

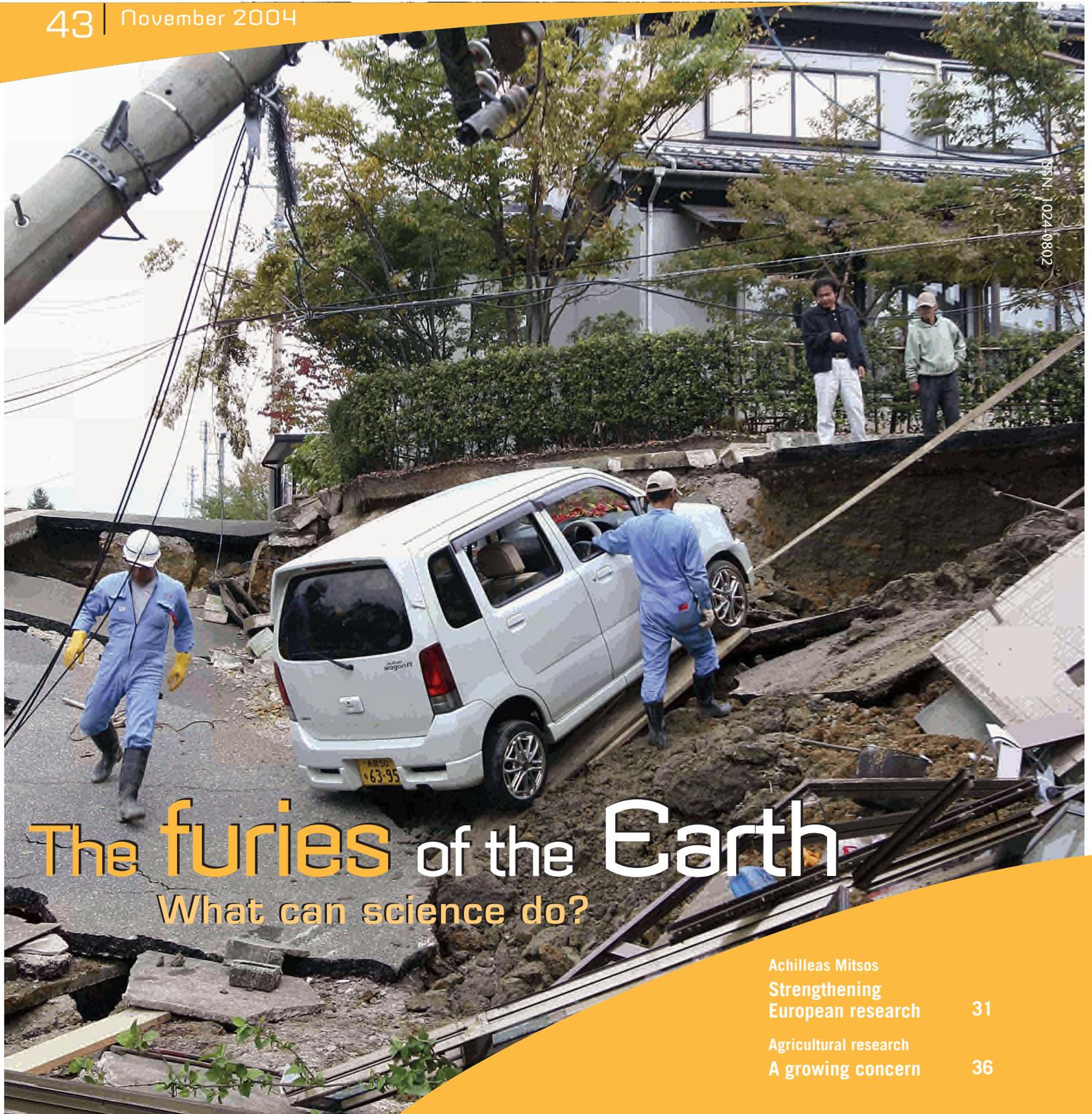
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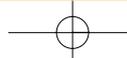
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The furies of the Earth

What can science do?

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Editorial

One of the first acts of incoming Commission President José Manuel Barroso – even before taking office – was to create the post of Commissioner responsible for communication.

Although it has been widely welcomed, this initiative is certainly not the end of the story. When it comes to communication, responsibility must be collective.

The reality is that public forums for genuine communication are rare in our information society. They are notably absent from the media, schools, and public and private organisations of all kinds.

Incommunicable Europe?

Meanwhile, those in charge say it is not their responsibility. In this, they are very wrong: strictly speaking, Europe belongs to nobody and to everybody. With the internet, information has taken priority over communication. The electronic networks are awash with documents, presentations and speeches. But not enough time and space is available for communication.

The same could no doubt be said of science. Where are the public domains for communication? Where are the public communication forums? Admittedly, scientists are increasingly speaking to citizens. In some cases, the layman is able to address and even understand the man of science. But while scientists may be ready to listen

to citizens, they rarely hear what they are saying. That is because there is more to communication than a stream of information, sometimes flowing in one direction and sometimes in the other. Communication implies mutually enriching messages and the forging of a genuine relationship. In this respect, the few successful communication experiences are no doubt public consultations, such as the consensus conferences, scenario workshops and the discussions of proposals organised in a growing number of countries. Given that communicating on the subjects of science and of Europe are notoriously difficult tasks, can we really speak of communication on European research? Are the messages getting across? In both directions? ■

FEATURE

Earthquakes

The united science of seismology

What can science do in the face of disasters unleashed from the depths of the Earth? Seismology and volcanology are young but developing disciplines. Geophysical and geological research, satellite observation, and the painstaking analysis of every major earthquake are fuelling the knowledge of researchers.



Forecasting earthquakes

4 Seismic warnings: the Icelandic laboratory

Local seismic activity

6 Dealing with the local 'site effects' of an earthquake

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14 Goodbye, Mr Busquin

Combative yet unassuming, Philippe Busquin has left his mark on European research. Scientists, politicians and industrialists who worked with him during his time as Commissioner pay homage to the man.



Medical research

16 Reducing congestion on the inflammation highways

Researchers from 13 European institutes are co-operating as part of a Network of Excellence that is seeking to shed new light on cell migration. When this mechanism goes wrong, various kinds of chronic inflammation can result, such as asthma and arteriosclerosis.



Nutrition

18 Childhood diets

The diet of newborns and of expectant mothers triggers a process of metabolic programming that marks us for life. Projects in the Infant Nutrition cluster are studying the effect of this little-known mechanism on foetal growth, child obesity and insulin-dependent diabetes.



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Interview

31 Strengthening European research

The Commission has set the goal of doubling the European research budget. There are plans to set up a European Research Council, increase technological excellence and put in place new European infrastructure. Achilleas Mitsos, Director-General for Research at the European Commission, explains why and how all this will be possible.



Science and society

33 Neighbourhood science

'Science Shops' are a crucial interface between scientists and citizens. These grass-roots research organisations carry out studies, audits and research – usually free of charge – on questions raised by the local community.



Agricultural research

36 A growing concern

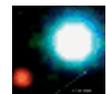
What if we returned to the traditional combination of arable land, meadows and trees? Researchers on the SAFE project are working on experimental plots in which rows of nut trees and poplars are intercropped with wheat and lucerne. The results are positive for production as well as the environment – a concept that should be of interest to the common agricultural policy.



Exoplanets

40 Capturing distant worlds on film

A young brown dwarf and, in its orbit, an astral body that is an exoplanet no less! We knew these heavenly bodies existed, but had never 'seen' one before. A unique image, thanks to the European Southern Observatory's (ESO) Very Large Telescope in Chile.



On the cover: 26 October 2004. The earthquake that struck the Niigata prefecture, in central Japan, was the most deadly to hit the country since the Kobe earthquake that left 6 433 dead in 1995. © Getty Images

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this increased biodiversity could also have negative effects, such as encouraging the return of rodents, slugs and other harmful species. Although, so far there is no significant indication of this effect," stresses Christian Dupraz. "But the effects of biodiversity, whether positive or negative, are difficult to demonstrate as you need protocols that permit rigorous comparisons."

Agroforestry is rooted in the general desire for a less one-dimensional and productivist agriculture, one that is less dependent on fertilisers, weed killers, insecticides and other chemical products. "What I like about this line of research," concludes Christian Dupraz, "is that it leads us to analyse the quality of the models invented by nature itself. When you look at dozens (or even hundreds) of hectares given over to a single crop, with the same genomes infinitely repeated, you are contemplating the exact opposite of what nature produces. What we are trying to do is to reintroduce the logic of the naturally diversified ecosystem into the cultivated agrosystem. It is a way of making it more stable and autonomous, less aggressive for the environment and – paradoxically – more productive." ■



The Dehesa, Europe's largest traditional agroforestry system, covers over

3 million hectares in Spain and Portugal.
© Christian Dupraz – INRA



© Fabien Liagre - Agroof

Not coming into leaf until May, the walnut tree allows the crops to receive the necessary sunlight early in the year. It can be combined with cereals whose growth is concentrated in the spring. This combination is still practised in certain areas of France. Opposite, the walnut is intercropped with lucerne (in the Dfois), sunflower (Périgord) and lavender (Provence).



© Christian Dupraz – INRA



© Christian Dupraz – INRA

To find out more

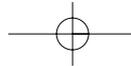
- Site of the SAFE project
www.montpellier.inra.fr/safe/
- 1st World Congress on Agroforestry
<http://conference.ifas.ufl.edu/WCA/>
- World Agroforestry Centre
www.worldagroforestrycentre.org/

Virtual crops

As part of the SAFE project, the University of Wageningen (NL) and the INRA in Montpellier (FR) developed agronomical models. These 'simulators' take into account the characteristics of a particular crop, tree and region and then forecast the effects of combining them. Such decision-making tools are all the more valuable as it is not easy to experiment in agroforestry. To carry out field tests for ten different crops and ten varieties of trees it would require 100 hectares to identify the best combination... and take over 50 years, the average time it takes for a tree to reach maturity! Using these models it is possible, for example, to plant cherry trees virtually alongside colza in southern Germany, observe the system's limiting factors and ways of improving them, and then compare them with another combination. The experience can then be repeated for Ireland or Greece, for example.

Europe learns from the tropics

Agroforestry remains dominant in most tropical countries (90% of the surface area in Sri Lanka, for example). This constitutes a pool of knowledge and practices, studied by the major institutes of tropical agronomy, that the SAFE researchers were able to draw on. They established links with the World Centre for Agroforestry in Bogor, Indonesia, and compared their modelling techniques. The 1st World Congress on Agroforestry, held in Orlando (USA), was attended by 800 delegates from 120 countries (from Mali to Ecuador, and including the Philippines, Nepal and Malawi) and showed the global interest in the practice.



Very close to the young brown dwarf is a cold object, clearly visible. This sensational picture is causing a frenzy of excitement among astronomers who interpret it⁽¹⁾ as the first picture ever taken of a planet orbiting a star outside the Solar System (an exoplanet). It was taken by a team from the astrophysics laboratory in Grenoble (FR), using the NACO optical system on the European Southern Observatory's (ESO) Very Large Telescope in Chile.

Capturing distant worlds on film

The presence of a planet, comparable to those in our own Solar System, orbiting the 51 Pegase b star – a star similar to our own Sun – was first detected in 1995. This exoplanet had never been seen before, although its existence had been deduced from the tiny changes to the light emitted by its star when it passed in front of the observation telescope.

Since then the world of astronomy has been in a frenzy of excitement due to a series of discoveries of this kind, telling us a great deal about the very diverse mechanisms of planetary system formation. It is knowledge of this kind that may one day lead us to indications of extraterrestrial life. About 2 000 stars similar to the Sun are today being observed and the presence of 123 exoplanets have already been inferred by the star hunters.

The picture taken from the ESO's Mount Paranal Observatory in Chile, in June 2004, marks a dramatic step forward in the search for an actual – rather than deduced – sighting. "This picture is a first step towards opening up a whole new field in astrophysics: the study of planetary systems using imaging and spectroscopy," explains Anne-Marie Lagrange of the Grenoble Observatory (FR) which participates in the work carried out at the ESO. "Direct observation will enable astronomers to characterise much more precisely the physical structure and chemical composition of exoplanets."

