always use international peer review.

Then there is the problem of fragmentation and duplication. It has been possible to some extent to send British money to Germany or German money to Sweden, for example, but it is very difficult. It has also been the case that some of the councils are so small they cannot fund their individual researchers appropriately. So there are always limitations to what you can do on a national level, limitations which do not apply here at European level.

What will be the ERC's international strategy?

We will try to maintain the closest possible contact with the national councils in Europe and the rest of the world because we want to exchange, we want to learn and listen - learn about best practice, new instruments, new funding streams. That is the international strategy. It is only science which counts, there is no political agenda.

What would you like the ERC to have achieved by the end of your term as Secretary General?

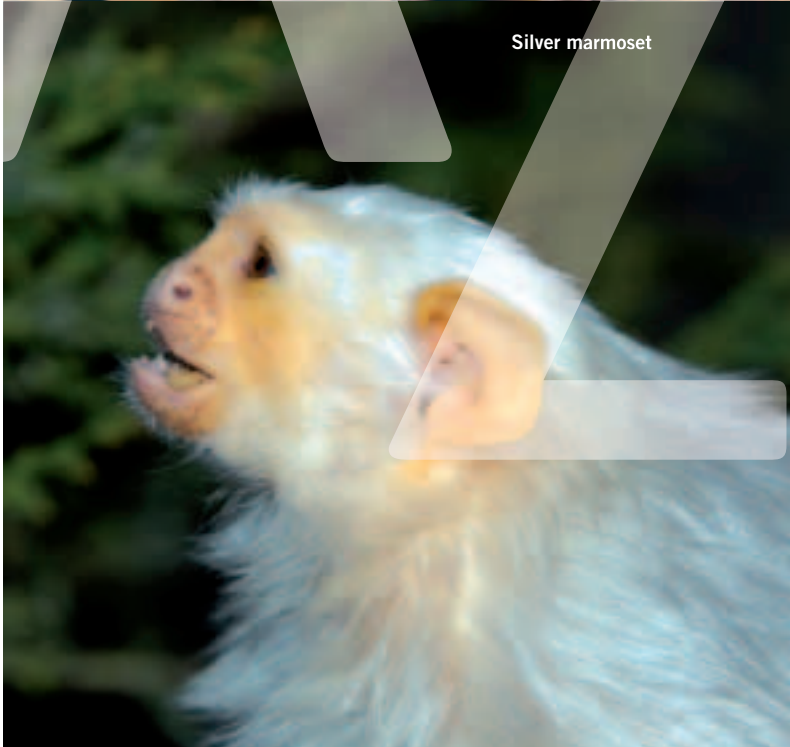
I would like to see the best heads in Europe think of the ERC when they want to apply for money, that's what we want - the best reputation possible. There are already high expectations from the scientific community, so we have to fulfil them and even go beyond them as far as possible.

For more information

http://erc.europa.eu/index_en.cfm

"We have set up 20 peer review panels to study project applications covering the whole spectrum of science from A for archaeology to Z for zoology."

Sarcophagus discovered during the excavation by the mission of Busbatrion to Sakkara, led by the URA128 laboratory of CNRS.
© CNRS Photothèque David Zivie



Silver marmoset

Seventh Framework Programme (FP7)

A new deal for European research

The EU's new research Framework Programme is set to be bigger and better than ever. But even as it is launched, thoughts are not only turning to what the impact of FP7 will be, but more generally to reflections about the whole architecture of European research and what the system could look like in the future. That, at least, is what emerges from a new book on European research policy and the FP7 by a group of officials from the European Commission's Research DG.

A New Deal for an Effective European Research Policy – the Design and Impacts of the Seventh Framework Programme was published in December 2006 and managed by Ugur Muldur. Henri Delanghe and Daniela Heimberger, two of the book's co-authors, look at the prospects for the FP7 and explain the book's wider call for *A New Deal*, making the case for a more coherent and effective European research policy.

What is the background to your book "A New Deal for an Effective European Research Policy"?

It is important to highlight that the book is purely the personal view of the authors, and is not intended to reflect the position of the European Commission. *A New Deal* grew out of work carried out for the impact assessment report which accompanied the proposals for the Seventh Framework Programme for Research and Development (FP7), and which was the first ever impact assessment of a Community initiative in the field of research. It is essentially a story about how European policy is made and we thought, "Why not share that story with a broader audience?", because there is a lot of interest in the outside world about the factors and mechanisms that shape European policy. And of course, in recent years research has moved to the very centre of policy, which makes it all the more interesting as a case study of how policy is formulated in a core area. Because the book also provides some longer-term perspectives, we hope that it might be a useful contribution to the ongoing debate on the future of European research.

What is the book about? How is it structured?

The book is an academic, evidence-based analysis of European research policy, setting out how FP7 was designed and looking at the expected impacts of the programme. It starts by assessing the main economic, social and environmental challenges which Europe currently faces, and describes the potential role that science and technology can play in addressing these challenges. It goes on to argue that Europe will not be able to meet these challenges unless it addresses a number of weaknesses which are currently preventing it from reaching its full S&T (Scientific & Technological) potential. It then moves on to the actual design process of the FP7 proposal, examining the lessons drawn from

"The more quickly you disseminate knowledge the more quickly you will transform it into new products."

past Framework Programmes, and explaining how the views of stakeholders were taken into account. The reshaping of the proposal in the inter-institutional decision making phase is the topic of a separate chapter. The book ends with reflections on "The Future", detailing the conditions that will favour the success of FP7, and presenting some wider implications for policy design and the future of S&T at the European level.

What is the 'New Deal' proposed in your book?

A New Deal makes the case for a more coherent and effective European research policy encompassing government efforts across the EU, and at national, regional or Community level, and involving the commitment of all research actors.

"Taking market policy, there is a common realisation that one could use markets in a more pro-active way, for example to create 'lead markets' through pro-active public procurement."

While the book sets out the significant benefits expected from a much bigger FP covering a longer period, it makes clear that on its own it cannot solve all the problems and challenges Europe faces. For one thing, its success depends on various factors and pre-conditions outlined in the book. But even if it is hugely successful, FP7 only accounts for maybe 10% of public R&D funding, which still leaves 90% in the Member States. Therefore, the EU can only begin to solve its problems if the Member States and the European Community move forward together.

The question then is how to move forward. In our analysis we avoid taking a position on some ideal division of labour between the EU and its Member States, precisely because these matters are complex and more evidence is needed to investigate what actions are carried out most effectively at each level of policy. We suggest it would be useful to have a real discussion on these issues, not rhetorical but evidence-based, which might help to determine the directions in which European research policy can best advance. This of course means knowing what everybody is currently doing in research, and what new measures are being implemented across the EU. As we said before, this is a personal vision of a possible way forward for European research policy, and should not be interpreted as the official position of the European Commission.

FP7 – making an impact

The 289-page book by Muldur et al., *A New Deal for an Effective European Research Policy – The Design and Impacts of the Seventh Framework Programme*, says that the FP7, if implemented successfully, is expected to have a much bigger impact than a 'business-as-usual' research framework programme. FP7 will have a significant impact on Europe's scientific, technological and innovative performance, it is argued. For example, participation in the new FP will be boosted by a much larger budget for collaborative research. Collaborative projects will generate a large number of patents, and firms taking part in such projects can expect to benefit commercially. There will be a bigger budget for human resources actions, ultimately leading to better R&D and enhancing the attractiveness of the EU as a place to pursue a scientific career. FP7 will do more to provide researchers with access to research infrastructures. But the FP7 is also expected to generate wider economic, social and environmental impacts, and – in macro-economic terms – to increase GDP growth, create jobs, raise exports and reduce imports and increase Europe's R&D intensity. Moreover, the authors say FP7 is likely to have considerable indirect, albeit less quantifiable, effects – helping to restructure the European research system by acting as a point of reference for the reorientation of public and private research agendas.

"Revisiting the division of labour between the Community and the Member States in the field of research policy", what would that mean in practice?

Our point of departure consisted of several observations: that at present each policy level (regional, national, Community, inter-governmental) is not necessarily aware of what policy initiatives in the field of research other policy levels are pursuing. Policy information, and above all the results of ex-post evaluation of research measures, need to be better shared across policy levels.

What we propose within this context is to start by re-doubling our efforts to obtain a comprehensive overview of which research actions are being implemented at which policy level. A next step would consist of developing – Community and Member States together – some common approaches and methodologies for evaluating the impacts of research policies, programmes and projects across the EU. A lot of work has already been carried out in this respect, but because of the complexity of the issue (problems of attribution because of, for instance, long time lags between the implementation of the research project and its impact, the difficulty of assessing additionality, etc.) there is much work still to be done.