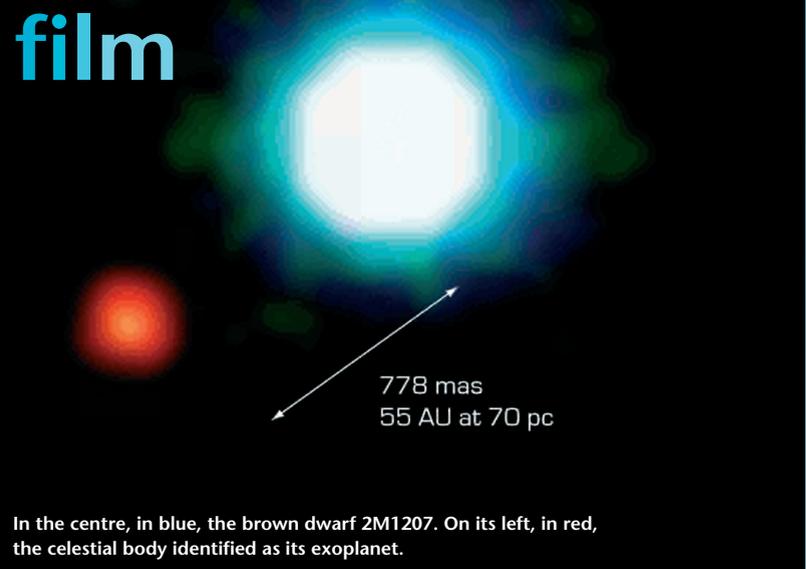
The exoplanet was caught orbiting an astral body known as 2M1207. Located just (in space terms) 230 light years from Earth, this young brown dwarf – that is, a cool and dim star, akin to a 'failed sun', whose mass and temperature are too low to sustain nuclear fusion – was itself only identified very recently, in April 2004. It lies in the TW Hydrae stellar association, a group of nearby stars, just a few million years old. "Whatever their nature, substellar objects are hotter and more brilliant when they

are young (10 million years old) and are, therefore, more easily detectable than older objects of similar mass," stresses the ESO astronomer Gaël Chauvin, coordinator of the joint European-US team that has been studying this phenomenon since 1998.

As for this young exoplanet itself, it is still 'warm' (1 000°C), which explains its visibility. It is five times the mass of Jupiter (or almost 1 600 times that of the Earth) and its orbital trajectory is about 55 times the distance between the Earth and the Sun (8 billion km). Its light spectrum shows the presence of water molecules. For Christophe Dumas, another astronomer engaged in this adventure, "it is incredible to actually be able to see this weak source of light in real time. It is a strange feeling when you think that this may be the first picture ever seen of a planetary system other than our own." ■

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Capturing distant worlds on film



In the centre, in blue, the brown dwarf 2M1207. On its left, in red, the celestial body identified as its exoplanet.

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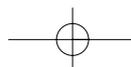
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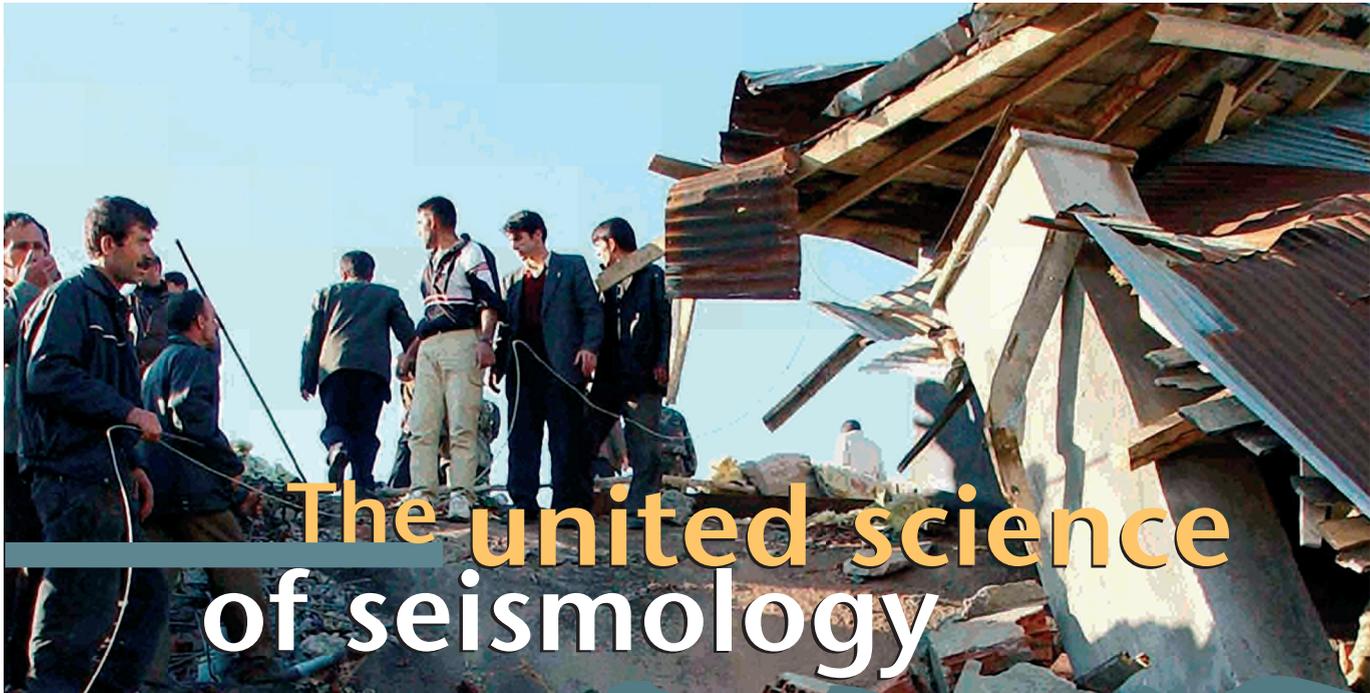
- www.eso.org

European hawk's eyes

This picture of an exoplanet was made possible thanks to the unique performances of the new NACO (NAOS-CONICA) instrument fitted to one of the giant telescopes (VLTs) at the ESO in Chile. Due to its deformable mirror, which compensates for atmospheric blurring, the NAOS adaptive optics system (developed in France) provides corrected pictures of a quality almost identical to that which would be obtained by a telescope placed in space. These pictures are recorded by the CONICA camera (designed in Germany) that operates in the near infrared.

(1) Although this interpretation is considered to be very probable (over 99%), it will be another one or two years before it will be possible to give 100% confirmation that the object identified is a planet. That is why the exoplanet is still referred to as a Giant Planet Candidate Companion (GPCC).





The united science of seismology

The furies of the Earth can be awesome. Of the many destructive natural risks that humanity must face, earthquakes are perhaps the cruellest, due to the sudden and unpredictable nature of the violence they unleash. Although they are largely concentrated in known risk areas, there are a great many of them and some remain deceptively dormant for long periods. Paraseismic engineering techniques used in building construction are an important weapon against the destructive force of earthquakes. This protection saves many lives in the world's more developed regions which can afford to build in this way. Elsewhere, earthquakes continue to sow death and destruction. The most terrible of all struck Tangshan, China, 29 years ago, leaving between 300 000 and 800 000 people dead or missing. And Japan, hit regularly, has just suffered a further earthquake, with 4 000 aftershocks, in October in the Niigata prefecture. Europe is also often affected.

What can science do in the face of such cataclysms unleashed from the very depths of the Earth? The first step is to know and understand the phenomenon. Seismology and volcanology are new disciplines. Formulated as an uncertain hypothesis in the first half of the 20th century, plate tectonics has only come into its own as a science in the past 40 years. Thanks to geophysical and geological research, the study of data transmitted by a worldwide network of hundreds of thousands of sensors, satellite observation, and the detailed analysis of every earthquake of any importance, a vast body of knowledge is gradually being built up.

Is it possible that science will, one day, achieve the ideal objective of forecasting earthquakes? Natural disasters are essentially random. It would seem presumptuous to expect researchers to become reliable forecasters of such events, even if, on some occasions, this has already proved possible. We are exposed to an array of natural and human-induced environmental risks. Science can be a means of 'taming' them to limit the damage they cause, but not of eradicating them.

Due to the extreme fear they instil, no doubt more than any other natural disaster, earthquakes have always aroused strong emotions and given rise to powerful expressions of international solidarity. Seismology is a science that is particularly oblivious to national borders. It is a field in which Europe contributes knowledge and expertise of the very highest level to the international effort to understand this devastating phenomenon.

An aid operation in Bingol, in the south-west of Anatolie (Turkey), where an earthquake measuring 6.4 on the Richter scale occurred on 1 May 2003.

© Abc Agency/Gamma/Photo News

Devastating earthquake of 21 June 2000
in southern Iceland.
© Agust Gudmundsson



Grounds for concern

Participants in the Prenlab project, which completed its work in 2001, were also able to monitor live a second remarkable double seismic episode. In this same region of south-western Iceland, just after midnight on 17 June 2000, there came a new and more violent earthquake, this time measuring 6.6 on the Richter scale.



Immediately after the first tremor, scientists on the spot deployed all their resources to analyse the many facets of this earthquake and the aftershocks that followed. Their observations quickly gave cause for alarm. During the night of 19 June, that is 80 hours after the first earthquake, they warned the authorities that a second earthquake of about the same magnitude could strike at any time and provided quite a precise map of the likely location (see page 4). As predicted, the next night it struck.

Since 2001, the fruitful European co-operation of the Prenlab project has continued under the Prepared project. The latter's mission is to study all the data recorded before, during and after the June 2000 earthquakes and to learn as many lessons as possible from them. All the micro-shocks recorded in advance of the two earthquakes are being scrutinised carefully, as is the information obtained from sensors placed at drilling points, changes in radon concentrations in borehole water, variations in the shear-wave splittings, etc.

"One should not imagine it will be possible to have clear and reliable forecasting in anything like the near future," stresses Ragnar Stefánsson. "The two successful experiences during the Prenlab project certainly prove it is possible, but subject to three conditions. You need excellent knowledge of a zone's tectonic conditions, an understanding of the processes at work in the underlying section of the Earth's crust, and an effective and highly developed system of geophysical observation that functions in real time. Viewed in this light, the further European research carried out by the Prepared project certainly has a scientific significance that goes beyond the Icelandic laboratory. It benefits the geophysics community worldwide."

To find out more

- **Prenlab:**
<http://hraun.vedur.is/ja/prenlab/>
- **Prepared:**
<http://hraun.vedur.is/ja/prepared/>
www.geophysik.uni-kiel.de/~geo43/research/projects/prepared.html

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Forecast or prediction?

When speaking of the future, the words forecast and prediction differ in terms of probability. The first, backed up by an array of reliable, cross-checked indicators that can be modelled, often concerns the near future, as in weekly weather forecasts. Seismologists, never quick to presume anything when it comes to the unfathomable mysteries of the underground world, prefer the latter term. With few exceptions, the present state of knowledge only allows them to make long-term or, at best, medium-term predictions.

These are based on a large array of data. First, there is the increasingly precise map of faults that correspond to the boundaries between the Earth's tectonic plates. Then there is the painstaking analysis of past earthquakes. Given a more or less constant tectonic pressure, rocks of a certain kind are presumed to experience cyclical ruptures of a comparable magnitude. If this does not occur, one speaks of a 'seismic gap', i.e. a growing probability of an earthquake due to the unrelieved build-up of stress. Finally, there are the new technologies of geophysical surveillance (see the case of Iceland), such as the increasingly numerous seismographic stations, probes, satellite pictures and GPS that measure movements on the edges of faults down to the last centimetre.

The question of precursors

Indicators known as precursors can provide a basis for more immediate forecasts. One example of this is the slowing of micro-seismic waves, illustrated in the case of the Prenlab project – but this phenomenon has only been observed in a very limited number of earthquakes. The study of radon concentrations in underground water in an active fault has become a classic precursor, although such an increase in radioactive gas can be linked to other causes, particularly climatic. Measurement of water levels in wells and the presence of bubbles are other indicators.

In the 1980s, Greek researchers discovered the pre-seismic existence of electric currents circulating in the quartzite subsoil. However, in addition to the fact that this rock is very particular to certain zones, the validity of their modelling has been much discussed. Reliable studies have confirmed the reality of changes in animal behaviour in the moments immediately preceding an earthquake.

The use of these precursors is, therefore, a very delicate matter. However, there is one model case. During the 1960s, China, a country prone to violent earthquakes, launched a mass campaign designed to alert the population to these precursors. This proved very successful and led to the early warning of the powerful earthquake, measuring 7.3 on the Richter scale, that struck the Haicheng region on 4 February 1975. Unfortunately, just one year after this unique experiment, the Tangshan quake, probably the most murderous on record, hit the country without warning and left hundreds of thousands dead.

Deep geophysical investigations to understand plate tectonics are essential to the evaluation of seismic risks. At the same time, they are generally of little use in forecasting the real damage an earthquake, sometimes of average magnitude, can cause on the Earth's surface. There is always going to be a specific 'site effect' that is dependent on low-depth geology. Over the past decade, evaluations of this effect have been central to preventive earthquake research, focusing in particular on the phenomenon of seismic noise. The Sesame project has made a major contribution to our knowledge in this field.

The violent earthquake, measuring 8.1 on the Richter scale, that hit Mexico City in 1985 had its epicentre about 350 km away, in the Michoacan region. Paradoxically, this area lying closest to the origin of the earthquake experienced much less destruction. The same scenario was repeated in San Francisco in 1989: the epicentre of the earthquake that measured 7 on the Richter scale was no more than 100 km from the city, but even at the very heart of the Californian bay, the extent of the tremors varied in intensity and the destructive force from site to site.

Every significant earthquake holds its own surprises in terms of the relative intensity at specific sites, such as occurred in Athens (EL) in 1999 and San Giulano di Puglia (IT) in 2002. These disparities – known as 'site effects' – have long been the subject of careful study by seismologists and are known to reflect the soil geology and topology of the immediate location. These geoseismological studies have progressively built up a valuable body of knowledge. We now know that solid geological formations (rocks) transmit seismic movements without transforming them, while sedimentary sandy or clay soils – that are much less rigid – serve to amplify the very destructive surface waves. Alluvial valleys are particularly sensitive in this respect. The same is true of sites where layers of a different nature are either superposed or adjacent. In-depth research has shown that such configurations can give rise to phenomena of seismic wave trapping, creating a resonating effect as in a violin, amplifying the intensity and the duration. Relief can play a similar role, although generally to a lesser

degree. A wave crossing a mountainous region will concentrate its energy in the peaks that are consequently subject to more intense vibratory movements.

From *ex post* to *ex ante*

Knowledge acquired of site effects analysed after the event naturally raises the question of whether or not the earthquakes could have been anticipated. If so, we would have a valuable preventive tool to be applied to town planning. It is advisable to carry out seismic microzoning operations before expanding towns, for example, and to adapt locally the minimum parasismic construction standards to take account of subsoil configurations. This is particularly pertinent for the siting of engineering works such as viaducts, tunnels and dams, or risk industries, such as nuclear power plants and chemicals factories.

In terms of methodology, obtaining a reliable estimate of the site effect at a given location is a complex affair. A qualitative knowledge of geological formations and their geometry is far from sufficient, as it is also necessary to predict quantitatively how these formations are going to behave in response to real waves. Digital modelling is a promising tool but requires precise geotechnical and geophysical surveying, the cost of which our society seems – paradoxically – increasingly less prepared to meet. This makes it essential to explore other, less-costly surveying techniques that are able to provide reliable information either on these parameters or directly on the site effects themselves.

Dealing with the local 'site effects' of an earthquake

In areas with a very high seismic activity, it is sometimes possible to observe the ground response to low magnitude tremors, but such sources remain random. In the vast majority of regions with a dormant seismicity, there is no observable seismic activity of any significance for years or even decades at a time. Also, in urban areas, an added difficulty is posed by what is known as 'seismic noise'. Although insignificant on the Richter scale, this is produced by human activities (earthworks, drilling, road and rail traffic, etc.) or certain natural phenomena (waves breaking on the coastline, avalanches in mountainous areas, etc.).

An ingenious engineer

In 1989, the Japanese seismologist Nakamura nevertheless revolutionised the world of applied seismology. He was the first to suggest that this seismic noise, possibly caused by artificial surface vibrations, could be analysed to significant effect in regard to the site effect of a given location. His empirical methodology, known as the H/V technique, established that the spectral ratio between the vertical and horizontal components of noise recorded at a given site make it possible to establish its capacity for a frequential response to seismic waves. This sparked a surge of scientific interest in seismic noise analyses over the past decade. Other Japanese research teams have also shown that the 'dense network' or 'array' recording of ambient vibrations could also be a very effective tool in extracting quantitative parameters on the subsoil structure, in particular the speed at which seismic waves spread, and to a great depth.

Over a period of three and a half years, beginning in 2001, more than 80 researchers from 14 geophysics institutions worked on the vast Sesame project (Site effects assessment using ambient excitations). Their aim was to

develop a better command of the theoretical and methodological bases for the use of seismic noise to produce valid estimates of the site effect. "The main attraction of this approach is its ease of use at a very low cost," stresses Pierre-Yves Bard of the Laboratoire de géophysique interne et tectonophysique (LGIT) in Grenoble (FR). "However, it is necessary to make sure that this cost benefit is coupled with reliable results. There isn't a scientific consensus yet on the validity of their physical basis or real confidence in the conclusions regarding site effects. The major drawback of these methods, and especially the H/V technique, is that they were developed in a purely empirical manner. They raise high hopes but, in the early stages, too little research was carried out to clarify their

physical foundations. The danger is that the current enthusiasm for these techniques will have a distorting effect and lead to completely false results."

The Sesame project first sought to elucidate the quite vague concept of seismic noise analysed at a given site. The first objective was to determine the physical characteristics of the noise sources. Are they local or distant? At what depth are they produced? And what are their temporal characteristics? A great number of site tests were carried out (in Basle in Switzerland, Colfiorito in Italy, Grenoble in France, Liège and Uccle in Belgium, and Thessaloniki in Greece) to measure the ambient noise and to compare this with the results obtained by digital modelling that artificially reproduces the

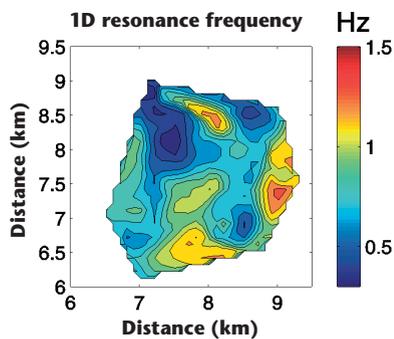
batteries of vibrators located at many points in the locations studied. A very large number of digital experiments were also carried out on simple and perfectly controlled structures to test the capacity of these methods (H/V and array) to identify pertinent characteristics of the subsoil or site effects.

Disseminating knowledge

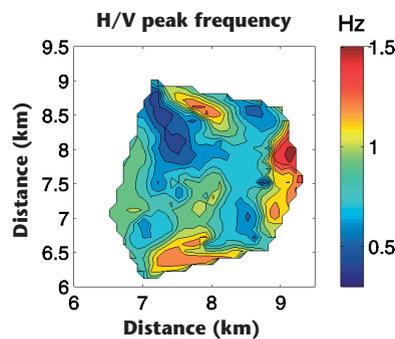
Software programmes and user guidelines have been developed for both these methods of analysis. In particular, significant improvements were made to the 'array' technique that, although very promising for measuring the propagation of surface waves, is not widespread in Europe. For the H/V technique, a practical guide for making and interpreting measurements was compiled, plus supporting multi-platform software. This could ultimately help 'standardise' this method and control its use. A use that could then become routine in the framework of parasismic regulations.

The conclusions of the Sesame project were presented and discussed at the 13th World Conference on Seismic Engineering, held in Vancouver in August 2004. "We do not claim to have succeeded in answering all the complex questions posed by the use of seismic noise," concludes Pierre-Yves Bard. "But I believe we have made an important contribution to the immense research effort carried out on this subject on every continent." ■

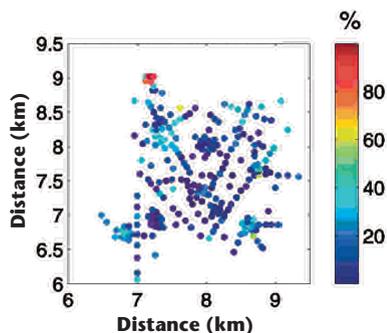
SIMULATION OF SEISMIC NOISE IN THE COLFIORITO BASIN (IT)



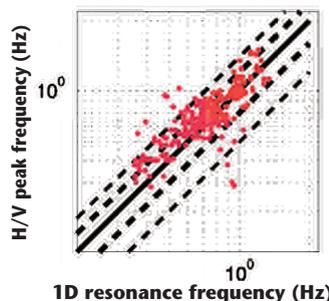
Map of local 1D resonance frequencies at the site, calculated on the basis of the Colfiorito geophysical model. The lower the frequency, the greater the depth of the sediment resting on the rocky substrata.



Map of H/V noise frequency peaks obtained from the analysis of seismic noise simulations. The high degree of correspondence between these two maps shows that the H/V noise ratio method permits the correct imaging of variations in the thickness of covering sediments.



Relative percentage difference between local 1D resonance frequencies obtained from a geophysical model and H/V noise peak frequencies.



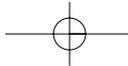
Comparison between the local 1D resonance frequencies obtained from a geophysical model and H/V noise peak frequencies. In the vast majority of cases, the correlation is excellent.

To find out more

- Sesame project site
sesame-fp5.obs.ujf-grenoble.fr/

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Understanding the furies of the Earth

European earthquake research is active on many fronts: improved seismic shock scenarios, the analysis of past earthquakes, the study of so-called 'dormant' zones, the deployment of measurement and observation infrastructures, improvements to tools and methodologies, and international and intercontinental co-operation.



Example of a palaeoseismic site: the Guzelkoi region in northern Anatolia, scene of a 1912 earthquake.

Palaeohistory returns with a vengeance

Five years ago and in the space of just three months (17 August and 12 November 1999), western Turkey was hit by two major earthquakes, with a magnitude of 7.4 (epicentre near the city of Izmit) and 7.1 (Sea of Marmara) respectively. The toll was 30 000 dead, more than 50 000 injured, and material damage estimated at over €35 billion. As occurs after every major earthquake, many research projects and field studies were subsequently carried out, focusing on the regions of Anatolia through which the Izmit Duzce and Marmara faults run – faults that now seem to be dangerously active at the boundary of the Eurasian and African plates. "Such a sequence of two earthquakes so close together in time and place is unique in the recent past," stresses Mustapha Mehgroui of the Institut de Physique du Globe in Strasbourg (FR), who coordinates the EU-backed project Relief (Reliable information on earthquake faulting). "In any event, it has demonstrated the inappropriateness of seismic

risk scenarios established on the basis of standard probabilistic assessments that are simply based on seismic history and simplified seismotectonic sources."

The Relief project, launched in 2002, is engaged in a vast exercise to study the geophysical terrain along the long line of these two faults – and in particular the 170 km rupture line caused by the 1999 earthquakes – by means of field tests and aerial or satellite pictures. "One of the specific originalities of our approach is the inclusion of a much more retrospective methodology to the region's seismic history, one going back well before the earthquake registering 7.4 that hit the Sea of Marmara in 1912. The Earth operates on a timescale that is incommensurate with our own. Many geophysicists are convinced that palaeoseismology, that is the search for traces left in upper geological layers by earthquakes dating back to the Holocene or Late Pleistocene periods – about 20 000 years ago – are a rich source for understanding the present risks presented by active faults."

A deceptive calm in Western Europe?

If we exclude its southern section running from Greece to Italy through the Balkans, Europe has low seismicity – at least for now. But is this relative calm deceptive? Some zones that experienced violent earthquakes in the past must be viewed as potentially active. Specific examples are Provence and the Rhône valley, the Rhine valley and Pô Plain, the Catalan coast and southern Spain. Although the risk is currently considered to be low, or unknown, Western Europe's potential vulnerability is, by contrast, high, due to its high population and infrastructure density, coupled with the rare application of parasismic standards, owing to the absence of earthquakes in recent memory.

Many in-depth geomorphological and geological studies today provide us with quite a well-documented knowledge of relatively inactive faults. But the intensity of plant cover and the

Crossing scientific boundaries

Natural disasters – landslides, avalanches, floods, earthquakes, volcanic eruptions, etc. – are many and varied, and a wide range of European research projects are engaged in either preventing them or mitigating their effects. "It is important not to have rigid compartmentalisation between the various earth science disciplines that are working on these subjects," explains Denis Peter, a scientific officer at the European Commission. The EU-MEDIN platform is an information tool that seeks to highlight current research projects, the approaches and methodologies used, and any significant results. At a future date, it will also seek to high-

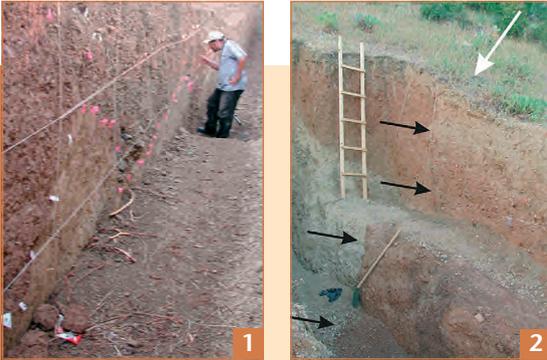
light European activities or initiatives (European civil protection, Interreg regional projects, etc.) that help reduce risk and/or increase risk awareness. "We must build bridges between research and applications so as to improve synergy and interaction between the knowledge and know-how that is being built up on all these fronts."