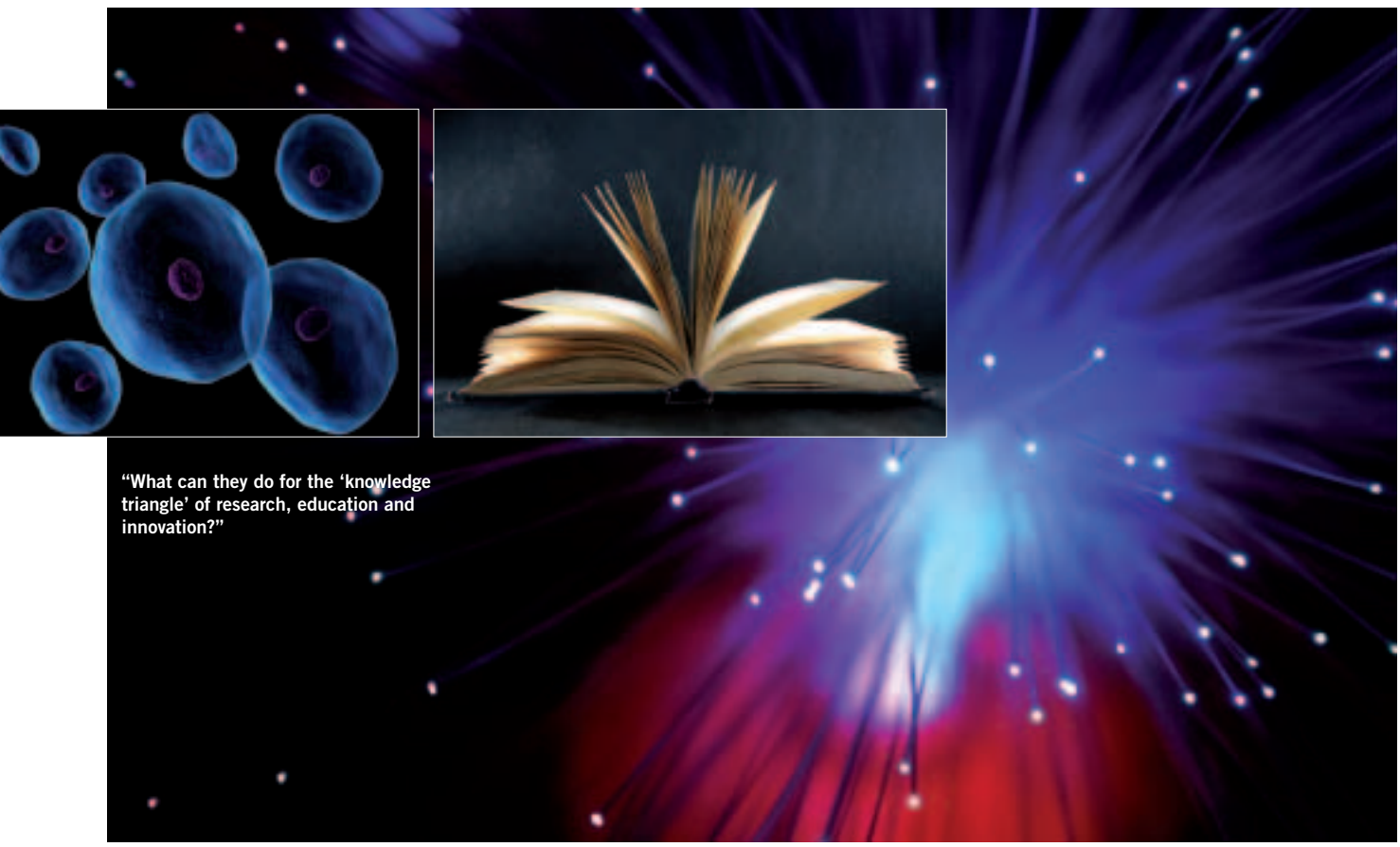
A third step would consist of applying these methodologies in an objective manner to actions carried out at the different policy levels, disseminating the results, and interpreting these findings together. In this regard we raise the idea of achieving the European Research Area in the field of evaluation through the creation of a European Research Evaluation Agency. It would then be possible to have an open debate based on sharing and comparing hard evidence of the impact of research policies at the different levels of intervention, which may lead in time to designing new and more effective divisions of labour. We also put forward the idea of a stronger role for a joint European foresight exercise which might help to develop shared visions and scenarios for the future European research system.

But are you really keeping an open mind – do you not just want more powers at EU level?

We do have a very open mind on this question. All we are really saying is that we need to have a more transparent evidence-based approach for deciding on future directions for research policy in the EU. Some actions are best implemented at regional level, some at national level, some at EU level, and some even at inter-governmental level. For Europe to spend its public research money wisely, it needs to ensure that it is judging accurately at which level a particular policy initiative or instrument is most effective. This means using the notion of 'European added value' to determine if the EU level is the right one, but the flipside means that we should make sure that we systematically evaluate the added value of carrying out policies at national and regional level.

The book floats the idea of new research institutions at EU level – could that prove controversial?

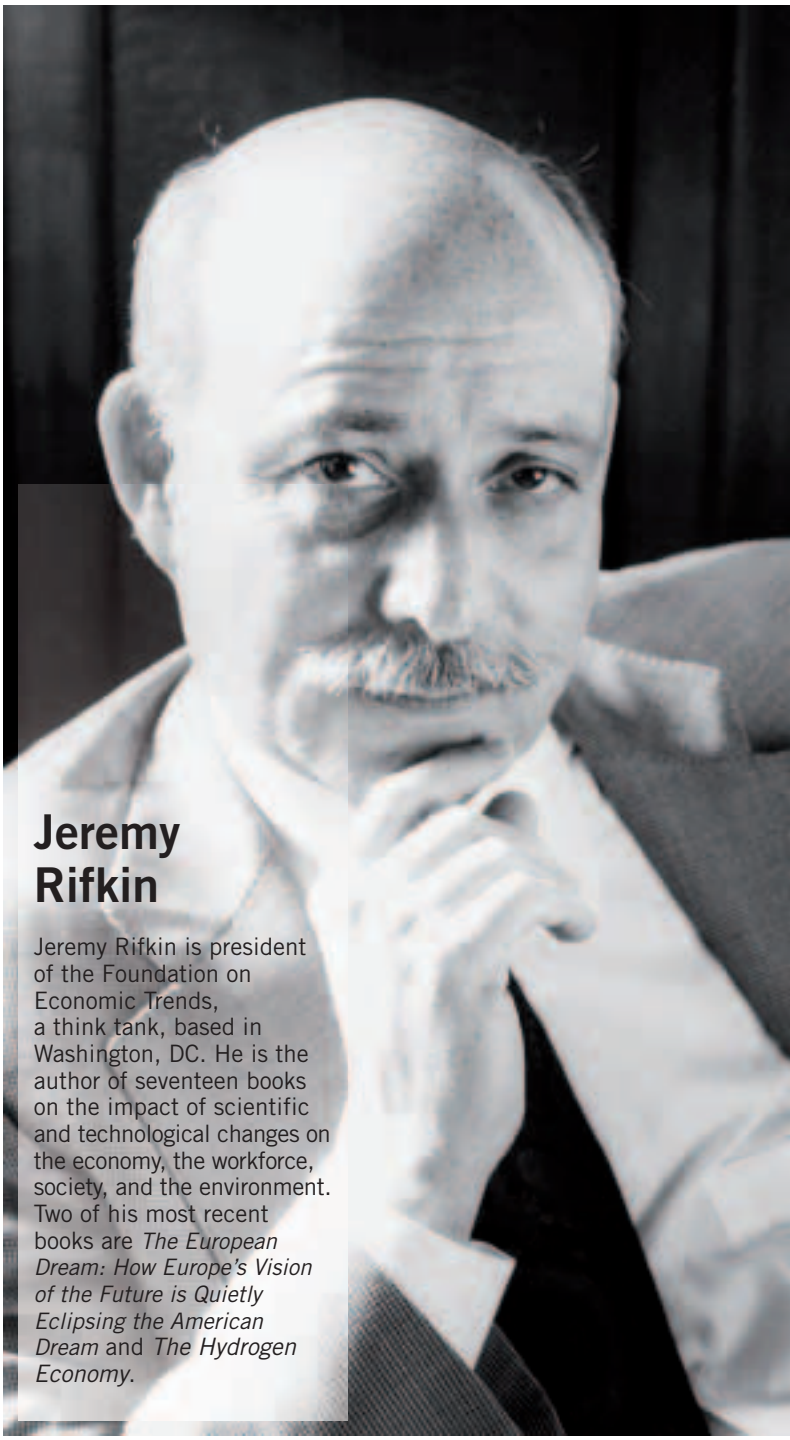
The successful creation in the recent past of a number of Community institutions in the knowledge triangle fields of research, education and innovation shows that the Member States are not against the principle of creating such institutions. However, the setting up of a European evaluation agency is presented simply as one idea among many, and there may be better options. But our aim was not to focus the debate too much on such details, but rather to open up a discussion by providing a few concrete ideas which hopefully will stimulate others to share their own visions for the future of European research policy.



"What can they do for the 'knowledge triangle' of research, education and innovation?"

Hydrogen revolution
The next great European project

In an interview with* RTD Info *magazine, Jeremy Rifkin presents his vision for a hydrogen economy and third industrial revolution. Rifkin believes that mitigating the effects of global warming whilst weaning Europe from its dependency on fossil fuels are the two greatest challenges facing the EU over the next 50 years. His vision entails the generation of power using renewable technologies and which is stored, distributed and shared in the form of hydrogen. This new 'hydrogen energy regime' will impact geopolitics, the wealth of nations and society at large. Rifkin believes that creating a hydrogen economy and unleashing the third industrial revolution should be the next big European integration project, and explains why this should be the focus of the Seventh Framework Programme (FP7) and other research programmes.



What do you think should be the priorities for FP7 research?

We are at a critical point in world history. We're now facing the greatest challenge that we've ever faced as a species, and that is climate change. The bottom line is this: the scientific community is now over 90% certain that human-induced climate change is dramatically affecting the earth, and the projected scenarios are foreboding. Current models put us back to the temperature on this planet of 3 billion years ago during the Pleioscene Era. Different flora, different fauna, different earth. I don't think we grasp the enormity of this change in climate, and the impact it will have on ecosystems, on living patterns and on the ability of our species to adjust.

We're at a shifting point, not only because of climate change, but because we're now beginning to see the sunset of the fossil fuel and uranium era. Experts agree that sometime within the next 30 years half the oil will be used up. That's when the era is over because the prices of oil become unaffordable.

In addition, we have increasing political instability in the oil producing countries, especially in the Persian Gulf. This makes the whole question of energy, of oil flow, problematic – week-to-week and even day-to-day.

Given the fact that we're moving toward peak energy production of oil, and we're experiencing real-time climate change of a magnitude that's beyond the scale of human history, I would suggest that the primary mission of civilization in the next 25-50 years ought to be an exit strategy from carbon-based fuels and uranium, and the laying down of a new infrastructure for a post-carbon era. This is about survival now, of the planet as we know it, and of civilization as we know it. This is nothing less than that. So, any other research priorities on technological development have to either augment that in some way or are secondary.

Jeremy Rifkin

Jeremy Rifkin is president of the Foundation on Economic Trends, a think tank, based in Washington, DC. He is the author of seventeen books on the impact of scientific and technological changes on the economy, the workforce, society, and the environment. Two of his most recent books are *The European Dream: How Europe's Vision of the Future is Quietly Eclipsing the American Dream* and *The Hydrogen Economy*.

The Hydrogen Economy? Searching... Here, production of hydrogen electrocatalysed by compounds of cobalt. The objective of this research is to identify new molecular catalysts for producing hydrogen from electricity or solar energy. Work conducted by the laboratory UMR5047 of the CNRS (FR). Close-up: an electrolysed cell with the working electrode in carbon and the reference electrode.

How do you see us exiting from carbon-based fuels and uranium, and what would a new infrastructure in a post-carbon era look like?
Let me back up and say that the point I made in *The Hydrogen Economy* is that the great economic revolutions in human history occur when two things happen. One, when human beings change their energy regime, the way we organise the energy of the planet, and two, when we change our communications regimes to organise our new energy regimes. The pivotal points in human history are when new energy regimes and new communications regimes converge. They change the human equation forever.