To find out more

- www.eu-medin.org/

Contact

- Denis Peter, Research DG
denis.peter@cec.eu.int



1. Study trench in Guzelkoi.
2. In this fault zone, the black arrows show the scars of faults dating back to 1912.

major and permanent changes to the landscape due to human activities are obstacles to observation of the slow deformations linked to the action of faults. Between 2001 and 2004, the SAFE project undertook an in-depth updating of this misleading impression of security. Using the most advanced seismological approaches, the project produced a new mapping of seismic risks in certain zones and set up expert systems to help establish new diagnostics for assessing potential risks.

Euro-Mediterranean seismology in the virtual age

The seismological destiny of the two sides of the Mediterranean is inextricably linked to the interaction between the Eurasian and African plates. It is on the basis of this major tectonic boundary that Europe has developed a powerful system of detection, in co-operation with its partners on the other side of the Mediterranean, from Turkey to Morocco. The deployment of this measurement infrastructure (over 2 000 seismographs, as well as the accelerometers and other provisional sensors linked to more than 100 specialised observatories) has been particularly intense over the past decade, rendering the Euro-Mediterranean network comparable to the monitoring systems found in California or Japan.

But how should we go about managing such a massive stream of data provided by so many different players? The first step, in 1975, was to set up the Euro-Mediterranean Seismic Centre (CSEM-EMSC), under the auspices of the European Seismological Commission, whose principal mission is to centralise information and data and convey warning messages – in

particular to the Council of Europe and other European institutions.

In the 1980s, the appearance of new very high-performance seismometers based on broadband digital technologies led to the creation of the Orfeus (Observatories and Research Facilities for European Seismology) network that is dedicated to the development of these tools, as well as data transmission and processing software.

However, over the past decade the rapid increase in the use of information and communications technologies via the Internet has come to pose a continuous challenge to the Euro-Mediterranean seismological infrastructure. "There is a need to unify standards, protocols and exchange procedures and to ensure total software compatibility. If not, we are going to be faced with an increasingly problematic diversity," explains Torild van Eck of the Royal Netherlands Meteorological Institute (KNMI), the headquarters of the Orfeus network. "In 2000, as part of European support for research infrastructure under the Fifth Framework Programme, we received financing to launch the Meridian (Mediterranean-European rapid earthquake data information and archiving network) project. The aim was to put into place the tools to optimise exchange, archiving and access for the vast quantity of data collected by some 400 stations equipped with broadband digital systems within the Orfeus network."

One of the most valued achievements of the Meridian project is the VEBSN (Virtual European scale broadband seismograph network), a high performance Internet platform for the real time exchange, updating and consultation of digital data obtained from a vast network of over 100 seismological stations. As soon as an event occurs – as happened, for example, at the time of the earthquakes in Algeria in 2003 and in Morocco in 2004 – users are able to obtain valuable information in record time on the situation in the affected areas, the amplitude of surface waves, the shocks recorded, the sequence of aftershocks, etc.

This increasing integration of Euro-Mediterranean observation networks is destined to spread, as it grows to include more of the new or candidate EU Member States and the high seismic risk area of the Balkans.

Testing resistance, training researchers

In the field of research on parasismic technologies, the Union plays an active role in promoting access to test infrastructures and training researchers. Ecoleader⁽¹⁾ is a consortium of the European Laboratory for Structural Assessment (ELSA) – the part of the Joint Research Centre in Ispra (IT) which tests the resistance of construction structures – and five other research centres in the Member States that specialise in simulating the characteristic vibrations of seismic waves⁽²⁾. Consisting of a Reaction Wall fitted with hydraulic jacks, the equipment at the ELSA laboratory is unique in Europe. Life-size construction prototypes are subject to extremely slow and very high-density shocks, which are controlled and calculated electronically, permitting a detailed analysis of the deformation of materials and structures.

The SAFERR⁽³⁾ thematic network provides young European or foreign researchers with advanced training in fields related to the prevention or mitigation of seismic hazard and parasismic devices.

(1) European consortium of laboratories for earthquake and dynamic experimental research.

(2) Universities of Bristol (EERC, UK) and Athens (NTUA, EL), LNEC (PO), Enel.Hydro (ISMES, IT) and CEA/Saclay (FR).

(3) Safety assessment for earthquake risk reduction – Network set up under the 'Human Potential' programme.

To find out more

- RELIEF
www.ingv.it/paleo/RELIEF/
- SAFE
www.seismo.ethz.ch/hazard/risk/SAFE.html
- MERIDIAN
www.orfeus.knmi.nl/meridian/

Contacts

- Mustapha Mehgraoui, IPG, Strasbourg (FR)
mustapha@east.u-strasbg.fr
- Torild van Eck, KNMI (NL)
vaneck@knmi.nl

In the field of research on parasismic technologies, the Union plays an active role in promoting access to test infra-



To find out more

- www.elsa.jrc.it/
- www.saferr.net/scope.htm

Studying the shocks

Current projects

LESSLOSS – Risk mitigation for earthquakes and landslides

A multidisciplinary project covering geophysics, geotechnical and parasismic engineering, town planning, civil protection, the socio-economic sciences, and information and communication technologies. Lessloss aims to promote a coordinated approach to the assessment of seismic risk, its environmental, urban and infrastructural impact, and prevention and protection strategies.

EU contribution: €6 430 000
Coordination: Michele Calvi,
Università degli Studi di Pavia (IT)
gm.calvi@unipv.it – www.lessloss.org

3HAZ CORINTH – A multidisciplinary approach for measuring, modelling and predicting the triggering modes and their effects

This project follows on from the Corseis preparatory project and is specifically centred on the predictive and preventive analysis of seismic risks in the western part of the Corinthian rift.

EU contribution: €1 500 000
Coordination: Dr Pascal Bernard,
Institut de Physique du Globe de Paris (FR)
bernard@ippg.jussieu.fr

NARAS – Natural risks assessment harmonisation of procedures, quantification and information

NARAS is working to compile, synthesise, update and harmonise various European approaches to seismic risk assessment and mitigation scenarios and procedures. It is also undertaking actions to promote training and increased awareness in schools (Southern Italy, Greece and France).

EU contribution: €240 000
Coordination: Paolo Gasparini,
Università di Napoli Federico II (IT)
paolo.gasparini@na.infn.it

FORESIGHT – Frequent observation-driven realistic evaluation and simulation of interacting geophysical hazard triggers

Foresight is putting together a coordinated collection of data provided by geophysical monitoring systems in place or being deployed (terrestrial sensors and satellite observations). It is also integrating the results into an operational Geographical Information System (GIS). This project is a follow-up to RETINA (www.acri.fr/retina).

EU contribution: €1 080 000
Coordination: Olivia Lesne, ACRI-ST,
Sophia Antipolis (FR) – oli@acri-st.fr
www.acri-st.fr/foresight

OPTSDET – Novel optical devices and techniques for seismic activity detection and measurement

Optsdet is carrying out research on the reliability and precision of optical sensors (currently little used) for the detection of ground movement.

EU contribution: €494 779
Coordination: Dr Emil Smeu, University "Politecnica",
Bucharest (RO) – smeu@physics.pub.ro

GEODEV – Centre of geophysical methods and observations for sustainable development

Geodev is a targeted project that aims to promote the recognition of the excellence of Polish institutes of geophysical research in the European Research Area.

EU contribution: €315 410
Coordination: Zdzislaw Kaczmarek, Institute of
Geophysics of the Polish Academy of Sciences,
Warsaw (PL) – kaczmar@igf.edu.pl

QUAKER – Fault-rupture and strong-shaking effects on the safety of composite foundations and pipeline systems: quantification and reduction of seismic risk through the application of advanced geotechnical engineering techniques

Quaker aims to develop advanced geotechnical techniques, centred on interactions between ground movements, superstructures and the supporting foundations.

EU contribution: €848 276
Coordination: Michael Davies, University of Dundee (UK)
m.c.davies@dundee.ac.uk
www.dundee.ac.uk/civileng/quaker/partners.htm

INDEPTH – Development of innovative devices for seismic protection of petrochemical facilities

Indepth is developing specific parasismic protection devices for the petrochemicals industry, an ultra-sensitive sector due to its potential impact on the environment.

EU contribution: €1 242 200
Coordination: Fabrizio Gatti,
Enel Hydro (IT) – gatti.fabrizio@enel.it
<http://indepth.boku.ac.at/sitemap.php>

VAST-IMAGE – Development of variable stiffness seismic isolators and vibration mitigation dampers based on magnetically controlled elastomers

VAST-IMAGE is conducting research on advanced technologies for elastomer and semi-active (of magnetically controlled stiffness) dampers/isolators. These devices are particularly relevant for the protection of strategic installations (hospitals, high-risk industries, cultural heritage, etc.) in the event of an earthquake.

EU contribution: €1 307 119
Coordination: Dr Renzo Medeot,
Maurer Söhne GmbH & Co. KG, Munich (DE)
medeot@mchn.maurer-soehne.de

EUROSEIS-RISK – Seismic hazard assessment, site effects and soil structure interaction studies in an instrumented basin

Euroseis-Risk will conduct a geophysical and geotechnical study of site effects and interactions between structures and soils, based on real tests at the Euroseis (EL) testing site.

EU contribution: €1 465 968
Coordination: Professeur Kyriazis Pitilakis,
Aristotle University of Thessaloniki (EL)
pitilakis@evripos.civil.auth.gr
<http://euroseis.civil.auth.gr/index.htm>

Earthquakes are the subject of many Union-backed research projects. Usually carried out by multidisciplinary teams, they look at various aspects of the phenomenon, such as prediction, scenarios, monitoring systems and architecture.

Completed projects

RISK-UE – An advanced approach to earthquake risk scenarios with applications in different European towns

RISK-UE is carrying out an evaluation of earthquake risk, an inventory and typology of principal weaknesses in the construction field (especially for historical heritage sites) and options for risk reduction in seven European towns: Barcelona (ES), Nice (FR), Catania (IT), Bucharest (RO), Sofia (BG), Bitola (Macedonia), Thessaloniki (EL).

EU contribution: €1 625 378
Coordination: Pierre Mouroux, BRGM, Orléans (FR)
p.mouroux@brgm.fr – www.risk-ue.net/

SAFEFLOOR – Low risk and totally recyclable structural buildings

SafeFloor is carrying out research to lighten and simplify the dismantling of construction elements, in particular to accelerate rescue operations in the event of building collapse.

EU contribution: €1 553 740
Coordination: Juan Manuel Mieres,
Necso Entrecanales Cubiertas, Madrid (ES)
jmieres@nesco.es

PRESAP – Towards practical, real-time estimation of spatial aftershock probabilities: a feasibility study in earthquake hazard

Presap is investigating the possibility of modelling the aftershocks that can strike a devastated zone on the basis of a study of the seismic waves from the initial shock.

EU contribution: €495 100
Coordination: John McCloskey, University of Ulster
(UK) – j.mccloskey@ulst.ac.uk

SEISLINES – Age-variant seismic structural reliability of existing underground water pipelines

Seislines is evaluating the condition and earthquake resistance capacity of existing water pipeline infrastructures and the development of an expert decision-support system for renovating networks in high-risk zones.

EU contribution: €651 700
Coordination: Dimitris Kalles, Computer Technology
Institute – Patras (EL) – kalles@cti.gr

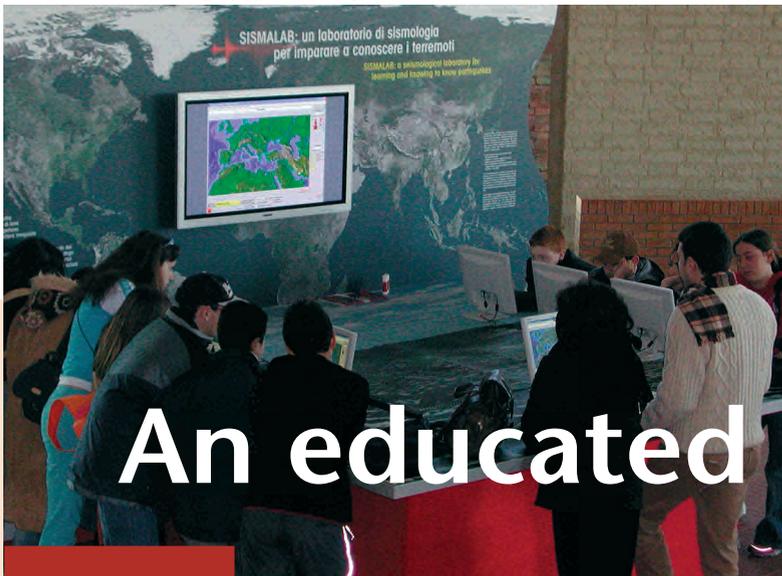
SPIDER – Strands prestressing for internal damping of earthquake response

Spider is conducting parasismic research and performance tests on the coupling system for energy dampening/dissipating systems using cables. These devices are intended to provide parasismic improvements for existing buildings (schools, hospitals, etc.).

EU contribution: €295 700
Coordination: Mouloud Behloul, Bouygues Travaux
Publics, Saint-Quentin en Yvelines (FR)
m.behloul@bouygues-construction.com



Seismography workshop at the Citta della Scienza Museum in Naples.



An educated

Ignorance is a poor counsellor, and although education does not remove a risk, it can make it more manageable – by increasing awareness of the danger, improving prevention and promoting an organised response. The EU-backed Eduseis project aims to explain the earthquake phenomenon in schools and science museums.

awareness of risk

The idea first took shape in the United States in 1994, in the form of the Princeton Earth Physics Project (PEPP), a network of educational activities in the field of physics concentrating on earthquake risk. In Europe, Eduseis (Educational Seismological Project) was launched in 1995 as an EU-supported partnership (through Erasmus), with specific support in France, Italy, Germany and Portugal.

The project employs an original approach by providing school-children with access to authentic seismographs, ideally, in their schools. In this way, teachers, backed up by scientists, can develop a lively training in the geosciences and earthquake risk, in particular. The project also requires a computer infrastructure, not only to permit interactive inter-connection between schools and access to scientific data via the Internet, but also to be able to draw on the data gathered by existing seismological networks. The aim is not simply to offer initiation exercises. In fact, Eduseis stations are genuine observatories which are linked to those that manage the earthquake risk.

The Naples example

Based in the Naples region, an earthquake risk area, the Italian component of the Eduseis project immediately took a distinctive turn. From the very start (1996-97), the Citta della Scienza Museum decided to support the project actively, thereby enabling it to reach a much wider public outside the schools. In technological, methodological and educational terms (especially through teacher training), the active co-operation between Naples University and other geophysical organisations in the country served to harness valuable expertise.

About a dozen seismological stations are part of the observation network made available to the Eduseis project. In schools, the experience is centred on the Liceo Scientifico Copernico in particular, the site of one of the seismographs. The Citta della Scienza Museum also has a seismograph and has invested in the Seismolab, a genuine interactive educational laboratory for geophysics and seismology. The project's dynamic educational activities are, today, well and truly up and running at the sites of the accessible stations and via the Eduseis website, where all the network's scientific observations are stored and reported on in the electronic daily *Il Sismo*.

Spreading the message

South-eastern France (the Côte d'Azur region) has participated in Eduseis since 1995, through the academic workshop known as Aster⁽¹⁾. Set up by the Institut Universitaire de France, the GeoSciences-Azur laboratory is responsible for the scientific aspects, and the Centre International de Valbonne (CIV) is in charge of education. These two bodies have developed prototype seismological and computer equipment that has been installed at five schools in the area attended by students aged between 13 and 18. Two mobile stations visit various schools to support thematic projects. The CIV also provides the network's scientific and educational coordination.

The movement has now started to spread to other French regions (Alpes, Provence, Languedoc-Roussillon, Midi-Pyrénées, Alsace), a move that is being coordinated by the Sismo des écoles network. In April 2003, this network linked up with Eduseis to organise, at the Valbonne centre, a European Eduseis meeting that was attended by about 50 teachers, engineers and researchers from seven countries.

"The sharing of experiences, data and practices is becoming increasingly important," stresses Jean-Luc Berenguer of the CIV. "The need for competent people (technicians and engineers) to manage the networks alongside the teachers is becoming vital. We hope that, by drawing on Eduseis' experience, the Union will become more involved in developing educational programmes on earthquake risk throughout Europe."

To find out more

- **Italy**
<http://eduseis.na.infn.it>
www.cittadellascienza.it/sismolab/
- **Germany**
www.copernicus-gymnasium.de/eduseis/HTML/index1.html
- **France**
www.ac-nice.fr/svt/aster/menu.htm
www.edusismo.org/seminaire/cr/abstract.htm

(1) *Animation Scientifique et Technologique pour l'Education au Risque majeur (Scientific and technological workshop for major risk education).*

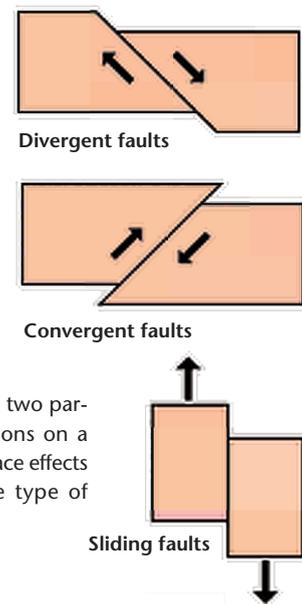
The mechanics of tectonics

When the plates of the earth's crust exert pressure on one another as they move, the rocks that make up these plates are subject to extreme stress. During a latent period, this stress is absorbed by a certain elasticity. But beyond a particular point, a sudden rupture occurs, either along an existing fault or by creating a new fault. The energy accumulated during the elastic deformation is then released, giving off heat and producing mechanical effects of movement along the fault.

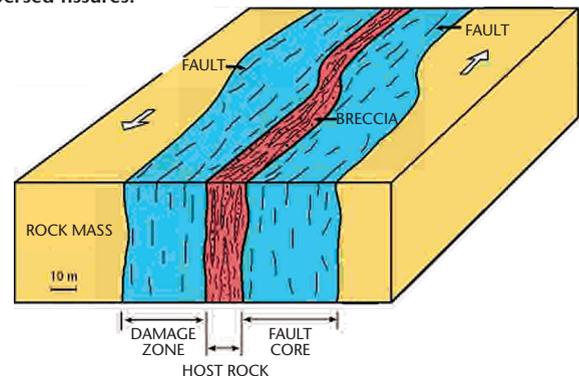
This rupture movement is transmitted through the lithospheric mass in all directions, in the form of seismic waves that produce elastic deformations of the rocks in their path.

Faults

There are three kinds of rupture mechanisms produced at the 'focus' of an earthquake, the point where a fault already exists or is produced. Movements of the plates in opposing directions, produced in an oblique vertical plane, cause a shearing of the rocks on a horizontal plane (divergent faults), or, conversely, a tightening of the rocks creating overlaps (convergent faults). The third variety is where two parallel plates move in opposing directions on a horizontal plane (sliding fault). The surface effects are, of course, dependent upon the type of movement.

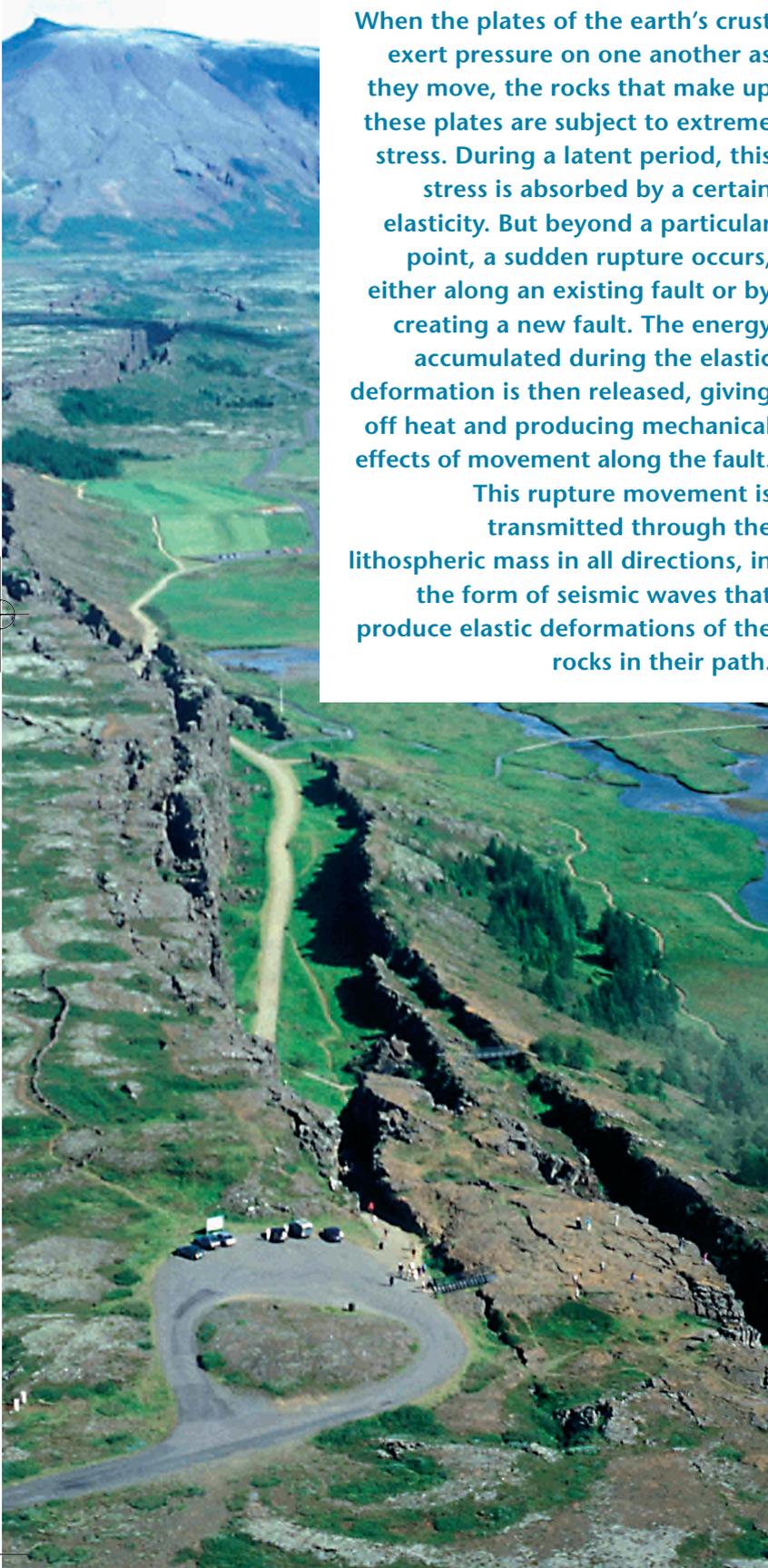


Typical fault structure: at the breaking point between two host rocks, the real core of the fault is a narrow zone consisting of crushed or cataclastic rocks (especially in the form of 'breccia'). On either side of this is a 'damaged' zone characterised by many dispersed fissures.



Aerial view of the Almannagja region, in the western volcanic area of Iceland. The total length of this fault is 9 km. It caused a vertical displacement of around 40 metres deep and 60 metres wide.

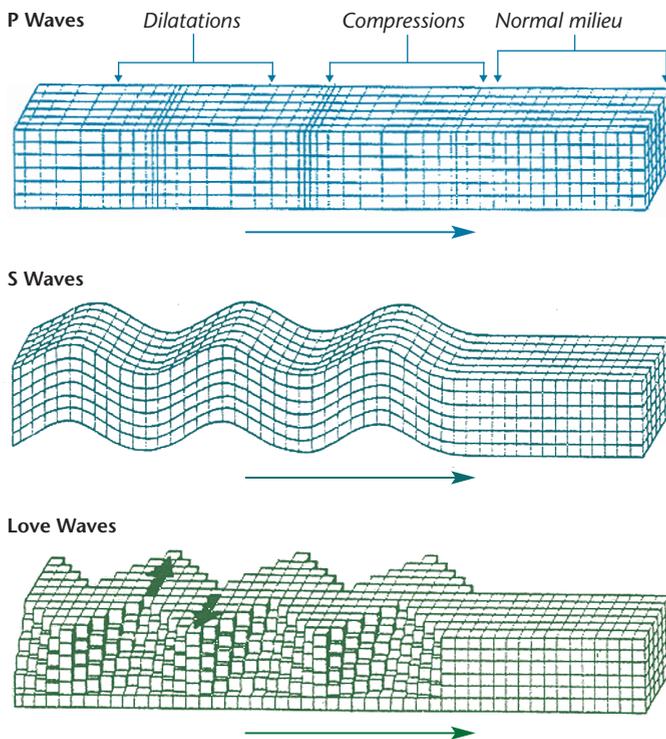
© Agust Gudmundsson



Waves

Several series of waves emanate from the focus of an earthquake. They have different speeds and produce different effects as they travel through the lithosphere. The fastest are the body waves, divided into two categories: primary or P waves and secondary or S waves. P waves are longitudinal and correspond to the successive expansion and contraction of the rocks through which they pass – like the rectilinear movements of an earthworm – and it is these waves that are felt first. The S waves travel much more slowly and are characterised by the movement of the rock mass along a line that is vertically perpendicular to the direction of the movement, rather like the swelling of the sea as the waves break on the shoreline.