The reason I say this is that we've had a very powerful communications revolution over the last 15 years with the personal computer, the internet, satellite and WiFi communication. Now at least 20% of the human race can produce and share information at the speed of light. It's an unprecedented, flat, open-source, distributed communications revolution. What I'm suggesting to the government leaders and Fortune 500 companies that I advise is that this communications revolution has a deeper mission, a chapter two. It's the command and control mechanism for a new energy regime and a third industrial revolution, a shift to hydrogen in a post-carbon energy era.

How would this work?
Here's the way the distributed communications revolution becomes the command and control mechanism for an energy era. Imagine millions and millions of hydrogen fuel cells in 25-30 years time. There are portable fuel cell cartridges that you can use to power your laptop, your cell phone, your MP3 player. They'll be out on the market this year from seven Japanese companies. And there are also stationary fuel cells. Every home, every office, every industrial park, every industrial region has fuel cells powered by hydrogen, which stores renewable energy.

What we do is use solar, geothermal, hydro and waves to generate electricity. Then we use some of the surplus renewable energy to electrolyze water and grab hydrogen for storage, for the grid, and for transport. With biomass – forestry waste, agricultural waste, municipal garbage and the like – we can get the hydrogen direct.

This is where I think we need to go with our R&D. It's still going to be challenging; it's not a magic bullet. But it's the only way to get us off the old fuels.

Why hydrogen?
Many people have asked, why do you need hydrogen? Why not just renewable energy? You can't do one without the other because renewable energy is intermittent, with the exception of biomass. The sun isn't always shining, the wind isn't always blowing. Water tables can be down

for hydro. Hydrogen is a way to store renewable energy so it's there and predictable for the power grid and for transport. With biomass, you can get the hydrogen directly, but you still need a universal carrier, which is hydrogen.

Hydrogen is the stuff of the universe, and when you use it the only by-products are pure water and heat. It takes us off the carbon cycle, which is essential to deal with climate change.

Aren't there alternatives to renewable energy?
You can take hydrogen out of coal, oil or natural gas. The problem is you're still in fossil fuels. Natural gas is an OK transition because it burns a little better than oil, but it doesn't give you more than a few years because natural gas follows the same bell curve in terms of global peak production as oil. You can use coal. The coal industry is saying: "Clean coal. Let's develop a whole new generation of coal-fired power plants, and give us enough time and money and we'll figure out a way to sequester the CO_2 and store it underground or under the ocean." The problem is that other scientists are saying that there's nothing on the horizon to suggest that it would be economically feasible, if at all, until mid-2020 or mid-2030. And it wouldn't make a significant contribution to CO_2 reduction until almost the mid-century according to the IEA. And then we still don't know if you can maintain the CO_2 under the ground or under the oceans with no leakage forever.

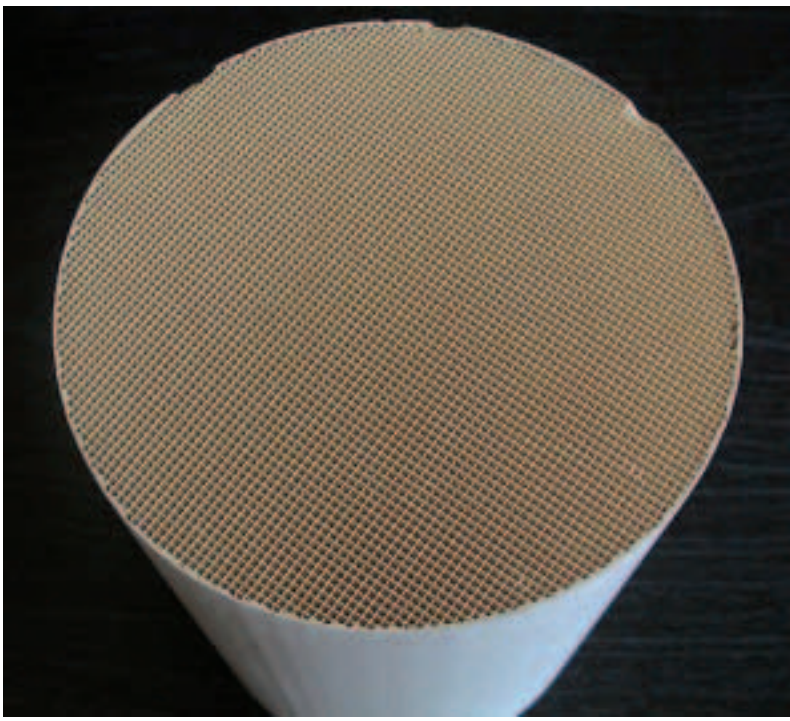
The nuclear industry says: "Why don't we get hydrogen by electrolyzing water with nuclear power?" The problem there again is cost. Nuclear power plants are prohibitively expensive compared to other forms of energy for electricity. Moreover, we're facing uranium deficits by 2025-2035 according to the International Atomic Energy Commission. Why would we want to build nuclear power plants at the cost of several trillion dollars just to run into a uranium deficit? Besides, we're 60 years into this technology, yet we still don't know how to transport and store nuclear waste. Finally, in an era of terrorism, why would we want hundreds or even thousands of nuclear power plants all over the world? It's what I would call a 'nightmare scenario'.

And finally, these old technologies, fossil fuels and uranium, are what I would call elite technologies. They're highly centralized 19th and 20th century approaches to energy. Coal, oil, gas and uranium are only found in certain regions, in certain pockets. They're not evenly distributed across the planet. So they require a huge military investment to secure them and a huge capital investment to process them. So we end up with a world where power is unevenly distributed.

How does this tie in with the communications revolution?
We're going to use the exact same architecture, the exact same software and hardware that we created in Silicon Valley. We're going to use that technology to re-configure the power grid of the EU and the whole world, in 20 years, so that the power grids are smart, distributed, and open source.

Now, here's the interesting nexus between the communications and energy revolutions. A fuel cell powered by hydrogen which stores renewable energy is analogous to a personal computer. When you get a personal computer, you generate your own information. But then you can also disseminate it as a producer to a billion people in three seconds. Try to imagine millions of fuel cells in 30 years from now, and remember we went from almost no computers 30 years ago to millions. There's no reason why we can't do that with hydrogen fuel cells as well.

So it's like your own personal energy source?
Exactly. You and I capture renewable energy locally. We generate electricity with it. Use it. Store some of the surplus in the form of hydrogen for later conversion back to electricity, or for direct use in transport. We send the rest of the surplus back to the power grid or share it. We can share energy with the same ease and transparency as we share information on the internet. Each of us becomes our own utility.



Close-up of a catalytic hydrogen production process on a structured reactor: general structure of the monolith (honeycomb-like brace covered up by the catalytic layer) Work of the research institute for catalysis, Villeurbanne – CNRS (FR).
© CNRS Photothèque/Laurent Villegas

What would be the impact of a change like this?
The coming together of the distributed communications revolution as the command and control for the distributed generation of energy – hydrogen – storing renewable energy, is the third industrial revolution. And it should have as powerful an impact on the 21st century as coal, steam and rail coming together with print in the 19th century, and oil, the internal combustion engine and automobiles coming together with electricity, the telegraph and the telephone in the 20th century. The multiplier effect should be at least a century. It will create millions of jobs, and it will bring us to the kind of sustainable post-carbon, post-uranium energy regime that is distributed, de-centralized, and gives power to the people.

The hydrogen economy and the third industrial revolution sound like a grand vision for Europe rather than just research priorities…
I think for Europe that it's the key to the next stage of European integration. The European Union started with energy, the Coal & Steel Community and then the Euratom.

Hydrogen must be produced from electricity. This could be provided by alternative energy sources such as windmills.

What I've said to José Manuel Barroso, Andris Piebalgs, Nellie Kroes, Angela Merkel and others is: "Look, this is an opportunity to create a new integrated program for the next grand project for Europe."

The way to reach the Lisbon Agenda is by creating a seamless infrastructure: an integrated transportation grid, communication grid, and power grid across the 27 countries, with hydrogen storing renewable energy. With such an infrastructure, you can engage in commerce and trade with ease across your 27 states, and you have the largest internal market in the world, in terms of wealth, and a population of 500 million people.

How should this be reflected in concrete research priorities?
Our R&D should bring together all sorts of technologies. You have software, telecoms, the chemical industry, engineering, energy, power, utility companies. It's really re-thinking the entire infrastructure of how we make energy and how we distribute energy.

To what extent do you think that this should be driven centrally or that it will just happen?
It's a combination. Many regions of Europe are already beginning to lay the foundations for what I've mentioned here. So, that's bottom up. On the other hand, it's going to require coordination at the national and EU levels. Something of this magnitude where we have to change the entire energy regime of the EU and the world in 25 years can only be done with the complete engagement of government at every level. And at the same time a total commitment by the business community, from SMEs to global companies, and civil society.

What we need is a generation of political leaders who say: "Ask not what Europe can do for you, but what you can do for Europe" and challenge a younger generation to begin in the schools and universities and the research institutions to prepare for the third industrial revolution and a post-carbon hydrogen economy. That's a vision that we need for Europe and the world.

How do the US and other regions of the world fit in with this vision?
Well, California, the sixth largest economy in the world, is already building a green, hydrogen economy along the lines of what I've been talking about. They're very far ahead, as they were with Silicon Valley and the IT revolution. They've already created a road map, and now New York and a few other states are following suit. Japan is pretty far along on this, too. The EU could be the leader, but it means that Germany and other countries, as well as Brussels, really have to take the lead now.

What has been the reaction of European leaders to the vision of a hydrogen economy?
Andris Piebalgs, commissioner for energy, has made renewable energy and hydrogen key parts of the New European Energy Policy and is advocating a new industrial revolution in energy. Last year, Chancellor Merkel asked me to come in and talk about how to boost the German economy. At one point, as a part of that I presented her with a paper on the third industrial revolution and a shift to the hydrogen economy. Subsequently, the Christian Democratic Union, her party, put that into their official energy platform. The centrepiece of their R&D will be the move to a hydrogen economy so that Germany can lead Europe.

Who would be the biggest beneficiaries from a move to the hydrogen economy?
I think that the biggest beneficiaries here are going to be the third world. The reason people are powerless is that they have no power.

It's not just a quip, it's literal. A third of the human race has no electricity.

So what I'm suggesting is that this third industrial revolution, because it's power to the people, allows us to finally get energy into the hands of everybody. Because renewable resources exist everywhere – unlike coal, oil, gas and uranium – there's something for everybody. If we can harness renewable energy, store it in the form of hydrogen, and distribute it through smart power grids, the developing countries will be able to have electricity and become players in the third industrial revolution and in globalization. This would be true globalization from the bottom up.

So it's going to be more of a level playing field? A multi-lateral world?
Yes, it moves us from the elite energies of the 19th and 20th centuries, fossil fuels and uranium, to the democratic energies of the 21st century: renewable energies, hydrogen storage for those energies and smart power grids to share those energies.

It's a flat revolution with tremendous power because it allows us to distribute energy much more equitably. It allows people to be much more self-sufficient. More importantly, it will deal with climate change and the peak of global fossil fuel production.

So wealth will be distributed more evenly as well?
Wealth and economic activity follows energy, because energy is the key to producing, amassing and distributing all forms of wealth.

Is there anything else you'd like to add?
When you take a look at what's going on here with climate change, it's really devastating. I just don't think our species has figured out how devastating this is at this point. I don't think we have a clue.

But we have to believe we have the time. If we can be 'mindful' and do only what needs to be done, maybe we can still save the situation. The key is to get this change under 2°C. That's why our hydrogen revolution's critical.

For more information

http://www.foet.org/JeremyRifkin.htm

International cooperation, the cornerstone of the Seventh Framework Programme

One of the objectives of the new framework programme is to intensify strategic partnerships with third countries, namely within the framework of greater mobility among researchers.
Sigi Gruber, head of communication for the international dimension of the Seventh Framework Programme, explains.

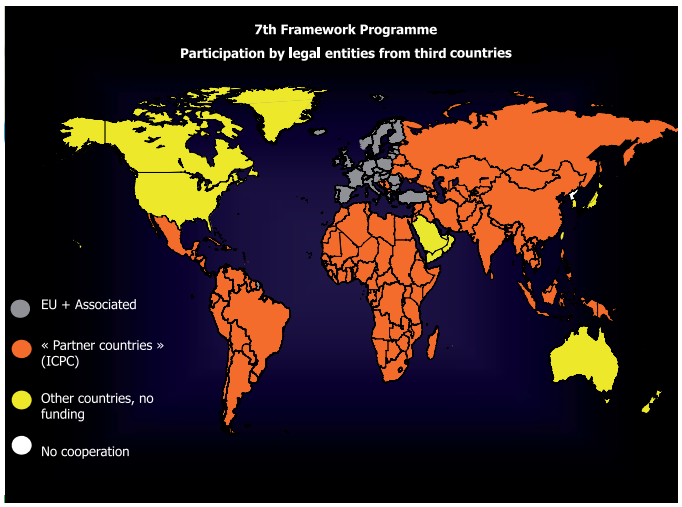
Could you explain how the international dimension is being fully integrated within the Seventh Framework Programme?
The international cooperation approach in the Seventh Framework Programme is noticeably different from that adopted in the Sixth Framework Programme. It aims to integrate international collaboration with regard to research in the framework programme as a whole, and is targeted in terms of geography and subject matter.

In order to extend international collaboration, three basic principles have been adopted:
- Firstly, the principle of *programming*. Unlike previous framework programmes, the Seventh Framework Programme, as a whole, implies the 'mainstreaming' of international collaboration, as well as the programming of specific priorities for third countries and regions. These priorities are included in the different calls for proposals in all thematic programmes.
- Secondly, the principle of *targeting* defines specific activities with third countries and regions in each thematic priority within the specific 'Cooperation' programme. The Seventh Framework Programme therefore ensures the integration of budgetary packages for each of the corresponding calls for proposals.
- Finally, the principle of *partnership and dialogue* is included in the specific international cooperation actions (SICA) which aim to bring about the balanced participation of third countries in collaboration with European partners.

The major new development therefore relates to two aspects. On the one hand, there is 'passive' (relating to all countries) or 'targeted' streaming. On the other hand, there are the SICA, which are activities intended for inclusion in each of the specific topics of the 'Cooperation' programme.

The 'Capacities' programme covers seven activities, one of which is reserved entirely for international cooperation. Using support measures, this activity should promote international cooperation with ICPCs (International Cooperation Partner Countries). It supports dialogue such as that in progress within the framework of the platform of the Western Balkan countries, bringing together different parties, such as universities, businesses, public authorities, civil society and donors. Moreover, this activity also supports the exchange of information with all ICPCs. This is aimed at allowing the EU and third countries and regions to discuss existing and future research priorities and to encourage debate between the different parties involved.

Specific International Cooperation Actions (SICA) allow for working on specific topics. For example: the development of biodiversity in the Andes, for both environmental and agro-industrial reasons.



The Seventh Framework Programme is also open to partnerships with the major powers, such as the United States or Japan. How do you distinguish between collaboration and competition?

Two important points have to be made here. On the one hand, the EU has always implemented a support policy for collaborative and generic research. We can, however, expect an increase in competitive research in Europe, namely via the 'Ideas' programme, which makes provision for a single selection criterion: excellence.

On the other hand, certain partner countries, such as the United States, have shown preference for a competitive approach over a collaborative approach. However, here too things are changing, as American researchers are evolving towards a more collaborative practice due to the increasing cost of infrastructures and the multi-disciplinary nature of research to be carried out. I am thinking, for example, of the ITER project relating to nuclear fusion, around which real collaboration on a global scale has been crystallised.

How are potential partners reacting to the Seventh Framework Programme?

The Seventh Framework Programme is, without a doubt, the most ambitious scientific programme ever seen to date. Our American partners have to negotiate their budgets at length each year, within a context of a decline in public funding. In contrast, the Seventh Framework Programme makes provision for a constant increase, spread over a period of seven years. In general, our partners are enthusiastic about the idea of this new framework programme and want to play an active part in it!

International collaboration activities encourage mobility among researchers. What about the brain drain?

To tell the truth, the brain drain is a myth and we are striving to bring the term 'brain circulation' into common usage. During the last five years, we have implemented a series of measures aimed at making Europe more attractive and welcoming for both its own researchers and also researchers from the rest of the world.

But we do not want to play a part in the brain drain from developing countries. Therefore, within the framework of Marie Curie Actions and mobility grants launched during the Sixth Framework Programme, researchers from emerging economies and developing countries could receive a reintegration grant, which would enable them to return to their own country, in order to pursue their research activities and reintegrate. We are looking to continue this kind of initiative. For example, the Seventh Framework Programme makes provision for providing support for the scientific exodus from third countries, like those in Africa, so that researchers can continue to communicate with one another, whether they are in Europe or have returned to their own countries.

What present-day instruments allow greater mobility among researchers?

By way of an example, I will mention three initiatives. In 2005, the European Council adopted a directive aimed at facilitating the obtaining of a scientific visa, which it hopes to see included in the legislation of all Member States between now and October 2007. The aim is to encourage foreign researchers into Europe. The second initiative, launched and jointly introduced within the Member States and countries associated with the Sixth Framework Programme, is based on the implementation of a network of over 200 mobility centres, which welcome researchers from all over the world and facilitate their entry into Europe. They will benefit from practical information related to looking for somewhere to live, obtaining a work permit, registration with a crèche or school, etc. The third initiative consists of the creation of a European portal for the mobility of researchers, which every day distributes between 900 and 1 000 offers of employment (http://ec.europa.eu/eracareers).

To this, we can add the completely new ERA-LINK network (European Researchers Abroad - http://cordis.europa.eu/eralink), the aim of which is to create a network of European researchers abroad. We launched a pilot initiative in the United States in June 2006, with a view to putting expat researchers in contact with one another and informing them of what is happening in Europe with regard to R&D. The idea is to keep in touch and encourage them to continue to cooperate with Europe. At the present time, ERA-LINK is fully expanding, and we are looking to introduce it elsewhere, for example in Japan or China.

Of course, all these initiatives have been implemented in strict collaboration with the Member States, in order to establish a kind of job market for researchers in Europe.

Can you measure the mobility of researchers? Are researchers more mobile now than they were before?

We have launched certain studies on this subject, but it is very difficult to measure this kind of data. Indeed, people do not have microchips implanted. Nor can we keep track of them, as they are not obliged to register. The only useful data we have relates to applicants for doctorates, who come to study in Europe. We know, for example, that Germany, the United Kingdom and Sweden are net importers, which means that there are more Indian or Chinese researchers coming in to these countries than there are German, British or Swedish researchers who leave.

What are your plans for the coming months?

Our initial aim is to let people know that international cooperation is, as of now, fully integrated within the framework programme as a whole. Everyone must be informed of this, especially European researchers, as that is the main problem. People do not yet know that the Seventh Framework Programme is putting forward an international dimension that is completely different from previous framework programmes and that universities, research institutes and even SMEs have an opportunity to participate in projects of an international nature. International cooperation that is more extensive, more integrated, more targeted, more structured and more organised; that is the message that we have to get across.

For more information

http://ec.europa.eu/research/inco

China-EU Science & Technology Year

Since 1998, the People's Republic of China has been very much present in projects funded by the European Union's framework research programmes. This country, which in recent years has systematically increased its research budget by more than ten percent per annum, has become the major third country involved in Community programmes.

Jun Han

Shiping Ren

In order to make the most of research opportunities offered by the Seventh Framework Programme, the authorities are redoubling their efforts in keeping Chinese researchers informed. They are doing so to such an extent that since October, this current year has been decreed the "China-EU Science & Technology Year". A studious year that has nothing to do with the Year of the Pig, in the traditional calendar! An interview with Jun Han and Shiping Ren, from the Chinese Mission to the European Union in Brussels.

How is scientific and technological research funded in China?

Jun Han, Minister Counsellor with the China Mission to the EU:
In China, scientific and technological development (S&T) is covered by several major national programmes.
On the one hand, we have major strategic guidelines. For S&T, for example, this is National Programme 863, announced by the Government in March 1986. For fundamental scientific research, we have National Programme 973, announced in 1997. Among these major national programmes, we should also mention the Spark Programme (1986) for research in the agricultural sector which is also based on S&T research, or the Torch Programme, launched in1988, for the development of hi-tech industries within the country. In total, ten or so major national programmes of this kind form the framework for the financing of research in China.
On the other hand, shorter-term priorities are covered by five-year programmes.
Financing for these different programmes comes from the State and its scientific institutions, who also sign research contracts with industry.