Lastly, when the earthquake focus is not too deep, i.e. in the upper layers of the lithosphere, it creates surface waves that have a more complex and destructive deforming force. Two types are distinguished, Love or L waves that cause an elastic movement of the rocks on a horizontal plane perpendicular to the wave direction (like a snake along the ground), and Raleigh or R waves that combine this kind of deformation in the horizontal and vertical direction.

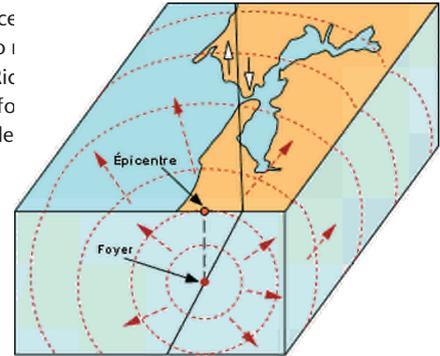


Epicentre and magnitude

The advanced technology of today's seismometers permits a detailed wave analysis, determining their nature, amplitude, speed and speed variations (slowing or accelerating). As soon as several devices (at least three) record the arrival of P and S waves, seismologists are able to calculate mathematically the exact focus of the earthquake, the 'epicentre' being the point on the earth's surface directly vertical to it.

Using the data supplied by waves, seismologists developed a common calibration system that makes it possible to calculate an earthquake's 'magnitude'. This notion refers to the energy released at an earthquake's focus, independently of the place where it is recorded and the type of seismometer used. It was introduced by the US geophysicist Charles Richter who created the logarithmic scale that today bears his name.

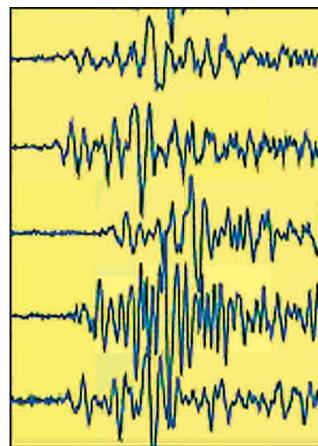
Use of a scale of this kind permits a more precise classification of the vast range of ruptures that the lithosphere can experience. A change of 1 on the Ric scale represents a tenfold increase in the amplitude of the seismic waves at the focus. The most violent earthquake ever recorded registered 9.5 and struck Chile in 1980. Readings in excess of 9 are extremely rare.



Intensity and site effect

Magnitude, which is a precise measurement of the focus, does not correspond directly to the damage an earthquake causes at a given site. In the latter case, one speaks of the earthquake intensity at the surface, a quite subjective notion linked to the site in question. This intensity is classified on the basis of *ex-post* estimates, first the perceptions of inhabitants and then the scale of the destruction, on the basis of a number of general criteria (but not the number of victims, as this is, of course, linked to the population density). The oldest classification, which dates back to the beginning of the last century, is the Mercalli scale that has 12 levels. The European Union recently adopted a new EMS 98 (European Macroseismic Scale) that takes better account of present-day construction materials and methods.

By comparing studies of intensity with soil geology, it has been possible to build up an ever-increasing knowledge of what are known as site effects, which has become an essential tool in preventing potential earthquake damage (see page 6).



Goodbye,



Philippe Busquin has completed his mandate as EU Research Commissioner without fuss, in a manner typical of the man. But behind the unassuming exterior, there lies an impressive tenacity that permitted an extensive renewal of EU science and technology policy. He leaves behind a clear and dynamic strategy, built on the creation of the European Research Area (ERA) and the vital mobilisation of the investment effort needed to achieve the famous R&D investment target of '3% of GDP'.

Below, various figures who worked with him in discussing, preparing and putting into practice these new foundations for European research pay tribute to a colleague.

Mr Busquin

Philippe has made a remarkable impact as European Research Commissioner, despite coming across as a quiet, unassuming and even shy person. By working on the detail and making numerous personal visits to scientists in Europe and the rest of the world, and through his remarkable ability to put across the case for science in Europe, he has raised science to the very top of Europe's political agenda. The incoming Commissioner will inherit a situation for science in Europe which Philippe has left in a very strong state.

..... David King

Chief Scientific Adviser to the UK Government and head of the Office of Science and Technology



Philippe Busquin was able to grasp an opportunity: to promote a promising idea and to stand as a major actor in European science policy. He was appointed at the end of a very difficult period. Trust between the scientists and the Commission was at its lowest level. He effectively reversed the situation. Governments, the scientific community and industrialists listen to him. He has managed to extract a precise objective from the Lisbon Strategy: that of setting aside 3% of GDP for R&D in the EU, and to make this a European goal supported by a large constituency. If the reference to science is today well rooted in the European Constitution, it is because Busquin and his cabinet fought until the last minute. He had the courage to speak in favour of the *Sauvons la Recherche* movement in France, of *Ciencia Viva* in Portugal, of the need to create a European Research Council, and of the importance of the involvement of the scientists themselves in European science policy. Thank you, Philippe!

..... José Mariano Gago

Former Portuguese Minister of Science and Technology (1995-2002), responsible for preparing the Lisbon Strategy.

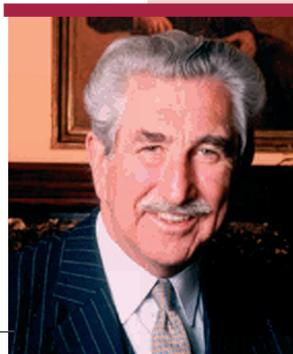


The Barcelona objective (3% of GDP for R&D in 2010) was one of Philippe Busquin's flagship ideas and made it possible to galvanise European forces in favour of growth and employment – two major qualities of his, a doctor of physics and influential politician.

As president of the Competitiveness Working Group at the European Round Table of Industrialists (ERT), I worked with Philippe Busquin and his team on many occasions in putting into place and achieving progress on the '3% objective'. I admired his European devotion, his scientific abilities, his social conviction, and his economic realism. Thank you, Philippe, on behalf of the ERT, researchers, and the young people who will have better jobs in an economy of growth and innovation.

Daniel Janssen

President of the ERT Competitiveness Working Group and President of the Board of Directors of Solvay SA



I met Philippe Busquin for the first time in Brussels at the round table on HIV/AIDS, malaria and tuberculosis in the context of the campaign for poverty reduction. He will remain in my memory as the champion of an innovative approach, through partnerships, to the development of new clinical tools and treatments adapted to the socio-economic conditions of the Southern Hemisphere, particularly Africa. I admired in him the passion for science and political action. He is a hands-on

type of leader who goes out into the field and talks with scientists at their laboratories, as he did in the summer of 2003 when he visited Tanzania, Mozambique and South Africa.

Pascoal Mocumbi.....

Former prime minister of Mozambique and high representative of the European & Developing Countries Clinical Trials Partnership (EDCTP)



Shortly after Philippe Busquin took office in Brussels, I had the opportunity to present CERN to him. I was impressed by his rapid grasp of the general picture, his curiosity for details and his understanding. I remember a passionate discussion, in a small Brussels restaurant, with the Euroforum members about ITER and the way international funding for such large enterprises could be sustained. The good dinner gave me a lot of food for thought about the funding



for construction of the CERN Large Hadron Collider (LHC), which later materialised in a loan given to CERN by the European Investment Bank. In part, the LHC owes its existence to Mr Busquin.

His vision of a European Research Area made it possible to break with the idea of separate and competing realities (universities, academies,

international organisations, funding agencies, etc.). I hope this idea will be pursued and widened by his successor.

Luciano Maiani

Professor of theoretical physics at Rome University "La Sapienza" (IT) and director-general of CERN from 1999 to 2003



Philippe Busquin is convinced of the beauty and legitimacy of scientific research and the progress that can be expected of it in the interests of our common prosperity and well-being. He is also very much aware of the need to give European citizens every means to reappropriate a research and development effort that is dependent upon their commitment and support.

He believes in the need to move away from the vision of a more or less peaceful coexistence, or even opposition, between science and technology, on the one hand, and society, on the other. Researchers and engineers are part of society and carry out their research on its behalf. It was to help correct any misunderstandings in this field that Busquin set up the European Group on Life Sciences. The initial mandate he gave to this committee and all his subsequent actions bear witness to his desire to promote a brilliant and transparent science able to contribute, at every stage of its development, to society's debates.

Axel Kahn

Director of the Cochin Institute in Paris (FR) and president of the European Group on Life Sciences (1999-2002)

It was 3 July 2004, two days after I took up my duties as director-general of the European Space Agency (ESA). I wanted my first visit to be for him. Relations between the ESA and the Commission had deteriorated over recent months but neither of us was interested in going back over the past to apportion blame. We met face-to-face for an hour and then continued to talk over dinner in the company of our closest collaborators. We soon cleared the air.

The adoption of the ESA/European Community framework agreement, the consolidation of joint activities and the launch of new initiatives, the first 'Space Council' on 26 November 2004: none of these would have been possible without Busquin's drive and commitment. As Commissioner, he provided the necessary impetus for the shared competence in space – for which the Constitutional Treaty made provisions – to become a future reality.



As a Member of the European Parliament and, I sincerely hope, future president of the 'Sky and Space' Intergroup, he will continue to defend this policy of equality prompted by the use of the space tool, thanks to rapid access to information for all people, wherever they may be. Thank you for all that, Mr Commissioner. Thank you, Philippe.

Jean-Jacques Dordain

Director-general of the European Space Agency (ESA)

We are indebted to Philippe Busquin for having placed research before the organisation of research! Let us hope there is the will and the ability to continue and build on his action.

..... **Jean-Marie Lehn**

Nobel prizewinner for chemistry and professor at the Collège de France and Strasbourg University (FR)



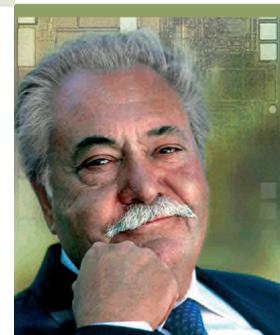
I was very impressed by Philippe Busquin's creativity and commitment to building a true European Research Area that serves integrated, Community-wide economic, social and scientific goals. In working with him, I was able to appreciate how his strong scientific background was matched by an awareness of financial issues.

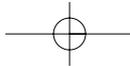
One of Commissioner Busquin's most visionary contributions was his early identification of Europe's need for multinational and multidisciplinary research. This led to the definition of Technology Platforms to drive Europe's future success in fields as diverse as transportation and nanoelectronics, a sector with which I am directly concerned. His support for the creation of the European Micro and Nanoelectronics Initiative Advisory Council (ENIAC) – which he called on me to lead, together with Information Society and Enterprise Commissioner Erkki Liikanen – represents an example of multidisciplinary co-operation to define a strategic agenda by combining public and private players.

Busquin is both a visionary and a realist. Drawing on the consequences from the Lisbon undertakings, he was instrumental in the Commission's proposal to double the EU's research budget. We support this objective and are certain that during his new mandate at the European Parliament he will play a key role in achieving it. I wish him every success.

..... **Pasquale Pistorio**

President and CEO, STMicroelectronics



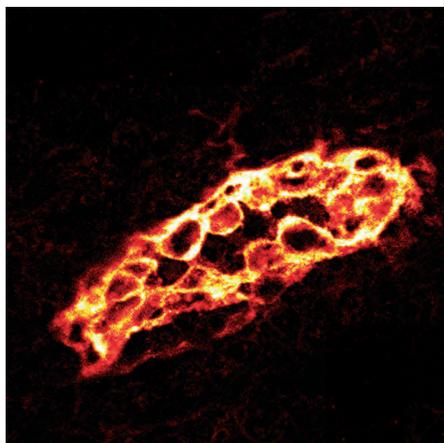


Reducing congestion on the inflammation highways

Why are leukocytes, or white blood cells, attracted to areas of inflammation and how do they travel to them?

By changing their migratory habits, can we stop the chronic inflammation associated with many diseases?

A new European Network of Excellence made up of 13 institutes from five EU countries (DE, ES, FR, IT, UK), plus Switzerland and Israel, has given itself four years to come up with the initial answers to these questions.



The activation of the endothelial cells that line the blood vessel walls plays a key role in the patho-physiology of many forms of chronic inflammation, such as rheumatoid arthritis.

They then take on a cubic shape and compete with the migration of leukocytes to the inflamed tissue. These cells are a major biological target for the development of anti-inflammatory treatments.

Asthma, arteriosclerosis and Alzheimer's are three diseases that, while affecting very different organs, are surprisingly similar in terms of biological mechanisms. They all involve the chronic inflammation of an organ: the lung, the arterial wall and certain regions of the brain respectively. This causes the immune system to react to the extent that it attacks the tissue of the body it is supposed to be protecting against external aggression. Auto-immune diseases are the ultimate expression of this kind of disorder, new consequences of which are regularly coming to light. On 25 August, for example, the British publication *Nature* published a study carried out by an Israeli group associating chronic inflammation linked to irritating substances in the environment with the appearance of cancers.