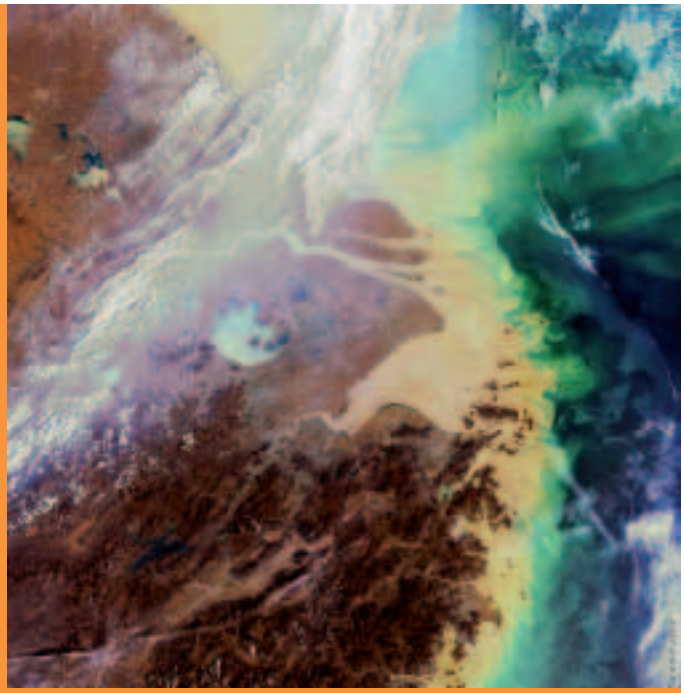
What kind of budget does China set aside each year, for financing scientific and technological research?

Jun Han: At present, it is around 1.3% of the gross domestic product. Last year, that represented the equivalent of some €30 billion. The aim of the Chinese government is, between now and 2020, to obtain financing for research of at least 2.5% of GDP.

Evolution of funds set aside for S&T research in China

Year	Percentage of GDP
1999	0.76 %
2000	0.90 %
2001	0.95 %
2002	1.07 %
2003	1.13 %
2004	1.23%

(Source: Ministry of Science and Technology/People's Republic of China)



Shanghai, 6 340 km², 18 670 000 inhabitants in 2006, satellite view. © ESA

An impressive 'national' list of scientific achievements in 2006

On 21 January this year, the ten main scientific and technological advances realised in China in 2006 were published by the authorities in Beijing. This 'Top 10' was drawn up by a panel of 565 members of the Chinese Academy of Science and the Chinese Academy of Engineering Science. The list is as impressive as it is multidisciplinary.

- The commissioning of a new generation internet network (Ipv6).
- The discovery of the largest deposits of natural gas in the country (Puguang, province of Szechuan).
- The development of the first experimental advanced superconductivity tokamak (EAST).
- Producing resonance in a chemical reaction at quantum level.
- The realisation of a 'green corridor' 436 kilometres long in the Takelamagan Desert. This is the longest green corridor in the world in a shifting desert area. A model of the type for controlling sand using biological methods.
- A complete oceanographic expedition (297 days at sea), by the vessel *Ocean 1*.
- Progress in the development of therapeutic hepatitis B vaccines.
- Obtaining key results in experiments carried out using the electron/positron collider in Beijing.
- Dual particle teleportation (one particle with negative drag, the other with positive drag)
- The launch of a teledetection satellite.

How are Chinese researchers and industrialists informed of research opportunities financed by the European Commission?

Shiping Ren, Second Secretary with the China Mission to the EU: The initiative regarding a partnership with European researchers systematically comes from Chinese scientists. The Government merely creates favourable conditions so that such initiatives can be taken up by researchers, for example, by helping them attend scientific conferences, colloquiums or symposiums in China or elsewhere in the world. Moreover, in Beijing, the Ministry of Science and Technology, in collaboration with the Delegation from the European Union, organises information events about research opportunities with the Union. Since summer 2006, we have also been organising informative courses in Beijing and the provinces regarding the Seventh Framework Programme and its potential for Chinese researchers. At certain seminars, the number of participants has been 300 to 400 people.
During the Sixth Framework Programme, we organised some 30 or so information days of this kind in China.

In your opinion, how will the collaboration between Chinese and European researchers evolve within the new framework programme?

Shiping Ren: Collaboration agreements relating to research between China and the European Union date back to 1998. That year, we were at the start of the Fourth Framework Programme. At the time, Chinese researchers managed to participate in just two or three projects in the framework programme. As the years have gone by, other teams have joined in. According to our calculations, in the Sixth Framework Programme, which is just ending, about 200 Chinese scientific teams have been able to collaborate with European researchers (within the framework of 134 projects, according to the European nomenclature). A portion of these (50 teams out of 200), were concentrated in the field of information and communications technology (ICT).
I believe that, with the Seventh Framework Programme, this collaboration is going to intensify, to the mutual benefit of all partners. Especially as a result of the fact that the new programme will cover a longer period than its predecessors.

What are the main areas of research for your country in the coming years?

Shiping Ren: We have practically the same priorities as the Europeans. That explains why partnerships with Chinese researchers are beneficial for all parties ("win-win" situations). We would focus on research programmes aimed at energy, environmental protection, biotechnology, health, new materials, IT, foodprocessing, transport and even space.

With regard to energy, China is collaborating on the ITER nuclear fusion reactor. Is this a priority?

Jun Han: China is indeed collaborating with the European Union within the framework of the ITER project. A large country like China needs enormous amounts of energy for the development of the country. If saving energy is one priority, developing new forms of energy is another, and ITER offers immense potential for addressing the energy needs of the whole world. That is why this type of major international project, which benefits the whole of humanity, is of interest to us. Nevertheless, in the area of energy, an area for which there is a China/EU steering committee and close bilateral cooperation, we do not limit ourselves to just this project. At the last meeting of the energy steering committee in Shanghai, last year, there were also a lot of discussions regarding clean coal, nuclear fission, hydrogen, etc.

With regard to Space, China gives the impression that it would like to develop its own activities in this field. For example, activities regarding manned flights. The historical flight of the first Chinaman in Space, Yang Liwei, is a testament to this.

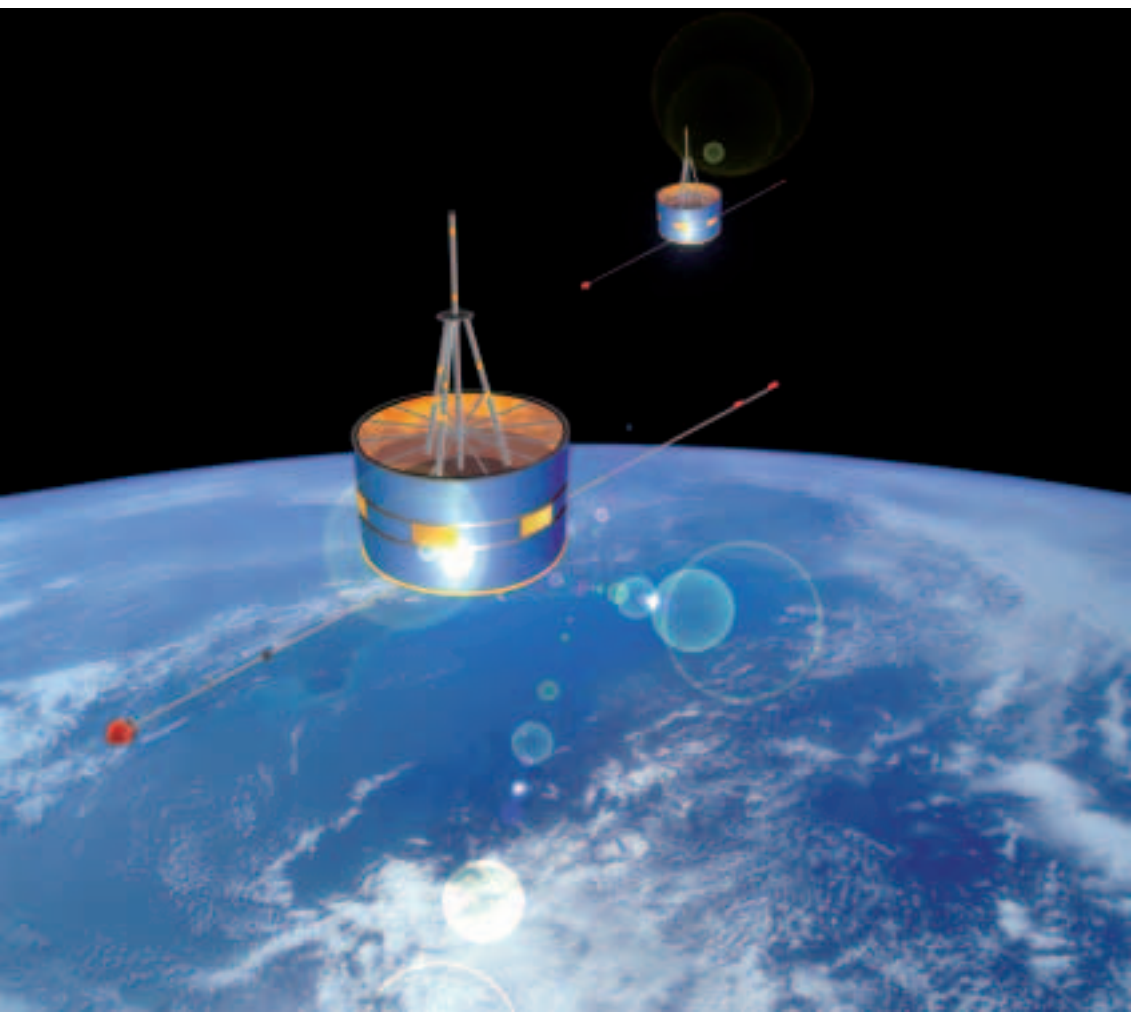
Jun Han: I cannot prevent people from seeing things from this angle. But I must however remind you that we are working, for example, in close collaboration with ESA, the European Space Agency, within the framework of the Double Star sun observation mission. Moreover, China is the main third country participating in the European Galileo satellite positioning programme. My country has set aside €70 million for the first phase and eleven collaboration projects have already been signed within this context. Two more are waiting in the wings. For Galileo, the first phase has, in our view, already been finalised. We are currently in the process of working on new methods of cooperation for continuing with this programme and hope to have the best possible options for the implementation of industrial collaboration. Galileo is a perfect example of the S&T collaboration that the European Union and China can put in place. It is also, for us, the longest project ever envisaged. With Galileo, we will be partners for a very long period: twenty to thirty years, at least.

In terms of health, are the links between China and the European Union as strong as they are with regard to technology?

Shiping Ren: One example out of many, by way of a reply. When we were faced with the SARS (Severe Acute Respiratory Syndrome) epidemic, we asked our European partners to lend a hand. Straightaway, in the Sixth Framework Programme, some ten or so research projects specifically aimed at SARS were implemented and €9 million was set aside for this. Nine of these projects were successful, which is a good success rate. With regard to the Seventh Framework Programme, we are going to be collaborating, specifically, on projects relating to traditional Chinese medicine. This should not take the place of modern scientific medicine, but we believe it may, in certain cases, provide interesting alternatives. Here, too, it will be a case of "win-win" partnerships... for each type of medicine!

For more information

www.most.gov.cn



Double Star mission in orbit. Artist's impression. Example of Europe/China collaboration in the field of Space. © ESA

The ITER fusion reactor is being built at Cadarache (FR). Six Chinese researchers are currently participating in this project, the aim of which is to provide sustainable energy generation. © ITER

"East meets West: Japan reforms its research system"

Japan is transforming its research system into a more US-style system based on open competitive grants. Increased mobility is an essential part of plans to encourage younger researchers to become more independent. Kiyoshi Kurokawa, special science adviser to Prime Minister Shinzo Abe, believes that independent-minded young researchers will develop more original research. A loosening of Japan's centralised and hierarchical university system is another key element of Kurokawa's reform plan. While advocating a US-style system, Kurokawa praises the Framework Programmes and sees the mobility of researchers across Europe as a major strength of the EU approach.

Kiyoshi Kurokawa

What reforms do you plan to make to Japan's research and science & technology policies?

I was a member of the Committee of Science & Technology Policy for the last three years and we are reforming the grant system as well as the university system. Through the last 5 - 10 years of reform, national research universities have become independent agencies, and the budget for competitive research grants has been increased. So, change is underway, and we are making progress. The transition is not so fast, though, because it means changing from the old system to a more US-style system based on open competitive grants.

You mean more of a free market system for grants?

Yes, stimulating competing ideas is important. But it has to go hand in hand with a social system that encourages the mobility of investigators. Social structures such as social security, pension plans and other things have to support mobility. These are very practical – but important – issues.

Mobility is a major component of FP7 as well, why do you consider it so important?

Mobility discourages in-breeding and encourages original and creative research. There is more cross-fertilisation. In the past, researchers tended to stay at the same university, sometimes in the same group led by a particular professor, for their entire career. The system itself is not designed to encourage young investigators to become independent. That is one part of the system that we are really trying to reform. It has been a fundamental issue for the last 20 - 30 years.

Why is it important to encourage young investigators to become independent?

Creativity is the essence of future development. And creativity always comes from the younger generation. So you have to really encourage them to become independent. When you have to show you're independent, that you're different and you can become somebody on your own, it encourages you to become creative.

How do you encourage them to become independent?

For innovation and creativity to be nurtured, the key is that you have different mentors from different institutions. In Japan, in-breeding has been the norm. The majority of graduate students at Tokyo University tends to come from undergraduate programmes at Tokyo University. In the hierarchical structure of the Japanese university system, this tends to suppress creativity and reduce opportunities to work with different people. In the US, on the other hand, graduate schools accept applicants from other undergraduate schools and when you graduate you're almost forced to go somewhere else as a postdoctoral fellow to continue your research and become a scientist with his or her own identity.

Why is there such a focus on Tokyo University?

Tokyo University was the first national university in Japan established almost 150 years ago, and has been considered to be the most prestigious. It also has the largest faculty and more funding than Kyoto University or Osaka University. As a researcher you have more peers and more infra-structure. So, once you're in Tokyo University, you are tempted to take advantage of this built-in structure. That makes you want to stay there. And unfortunately that encourages in-breeding.

How much progress has been made towards the goals you mention here?

Japan has been changing over the past 10 years. More than half of all investigators now seek post-doc fellowships somewhere else, inside or outside Japan. Among others, the Japan Society for the Promotion of Science, one of the largest funding agencies, is encouraging younger people to develop as independent investigators.

"Mobility discourages in-breeding and encourages original research."

"The majority of the students go to graduate programmes at Tokyo University. This tends to suppress creativity."
© ISSL – University of Tokyo, Japan

But the transformation is taking some time. Implementing a US-style system and encouraging younger investigators to become independent is not going to happen overnight because it is linked with culture and the existing society and university system.

It seems that you are inspired by the US system. Apart from the mobility and system of competitive grants, what are its strengths?
In the US research is institutionalised. So even if you pour more money into the system, the management and university structure allow a rapid response. Over the last 10 years, the US research community has effectively absorbed a doubling in funding for the National Institutes of Health (NIH). In Japan or France or elsewhere, can you absorb a doubling in funding to effectively produce output?

Are there advantages to the Seventh Framework Programme and the European approach to research?
The EU is really expanding so that opportunities for many young or mid-career investigators are expanding, too. There is mobility across national borders so a researcher from, for example, an Eastern European country can seek better opportunities in Nordic countries, Germany or France. Adding to that the network type of FP7 also helps. Europe will absorb more talented researchers from other EU countries within FP7.

Do you think that centrally-directed research programmes such as the EU's Framework Programmes and Japan's Innovation 25 are good ways to encourage innovation?
Yes, mission-oriented research, where you define the research topic through a committee and then issue a call for research proposals, is one good way. But over time, researcher-originated grants give you more creative potential to define your own research. In the US, the majority of NIH (National Institutes of Health) grants are for such investigator-originated or R01 (Research Project Grant) type research. It's very competitive, but it works, in parallel with a well-developed peer-review system.

In Japan, the Committee for Science & Technology Policy is responsible for identifying areas and allocating funds, and about half the budget is for investigator-originated research while the other half is for top-down or mission-oriented research.

What research priorities do you think research priorities should be going forward?
'Innovation' has become a popular key-word over the past decade. I suspect that it is because both the general public and policymakers are looking to scientists to solve the fundamental problems facing mankind – such as climate change, the population explosion and energy security – in addition to expanding the frontiers of science. In the era of ever-wider information sharing through the Internet, people in the developing countries would like to have the same affluence as we have in the rich countries. But at the same time, people in both the developing countries and the developed world recognise that we face global problems that threaten our sustainability. They see science and innovation as offering the solutions.

Russia and the European Union:

Russia and the EU do not have the same approach with regard to research but more intense cooperation should come about thanks to the Seventh Framework Programme.* RTD Info *interviews Alla Akulshina, Deputy Director of the Regional Centre for Information on Cooperation with the EU in R&D at Voronezh University.

What are the major differences between the Russian and the European Union's approaches to research & development (R&D)?

Traditionally, Russia's strong point is basic research. Russian education has always given priority to mathematics and the sciences and our best colleges of higher education, therefore, have a tendency to concentrate on mathematics, physics and nuclear and space research. On the other hand, applied research is an area in which we only invest a small proportion of our Gross Domestic Product (GDP). However, this is a deplorable state of affairs, given that applied research is better able to meet immediate social and economic needs.

In the EU, the situation is reversed, as it is traditionally applied research which takes priority. In contrast to the situation in Russia, the EU programmes encourage mobility, are very flexible and maintain close links with industry. This is reflected in the Seventh Framework Programme.

The 'Ideas' programme and certain thematic priorities are certainly interested in basic research but, as a general rule, it is applied research which tends to be favoured.

Another important difference concerns financing. Russia invests less in R&D than the EU Member States (1.17% of the GDP in 2004) and it is the government which continues to finance the greatest part of R&D expenditure in Russia (almost 60%); only one fifth (21%) comes from industry. That is much less than in EU countries where companies are the main source of the increase in R&D expenditure. As for foreign financing, this amounts to 7.5%, including the framework programmes.

There are, however, also points of convergence. The Russian Federation launched its new research programme this year. Intended to last six years (2007-2012) and with a budget of approximately €5.6 billion, the Russian federal scientific programme prioritises the same subjects as the Seventh Framework Programme: energy, the environment, biotechnologies, information and communication technologies, nanotechnologies and transport.

What is your opinion of the Seventh Framework Programme?

I think the new framework programme is the most ambitious scientific programme in the world and the most important instrument for economic growth in Europe. However, in my opinion, it is still a bit too bureaucratic. There is a need to plan a more simplified administrative procedure, especially for the Marie Curie programmes.

Is it this bureaucratic aspect which stops Russian researchers from participating in framework programmes?

In Russia, research programmes are much less bureaucratic but I do not think that is the only thing holding our researchers back.

As a general rule, it is quite difficult for us to participate in European framework programmes. Of about 50 000 participants in the Sixth Framework Programme, there were only 300 Russian researchers. This is partly due to our lack of experience but it is also due to the fact that it is quite difficult to obtain information on framework programmes. In Russia, there are only 11 centres which provide information on European programmes. Furthermore, the very structure of the programme makes it difficult for us to gain access. This is understandable, as since it is a European programme, it naturally gives preference to European researchers. Moreover, international cooperation only constitutes a minute part of the programme.

Alla Akulshina

Do you think that the increased international dimension of the Seventh Framework Programme will allow a greater number of Russian researchers to participate?

Yes, I hope so, thanks to the 'Capacities' programme and to the SICA (Specific International Collaboration Actions) which facilitate the participation of researchers from third countries.

However, I think a more fruitful collaboration could develop if we actively participate in 'Cooperation' programmes and in any thematic priorities where our approaches are complementary.

Currently, Russia and the EU have a lot in common both in terms of the research themes tackled and in the priorities given to them. I am particularly thinking of ecology, energy and the biotechnologies. If we could combine Russian expertise in basic research and European knowledge of applied sciences, the result would be all the more successful.

This cooperation would enable progress to be made both in European and Russian science. Unfortunately, to date, the level of Russian participation in framework programmes does not reflect our scientific capability.

reinforcing collaboration in R&D

The brain drain is a concern for the EU. Is this also the case for Russia and do you think that the EU mobility programmes may have an influence?

The brain drain is one of the major problems in research in Russia. It is estimated that 5 000 to 8 000 researchers have left Russia over the last eight years. This is the consequence of a policy that did not value science. Nowadays, the job of a researcher is no longer prestigious and salaries have decreased significantly. It is, therefore, not surprising that scientists are leaving Russia to find better working conditions elsewhere.