Activating defence mechanisms

As defensive reactions by cell tissue against a foreign aggression (infections, burns, allergies, etc.), the biological mechanisms of ordinary inflammation are quite well described. It all

Mastocyte: this immune cell that contains many granulations in its cytoplasm plays an important role in immediate hypersensitivity. These granulations release mediators – such as histamine – at the time of the allergic response.

© David, B. / Institut Pasteur

starts with a kind of warning signal emitted by certain leukocytes in the form of a tiny molecule known as histamine. This hormone triggers an immediate inflammatory response, in particular the dilatation of blood vessels, that causes the familiar rashes associated with allergies. In its attempts to repair the damage, the histamine will also activate other categories of leukocytes – lymphocytes and macrophages – that secrete a wide variety of glycoproteins of the cytokine family. Both mediating and amplifying agents, the cytokines in turn trigger the mobilisation of more leukocytes that begin to migrate to the site of the inflammation.

This process is believed to be at the origin of a state of chronic inflammation. But what is it that triggers this mechanism? It was to answer this question that a European Network



of Excellence, known as Main-NoE (Migration and Inflammation Network of Excellence), was launched on 18 June of this year, at the instigation of Ruggero Pardi of the Fondazione Centro San Raffaele del Monte Labor, a world-renowned biomedical research centre based in Milan (IT).

"Dozens of European laboratories are currently working, on an uncoordinated basis, on the various mechanisms of inflammation. Some are specialised in the synthesising mechanisms of a particular cytokine, others are interested in their receptors or in their action on lymphocyte differentiation, and others, finally, are looking at the key problem of their action on migration. I contacted several of my colleagues who had already worked in partnership on a previous European project. We chose to draw on the dynamic of the new tools for co-operation created by the Sixth Framework Programme to concentrate systematically on this latter process alone. We hope in this way to achieve the best degree of integration among the participating scientists," explains Pardi.

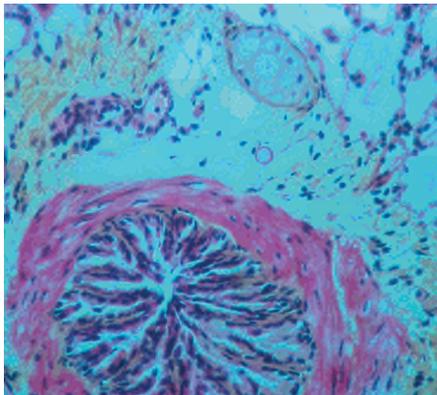
Lines of attack

The Main-NoE is pursuing four lines of attack in investigating the migratory phenomenon of leukocytes.

■ The first, seemingly simple, question is how do researchers study cell migration? **Tools Development** is seeking to provide them with the most effective techniques, such as video-microscopy that makes it possible to observe cell or biocaptor migration 'live' and, thus, measure the concentration of chemical messengers in the cellular environment.

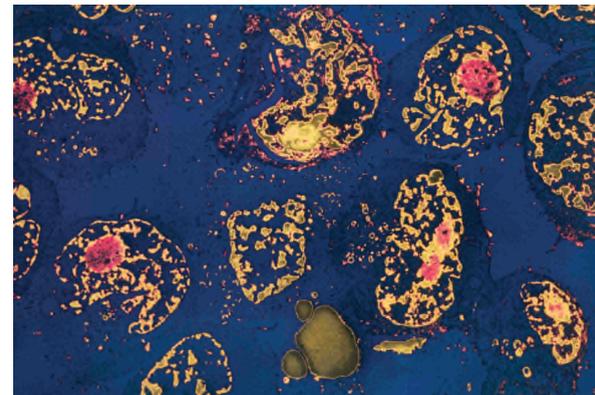
■ Question number two: how do leukocytes travel? We know they form pseudopods that attach them to the extracellular matrix, after which they retract, drawing the cell body with them. The **Target Identification** programme is seeking to identify the proteins at work in this process, especially cell skeleton and matrix proteins. But do the migratory mechanisms depend on the type of cell or the type of pathology? To date, this problem has received little attention. Different laboratories use different cell types and different culture conditions when carrying out their *in-vitro* tests, making any comparison of results a tricky task.

■ This leads on to the third area of research, namely **Target Validation**. This aims to develop standardised and clinically pertinent tests to study the action of cytokine cocktails. DNA chips that make it possible to analyse the expression of all the genes known to be involved in cell



Cross-section of asthmatic bronchial tubes.

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Cross-section of lymphocytes

© Dauguet, C. / Institut Pasteur

migration will also be developed to compare the genetic profiles of different leukocytes during their migration.

■ Finally, there is the question of whether or not these mechanisms lend themselves to pharmacological modification for therapeutic purposes. Current anti-inflammatory medicines often present serious side effects and sometimes reduce natural immune defences. The **Drug Development** programme aims to promote the network's research, in association with two biotechnology companies – Endocube SAS (FR) and Bioxell SpA (IT) – which will benefit from a priority licence on patents registered by the network's researchers and will ensure the pre-clinical development of the most interesting molecules.

Nurturing a healthy body of knowledge

This ambitious programme could not, of course, function without the costly tools that are essential to modern 'big biology'. Joint services, such as cell imaging, proteomics, DNA chip and bio-informatics services, will provide this essential merging of resources. Finally, the Main-NoE will organise training seminars, designed for post-doctorates in particular, on the mechanisms of chronic inflammation.

With Union funding of €10 million over the next four years, a network of this kind requires an effective logistics organisation. The Italian Science Park of San Raffaele, with long experience of managing biotech R&D programmes, is providing the administrative infrastructure. A steering committee, headed by Ruggero Pardi and Anne Ridley (University College London), meets twice a month, by videoconference, to discuss

progress and allocate funds on the basis of requests from the around 180 researchers involved. "Closer working relationships are being forged within the field of technology, as well as science. That is why, when financing the teams participating in the Main-NoE, priority must be awarded to those that propose a very integrated project and/or the development of investigation tools that can be useful to all network participants," explains Pardi. He also says he is "very excited by this new organisation to promote the excellence of European research".

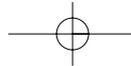
An external advisory committee, headed by Alan Rick Horwitz of the University of Virginia (USA), will advise the managing team. The three other committee members will also be American. This is because Main-NoE seeks to be a partner, and not a rival, of the US initiative known as the Cell Migration Consortium (CMC). "MAIN and CMC will share information and technology platforms and will develop a coordinated programme of scientific events so as to communicate their results to a wider audience of experts," stresses Pardi. "Information will also be provided to patients who are suffering from the often disabling effects of chronic inflammatory diseases." ■

Contact

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pardi.ruggero@hsr.it

To find out more

- Site of the MAIN-NoE project
www.main-noe.org



Childhood diets

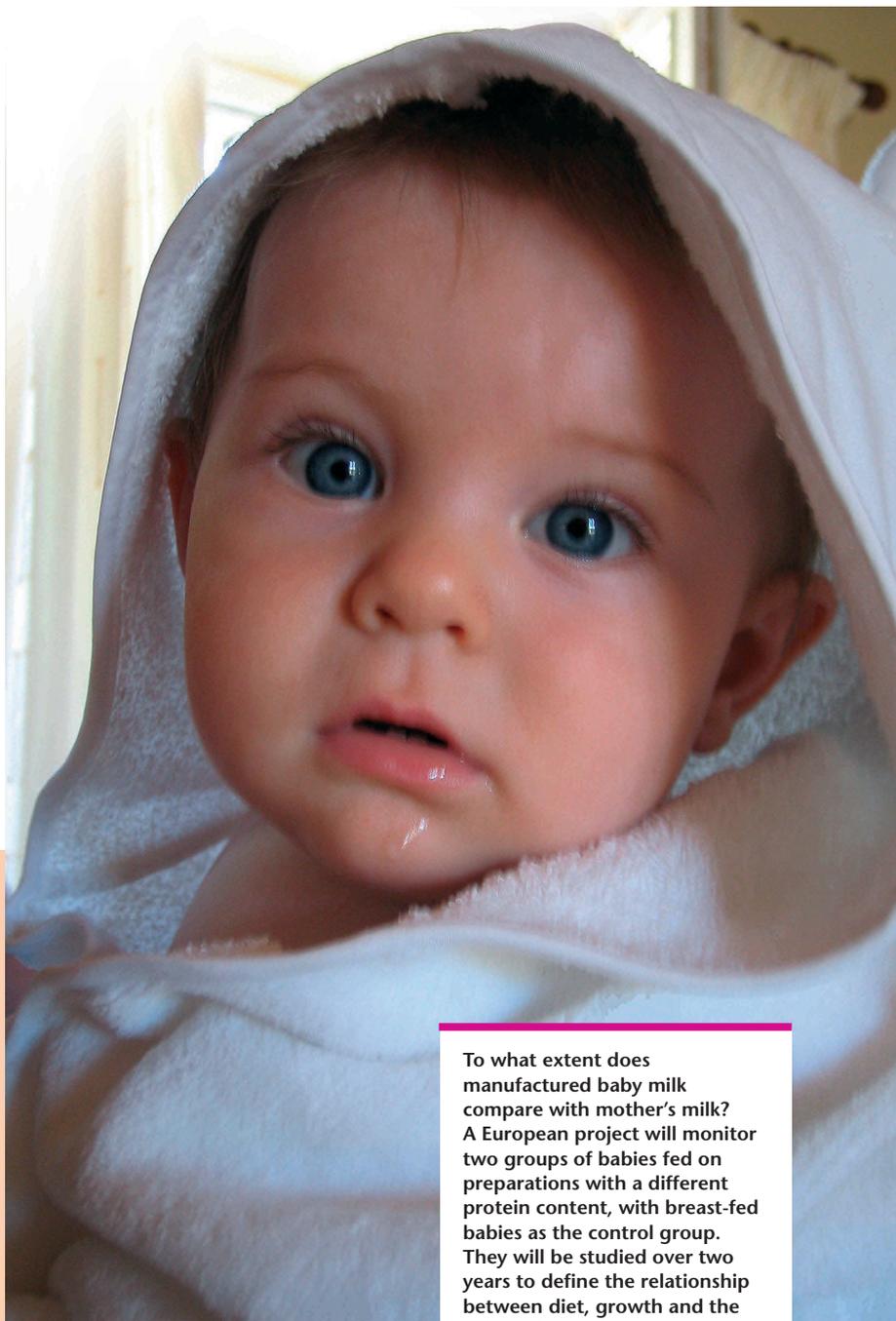
© Christophe Reyners

Diet during the first months of life and even before – the impact of the expectant mother's diet on prenatal nutrition at the foetal stage – triggers a process of metabolic programming that marks the human being for life. Research in this area is very important in the field of preventive medicine. The three European projects that make up the *Infant Nutrition Cluster* are studying these 'programmed' relations in terms of pathologies of foetal growth, infant obesity, and insulin-dependent diabetes.

Last July, more than 400 participants from 50 countries and a range of backgrounds – from scientists to representatives from the food industry – gathered in Paris for the conference organised by the Infant Nutrition Cluster. Such a success reflects the growing interest in research based on the new concept of *metabolic programming*.

The idea originated in the 1990s as a result of an increasingly disturbing convergence between the results of experiments on animals and epidemiological investigations in man. All these studies suggest that what the foetus and newborn infant ingests has a lasting effect on the way in which body cells use, convert and destroy nutrients, this being what is meant by the term *metabolism*. This modelling can later affect the health of the child, adolescent and adult. Incorrect diet at these early stages is believed to be a root cause of the development of an array of medical problems in later life, including obesity, high blood pressure, diabetes, arteriosclerosis and impaired cardiac function, cognitive capacities and immune defence.

To carry out the necessary further investigations in this field, three distinct lines of enquiry, supported by the EU, were brought together within the framework of the Infant Nutrition Cluster. The three projects are Childhood Obesity, Perilip – which is looking at problems of foetal growth in the latter stages of pregnancy – and Diabetes Prevention, which is the European component of Trigr, a global test on the influence of cow's milk products on insulin-dependent diabetes.



To what extent does manufactured baby milk compare with mother's milk? A European project will monitor two groups of babies fed on preparations with a different protein content, with breast-fed babies as the control group. They will be studied over two years to define the relationship between diet, growth and the risk of obesity.

"Despite the evident difference between our centres of interest in terms of pathologies, we have a common interest in infant nutrition and the concept of metabolic programming," stresses Peter Dodds, group and Perilip project coordinator. "We therefore felt it essential to come together within this relatively informal framework, free of contractual obligations, to share information and to reflect jointly on possible future action based on our findings."