The Marie Curie actions facilitate the participation of researchers in framework programmes but, to address the brain drain, there has to be a programme at a central level, at the level of the state. A good example to follow would be that of China. Following the example of the Chinese government's policy, our government must create favourable conditions to encourage the return of expatriate scientists.

Space – one of Russia's strong points, and one with the most media coverage. Here the Soyuz launcher is ready for takeoff. © ESA

For more information

http://www.rciabc.vsu.ru/

Mathematics, an area in which the Russians are particularly brilliant. In 2006, the Fields Medal (considered the 'Nobel prize for maths') was awarded to Andrei Okounkov (Berkeley University). The hot favourite, Gregori Perelman, refused it and preferred to watch the ceremony on television in Saint Petersburg.

Prevention is better than cure

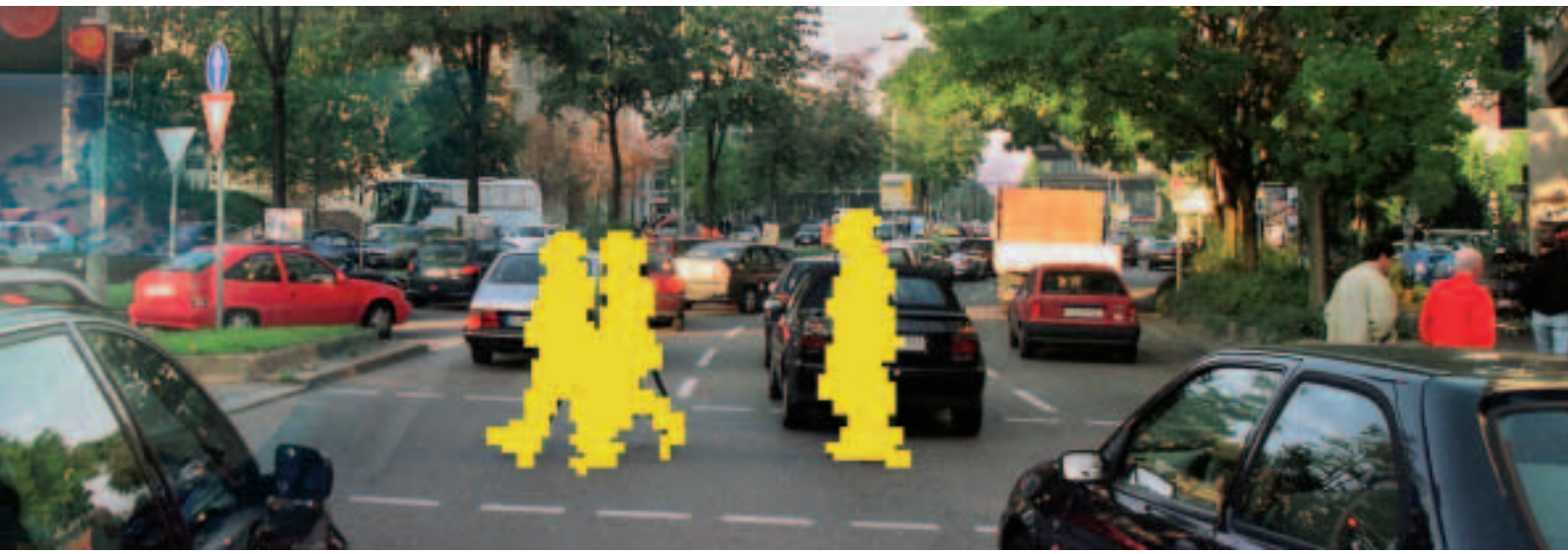
Visualisation of sensor data and detected and classified objects (vehicles and pedestrians) and their trajectories in a virtual three-dimensional world. The perception system is used to detect possible collisions and to mitigate their effects with focus on the protection of vulnerable road users by (semi-)autonomous braking which is the objective of *SP COMPOSE* within IP *PReVENT*.

Hi-tech systems will assist drivers and help to improve road safety into the future.

With over 42 000 road fatalities across the EU in 2004, improving safety is a top priority for European authorities. One way of working to achieve this is through the development of "safe" technologies, which can help drivers to avoid – or at least mitigate – accidents. Bringing together car manufacturers, suppliers, research institutions and associations, *PReVENT* is a project that researches preventative safety applications. Dr Reiner Wertheimer, Manager and Project Coordinator of BMW Group Research and Technology, reveals a little more about the programme and explains his company's involvement in the scheme.

How has the* PReVENT *project evolved since its launch?
PReVENT started as an initiative to promote technological progress in technical perception and actuation. However, during the project's preparation – which lasted about one and a half years – the research focus shifted to driver assistance and active safety functions, in order to accommodate the European Commission's 2001 initiative to halve the number of EU road accident victims by 2010.

Do you think this deadline is realistic in terms of PReVENT's goals?
The timeframe is quite short for us to have a widespread impact on traffic: research projects typically last three years, while pre-development and development cycles add another five. *PReVENT* started in 2004, meaning product launch will take place in 2012 at the earliest.
Since only around 8% of the car fleet is replaced every year, full market penetration will occur in 2024 – assuming a 100% take-up rate.
Having said that, the research was not started from scratch. *PReVENT* benefits from components and technologies developed in earlier R&D projects and, in turn, will feed into many future research projects.



How is the project structured?
PReVENT is organised into groups which carry out functional and cross-functional sub-projects. Four of the groups focus respectively on: safe speed and safe following distances; lateral support; intersection safety; and collision mitigation. A fifth group looks at combined activities: for example, integrating different safety functions at the level of the human-machine interface. Most sub-projects are application-oriented, while a few focus on technology. None of the projects have a budget exceeding €4 million, in order to keep individual activities manageable.

Which of the sub-projects has BMW been involved in?
BMW Group Research and Technology has mostly been involved in cutting-edge projects such as developing wireless local danger warning; integrating digital maps and autonomous cruise control; intersection safety; and collision mitigation through autonomous braking. Our interest in collision mitigation and pedestrian protection has also motivated us to promote the development of a distance-sensitive range camera. This allows detailed object distances to be captured in image sequences.

How does the* PReVENT *consortium work together?
DaimlerChrysler is PReVENT's coordinator, while each partner contributes to a different degree – BMW's contribution has been one of the largest. A core group of about a dozen key partners acts as the decision-making body for the project.
Collaboration has generally been good, although a few partners have struggled to deliver. At the sub-project level the organisation has been quite efficient but, on the macro level, this has been more difficult. The prestige surrounding the project, as well as the large budget of around €55 million – including €30 million in EU funding – has led to more political (and, in turn, management) oversight than usual, adding to project overheads.

What about Intellectual Property?
The guidelines are clear. The project generally is "open source", though not all of its components are. Past knowledge is provided if essential for the project, but this cannot necessarily be used by partners outside the project. New knowledge is available to those participants who contributed to developing it.

What will happen when the research ends in 2008?
Many useful applications will have been demonstrated by this deadline. But not all will translate directly into products, as industrial R&D processes are quite complex. A great deal of effort is required for pre-development, focusing on production reliability, adequate packaging, small weight and power consumption and low production cost.
For reasons of product liability, the legal implications need to be considered, along with a detailed investigation as to how the new functions will actually work in traffic. Field-testing has been proposed in order to facilitate and accelerate the introduction of products onto the market. However, partly since accident scenarios are so diverse, large fleets of standard vehicles would be required to ensure the statistical significance of such investigations.

For more information:

http://prevent-ip.org/
http://bmw.com

Right on track

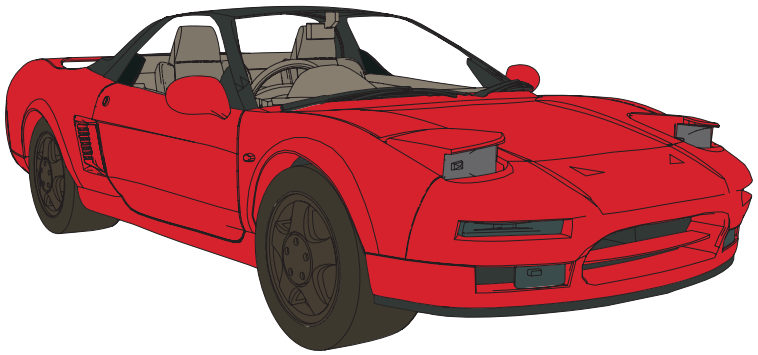
A future full of* PROMISE *for anyone wanting better product information, thanks to new smart technologies.

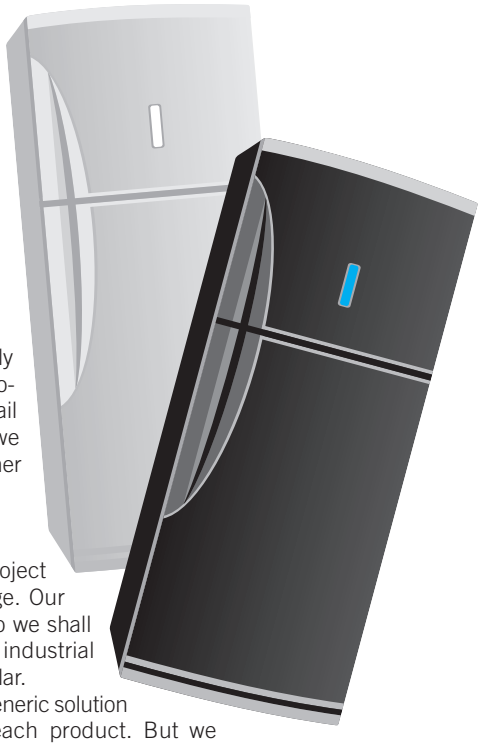
How much does a car salesman really know about a vehicle's history? And what could a fridge manufacturer tell you about the future of his white goods? The answer is, probably not all that much. To change this, and ensure better customer service, an innovative idea has been put forward by the *PROMISE-PLM* (Product Lifecycle Management and Information Tracking using Smart Embedded Systems) project. Through the use of smart technologies, it aims to make information available at any stage of a product's lifecycle and anywhere in the world. Funded under FP6, *PROMISE* focuses on developing a system to gather, process and deliver this data. The project has 22 partners, including the Finnish SME Trackway. Timo Nurminen, Director of Consulting at this information-tracking company, provides some insight into the initiative.

How did Trackway become involved in the* PROMISE *project?
We were doing a local project with the Helsinki University of Technology, an early member of the *PROMISE* consortium. We were involved in a project with them at the time and it was through them that we were introduced to the consortium.

What does the project aim to do?
It is addressing an industrial problem: when durable goods like refrigerators or cars leave the factory, the producers really have no idea what happens during their lifecycle. Of course, some data can be stored – if you take the product to an authorised service dealer – but in most cases this does not happen.
What we want to do is provide information throughout a product's lifecycle – when is it serviced, what parts are being changed, what is the condition of the product in its end-of-life stage, which parts were recycled – and to feed this information back to the manufacturing and R&D process.

What is your company's role in the process?
Trackway's contribution is to create software that enables this tracking, so that each player involved with a product can see what the others have done.
Industrial Property (IP) implications is one of the key research areas. We have developed software that allows each participant to limit data-sharing: for example, the service company might want to share the maintenance history, but not how long it took for the maintenance to be carried out.





"When durable goods like refrigerators or cars leave the factory, the producers really have no idea what happens during their lifecycle."

How frequent is Trackway's contact with the other consortium members?
It is very regular – we have weekly conference calls, regular face-to-face meetings and a lot of e-mail exchanges. And, of course, we are cooperating closely with other software providers like us.

How is the project progressing?
We are 26 months into the project now and past the halfway stage. Our first products are now ready, so we shall soon start piloting them with industrial end-users like Fiat and Caterpillar.
Initially, we wanted to create a generic solution which could be adapted to each product. But we quickly realised that the industrial scenarios and requirements vary greatly and that the product specifications varied too much. So, now we have adopted a modular approach: different sets of hardware and software can be combined to provide a solution that is suitable for the specific product, from consumer electronics to heavy manufacturing.

Who will get product ownership at the end?
That is quite a thorny issue. IPR (Intellectual Property Rights) agreements were made at the beginning, but as the project has changed and evolved, companies have been forced to use some of their existing IPR. The Commission has just been reviewing this issue with us. One of the aims of the project is to create an open system and standards, though it is very difficult to achieve.

What benefits has your company gained from involvement in the consortium?
The most important has been the opportunity to network. We have had such good feedback from end-users, who have been far more open than usual. As a result of being in the consortium, we have been given first-class information about industrial requirements.
Of course, the fact the project is Europe-wide has created some practical problems from the project management side. It has involved a lot of travel, and companies are in different time zones. But there are many different companies involved and we have made some good contacts that we intend to develop into working relationships outside the project.
Finally, we plan to commercialise our own product solutions here in Scandinavia, by using the different modules that have been developed, once the IPR issues have been resolved, of course.

How do you see the future?
The project deadline is very clear. If the consortium wants to continue after that, we need to look for different, commercial-focused funding. On the plus side, the prospects look good, we are on schedule and I remain optimistic about the results we can achieve.

For more information

http://www.trackway.eu
http://www.promise-plm.com/

Oceans: the Final Frontier

In the quest to tap into a hidden wealth of resources, underwater research is heating up for partners across Europe.

"This project has an important educational role in informing society of humanity's effect on this fragile environment."

Europe's deep-ocean margin stretches over a distance of 15 000 km along the Atlantic Ocean from the Arctic to the Iberian margin and from western to eastern Mediterranean, and to the Black Sea. Vast and complex, this frontier contains an abundance of biological, energy, and mineral resources – which the EU aims to develop. First, it must find out more about the structure and dynamics of the ocean margin ecosystems, which are vulnerable to over-exploitation and pollution.
In 2005, 45 partners from 15 European countries joined forces to launch the Hotspot Ecosystem Research on the Margins of European Seas (*HERMES*) project. Coordinating efforts along the whole European margin, *HERMES* aims to study "hotspot" ecosystems – exciting environments full of unknown species. With small businesses making up nine of the consortium's members, Jordi Teixidor from the technological SME, Praesentis, explains his company's role.

How is Praesentis contributing to the* HERMES *project?
Praesentis is basically involved in system integration and the development of submersible platforms that can go to a depth of 500 m. Our platforms capture images, as well as geophysical and chemical data, and we have systems to analyse this. We are thus focused on the development of submarine telepresence – remote-controlled robotic sensors – working in an underwater environment.
We are also developing new systems – a number of different vehicles of varying complexity, from small remotely operated vehicles (ROVs) to a dredge submarine. Alongside this, we are also developing our analysis capabilities.

Has your company taken part in any* HERMES *expeditions?
Yes, we have been involved with one of our standard products – Bleeper EVO – in search-and-locate campaigns off the Spanish coast. So far, we have been looking for coldwater coral at a depth of 130-150 m.
HERMES is basically a group of small projects doing the same thing in different locations, which will together create a map of Europe's deep-sea frontier.

How much involvement do you have with the international* HERMES *network?
Obviously we get involved during the expeditions but, at the level of system development, we are basically engaged with the local partners here in Spain. Most of the expeditions are about systems-testing off the nearby coastline since we have some large underwater canyons in the region.

What is your impression of the project up to now?
I believe it is one of the best-organised projects we have ever been involved in. The project coordination by the National Oceanography Centre in Southampton (UK) is excellent. This goes as much for support as for development. It is a very complex job to coordinate between 30 and 40 research centres at the same time and they are doing an impeccable job.

Does the project face any particular challenges?
It is true the project is very big and investigating sea depths requires a lot of sophisticated resources. For example, there are hardly enough oceanographic boats in Spain – or in Europe for that matter – that can meet the demand that has now been created by *HERMES*. The sea is enormous, so mapping out even this small part is proving to be a challenge. If we manage to map out the whole European seaboard it will become a reference point around the world.
We also think the project could be better publicised. It has an important educational role in informing society of humanity's effect on this fragile environment. In Spain, for example, there is little awareness of the sea – it is basically about going to the beach and meeting friends. Yet the sea is full of life and we need to know more about it before that life disappears. There are already some awful "dead zones" that have been created, the result of pollution and overfishing. We hope in some small way to contribute to raising awareness, by creating telepresence systems that allow a better understanding of the underwater environment.

What support has* HERMES *provided to* Praesentis *as an SME?
Of course we receive institutional support, although as a hi-tech company our participation is not about raising our R&D. The project is not, strictly speaking, a profitable venture for our company, because the budgetary contribution is only a small part of the costs needed in developing our systems. Most of the *HERMES* budget goes to the research centres and, for those SMEs like us involved in developing technological platforms, the allocation is rather minor and does not cover the development costs. Instead, the major advantage for us has been building relationships with different partners across Europe – major players in oceanographic research who could, in the future, be potential clients for our products. Above all, the association with such a project gives us a lot of prestige. This project is very ambitious in scope and it is a pleasure to be involved.

For more information

http://www.praesentis.com
http://www.edu-hermes.org/

KI-AB-06-S01-EN-C

Loud and clear

EuroHear ***aims to discover more about genetic causes of deafness – and communicate its findings across the scientific community.***

Hearing impairment affects over 10% of Europeans, a total of more than 40 million people across the EU. Given the number of citizens affected, the European Commission's decision to fund the *EuroHear* project under FP6 in 2005 speaks for itself. The initiative brings together 250 scientists from 10 countries, with research focusing on inner ear development and age-related hearing loss. As *EuroHear*'s scientific coordinator, Professor Christine Petit of the Institut Pasteur, explains, the project is designed to improve interaction between those in different scientific fields as they work together to discover more about the causes of deafness and, ultimately, develop a cure. Given its success to-date, *EuroHear* intends to carry on its work under FP7.

What are the aims of the* EuroHear *project?

Our main objectives are to elucidate the genetic bases of deafness and to decipher the pathogenesis of the various forms. We also aim to understand how the cochlea – the sensory organ in the ear – works. Our goal is to put these two fields of research together and thus to pave the way for developing preventive and therapeutic approaches to deafness. With these objectives in mind, our ambition is to achieve European multidisciplinary research on the functioning and dysfunctioning of the cochlea.

Why is the research carried out under* EuroHear *so important?

Deafness is a serious handicap but, as it is not immediately visible, it tends to be neglected. The social cost of deafness is very high since it impedes communication between people.

Our scientific challenges can only be met by combining medical, experimental and theoretical scientific approaches.

What are some of the challenges you face in this project?

Bringing together experts from different fields is only the first step: the greatest hurdle is to succeed in working together. Each of us has his or her focus of research and the willingness to work together is not enough when the fields of scientific expertise are so distinct, for example, between genetics and biophysics. This is why we have prioritised multidisciplinary training on the cochlea in *EuroHear*. Each year, 30 scientists are invited to participate in courses on cochlear physiology, biophysics, imaging, genetics or other areas. The feedback we have got from the participants has been extremely positive. These are unique occasions for exchanges between young scientists throughout Europe and they can then develop into collaborative projects.

Do you hope to find a treatment for hearing impairment as a result of your research?

Certainly. We are developing several approaches to achieving this. Certain groups are focusing on the regeneration of the damaged cochlea, some on improving the mode of delivery of drugs in the cochlea, and others are committed to the *in vitro* and *in vivo* screening of drugs.

This project is set to last five years – is that long enough to achieve your goals?

Research to find the deafness genes and to decipher cochlear biophysical properties and molecular mechanisms is improving – and this can be attributed to the sharing of resources. Thanks to *EuroHear*, projects which started out as competitive (between European scientists) have now become collaborative. Even so, although the process of creating an authentic European multidisciplinary research area concentrated on the cochlea is now underway, it will take time. It requires a kind of "cultural change" in order for scientists to develop a common language.

"We have embarked on an ambitious project that bridges scientific disciplines. The European dimension of the programme provides a real added value regarding this objective."

Does this mean that you hope to obtain funding under FP7?

Indeed, that is one of our great hopes. There is some concern that, so far, nothing specific has been allocated within FP7 for research related to the sensory organs – except a Coordination Action on hearing impairment and degeneration. Even though Europe has a strong position in this field of research, it cannot be maintained without proper support.

Moreover, we have embarked on an ambitious project that bridges scientific disciplines. The European dimension of the programme provides a real "added value" regarding this objective. However, it needs to be extended into FP7 and to be properly reinforced in order to get the full benefits of our initiatives.

I am not saying that the research should be open-ended, but a longer and more flexible timeframe should be envisaged when necessary. At the same time, this flexibility would in no way dampen our enthusiasm for starting up new research fields.

For more information

http://www.pasteur.fr
http://www.eurohear.org/