Superprotein babies?

Two of the projects are interested in examining differences in composition between mother's milk and manufactured milk preparations for bottle feeding.

"Experiments carried out on animals and epidemiological investigations in man, some on a large scale, suggest that breast feeding reduces the risk of obesity," explains Doris Oberle, of the Munich Faculty of Medicine, a partner in the Childhood Obesity project. But what is the reason behind this? For a number of years now, scientists have been looking at the relatively high protein content of processed baby milk. To compensate for the fact that the proteins in cow's milk are less readily digestible, these preparations contain more of them than mother's milk. Proteins promote growth but also possibly the development of fatty tissue – hence the risk of obesity, which is a possibility that baby milk manufacturers are taking very seriously. Jean-Michel Antoine, a researcher at Danone, the French agri-foodstuffs partner in the Childhood project, believes that "the fields being investigated by the cluster raise a real question regarding a possible review of current standards for protein content".

To go beyond simply noting statistical links within the population as a whole, Danone and Berthold Koletzko, director of the Nutritional Medicine and Metabolic Diseases Department at Munich's Von Hauner Hospital, suggested testing this hypothesis clinically. The project was presented in Rome, in October 2003, at the Ninth European



Future health can be determined in the womb. Researchers are looking at the influence of the mother's diet – especially lipid intake – on intrauterine and perinatal growth.

Conference on Nutrition. It involves monitoring, over a year, two groups of newborn infants fed on baby milk with different protein contents. Breast-fed babies constitute the control group. The children will be monitored closely until the age of two, at which point it is already possible to draw initial conclusions on the relationship between the proteins ingested, growth, and the risk of obesity. At the same time, an investigation being carried out in the five participating countries – Germany, Belgium, Spain, Italy and Poland – is to look at the practices of various cultures in terms of infant nutrition.

Although recruiting the volunteer mothers proved a long and sensitive process, the current clinical trial concerns 1 151 newborn infants with another 639 breast-fed babies forming the control group. At its plant in Steenvoorde (France), the Danone subsidiary Blédina, which specialises in baby food, has developed and produced two experimental milks with the same protein content but different energy values. The first results are expected at the end of 2005. The children will then continue to be monitored by a subsequent project, until the age of eight.

Diabetes and breast feeding

The issue of cow's milk proteins present in preparations for newborns is also at the centre of the very different research subject of insulin-dependent diabetes. Again, epidemiological surveys carried out worldwide during the past 20 years suggest that breast-fed babies are less likely to develop diabetes than others. This finding may seem odd as this autoimmune disease, in which the immune system attacks the body itself, has a well-established genetic origin. "Nevertheless, today we are inclined to lend credence to the hypothesis that the immune system of children with a genetic risk of diabetes is unable to cope with intact foreign proteins in their food. These trigger a chain reaction that can lead to the destruction of the pancreatic cells that produce insulin," explains Michael Dosh who is studying the question at Canada's Toronto children's hospital. "Experiments on animals show that hydrolysed cow proteins – proteins that are too small to trigger an immune reaction – do not have this 'diabetogenic' effect."

It took several years of preparation before this hypothesis could be put to the test in humans. Hans Åkerblom, of Helsinki University, first carried out a pilot study in Finland. However, this was done on an insufficient scale and the results could not be regarded as conclusive. Given the scientific interest in the problem it subsequently proved possible, in 2002, to launch the major Trigr⁽¹⁾ trial. ➔

(1) Trial to Reduce Insulin-Dependent Diabetes in the Genetically at Risk.

Baby milk: European regulations

The European legislative framework for preparations for newborns – which are only awarded the 'milk' label if their proteins come exclusively from cow's milk – dates from 14 May 1991. Directive 91/321/EEC "on infant formulae and follow-on formulae" defines the labelling requirements for these foods, their composition and the origin of their ingredients. It strictly limits advertising for these products and requires Member States to circulate among the general public and institutions concerned information on the nutritional needs of young children. The most recent updating of this regularly amended text was in February 2003. The Scientific Committee on Food, under the Health and Consumer Protection Directorate-General, is responsible for monitoring observance of these recommendations.



European projects

Infantile Nutrition Cluster

- www.imperial.ac.uk/agriculturalsciences/Cluster/

Childhood Obesity

- www.childhood-obesity.org/index.php
Contact: Berthold Koletzko
bkoletz@helios.med.uni-muenchen.de

Perilip

- www.imperial.ac.uk/agriculturalsciences/Perilip/
Contact: Peter Dodds
p.dodds@imperial.ac.uk

Diabetes Prevention

- www.trigr.org/
Contact: Hans Åkerblom
hans.akerblom@helsinki.fi

Major conferences

- Rome conference:
• www.fens2003.org

Paris conference:

- www.wcpghan2004.com/texte/precongress.htm

Also coordinated by Hans Åkerblom, this project involves 6 000 diabetic families who will be monitored by some 40 clinical centres in 15 countries, in North America, Europe and Australia. Babies with a genetic risk of diabetes and whose mothers are unable to breast feed them will be fed during six months with either an 'ordinary' milk preparation or one with hydrolysed proteins. They will then be monitored until the age of five to detect whether their blood shows early indications of diabetes.

Twelve centres are participating in the European branch of the project, known as Diabetes Prevention, which will end in 2006. Trigr itself will continue until 2012, when the global results are expected.

Before birth

The 'destiny' of an individual's health also seems to be partly decided before birth. In Europe, between 3% and 7% of babies have achieved insufficient growth at the end of pregnancy. They may be born too small, sometimes deformed, and later risk suffering from physiological and metabolic problems, even learning difficulties. Most very premature infants, who are placed in an incubator and fed through a drip, show the same symptoms.

Scientists suspect the cause lies in a deficiency in certain fatty acids, the essential components of lipids. "We know that the perinatal supply of these acids, carried in the mother's blood, has a considerable long-term impact on neurological development or the immune system," states Hans Demmelmair of Munich University (DE), one of the partner centres working on the Perilip project.

Researchers therefore want to understand the influence of maternal lipid intake on intrauterine and perinatal growth. This complex subject covers the metabolism of various fatty acids by the mother, their passage through the placenta and into the milk and, finally, their effect on the foetus. To study this, seven partners with very diverse specialities are carrying out a set of experiments on animal models (rats and piglets) or cell and organ cultures. "Although some non-invasive measurements can be envisaged in pregnant women, newborns or premature babies, given the present state of knowledge, the project's fundamental approach is to explore the molecular and cellular mechanisms before attempting any direct testing on the human being," stresses Hans Demmelmair.

Perilip should provide dietetic recommendations for nutrition during pregnancy and, in the longer term, an improved diet for premature babies.

Paradoxically, as the animals used as models by some partners are mainly piglets, an unexpected and much more immediate benefit will concern the diet of reproducing sows. Insufficient growth at the time of birth and consequent mortality are serious problems for pig farmers, which is no doubt the reason why Cotswold, a British pig feed producer, is participating in the Infantile Nutrition Cluster. ■

Earnest

A successor to the Infantile Nutrition Cluster under the Sixth Framework Programme, this project is dedicated to the early metabolic programming of adult health through early nutrition. The many activities include the follow-up of present studies, fundamental experiments, and sociological surveys of Europeans' nutritional habits. The project is being coordinated by Berthold Koletzko of Munich University and includes partners from 12 countries.

To find out more

- <http://hauner.klinikum.uni-muenchen.de/earnest/>

The obesity epidemic

Urgency – that is the word that on everyone's lips as soon as there is talk of obesity. In 1996, the World Health Organisation (WHO) sounded a warning, speaking of a global epidemic and even formulating the term "globesity" to describe it. Since then, things have become even worse.

In May 2004, on the occasion of the 13th European Congress on Obesity, in Prague, the International Obesity Task Force (IOTF) presented the European chapter of its report. A quarter of all children in Europe are overweight and 3 million of them display characteristics of obesity. The situation is most serious in southern Europe, with more than a third of Italian children affected compared with 10% of young Slovaks. Philip James, IOTF president, was hardly reassuring: "the

epidemic is accelerating and seems to be running out of control. It is exceeding our worst expectations."

Although physiological factors, such as hormone disorders, pose specific scientific questions of importance, the sociological causes of this explosion, in any event, are well known and in developed countries are linked to behaviour, especially among children and adolescents: an unsuitable diet (meals that are too rich, snacks between meals, sweets, soft drinks) and reduced physical activity (motorised transport, television, video games). As Berthold Koletzko, coordinator of the Childhood Obesity project, points out, "infant obesity has serious short- and medium-term effects during childhood and adolescence as well as long-term effects throughout adult life". In addition

to psychological and social integration problems beginning at a very young age, obesity significantly increases the risk of non-insulin dependent (type 2) diabetes, cardiovascular disease, high blood pressure, gallstones, arthritis, respiratory ailments and even certain cancers in later life.

In the face of this worrying public health problem, the European Commission decided to act. The Fifth Framework Programme for research includes more than 20 projects devoted to various aspects of obesity, with subjects ranging from the lifestyle of adolescents to obesity in elderly people, molecular or fundamental metabolic studies, and socio-psychological aspects of the problem.

To find out more

- IOTF
www.ietf.org/

REFERENCE POINTS... REFERENCE POINTS...

Gazing into the future of science and society

There is a need to open scientific culture up to a broad public, with citizens involved in the democratic debate on the choices science presents and the ethical issues it raises. At the same time, more young people need to be encouraged to embark on research careers – especially women, since they remain under-represented in the scientific community.

These are just some of the components of the 'Science and Society' issue, a field in which the European Union has been seeking to make a valuable contribution for a number of years now. Achieving the Lisbon objective of a Europe that is a dynamic and globally competitive knowledge-based economy will largely depend on the strength of its research and the acquisition of knowledge. It is an effort that needs a broad consensus in society, one that is understood, accepted and supported by a large majority of citizens in the enlarged Union.

To highlight these aspects, between 9 and 11 March 2005, the European Commission will be holding, in Brussels (BE), the European Forum on Science and Society. This gathering will be open to decision-makers, researchers, civil society groups, and other stakeholders. The main aim of the meeting is to take stock of the many European and national actions launched since the Science and Society Action Plan was first unveiled in 2001.

A large number of subjects will be discussed, with the European Research Area never far from people's minds. Relationships between science and democracy, scientific communication and popularisation, safeguarding diversity and non-discrimination in the field of research are

just some examples of the topics on the agenda. There will also be interactive contributions from a number of parallel national events. Finally, at the event's many stands, European initiatives will be able to present their approach to research and experimentation.

This exceptional meeting, in terms of scale and breadth, will culminate with the proclamation of a charter entitled 'Science and Society for the Future'.



To find out more

- europa.eu.int/comm/research/society2005.html
- rdt-society2005@cec.eu.int

Instruments of debate

Halfway through the Sixth Framework Programme (FP6), in June, the panel of experts responsible for assessing the effectiveness of the new instruments – the Integrated Projects and Networks of Excellence – submitted their Marimon report, named after their chairman. This document is currently the focus of a certain amount of controversy.

The experts acknowledge the utility and validity of these new instruments, which aim to achieve critical masses of expertise and excellence within the European Research Area, and recommend that they should be continued under the next Framework Programme (FP7). However, the Marimon group also sets out a number of constructive recommendations that reflect a certain disappointment and incomprehension within the research community.

The experts consider there to be insufficient clarity in defining the goals of the calls for proposals for Integrated Projects and/or Networks of Excellence. They express concern at the genuine misunderstanding that the criterion for the new instruments is a question of size. They also wonder about the validity of the criterion of "lasting integration" that is supposed to govern the creation of Networks of Excellence. Finally, they fear that the new instruments have, in practice, served to reduce the role of traditional research projects based on more targeted themes and more limited consortiums that are better suited to

many players, such as SMEs and 'emerging' participants, in particular in the new Member States.

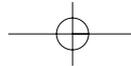
But their most controversial remark is that, when issuing calls for proposals, the Commission should simply specify the strategic objectives, indicating the range of instruments available. The candidate participants could then announce their own specific research goals and their preference for a particular instrument that they consider is best suited to their choice.

In a communication at the end of August, the Commission sought to reply to the Marimon group's findings. Although it accepts – with certain qualifications – several of the criticisms regarding the necessary clarification of the goals of the new instruments when launching calls for proposals, it contests the last of the above points. It believes that such an idea would call into question the fundamental principle of the work programmes, which are implemented with independent consultation bodies and which have always been at the heart of the Union's Framework Programmes. Allowing participants to choose their specific research goals on the basis of general strategic objectives would result in a dispersion of the resources and effectiveness of European support over an unmanageable range of subjects. As to allowing participants to choose the instrument from which they would like to benefit, that would render impossible any arbitration between the proposals.

The differences of opinion between the Commission and the authors of the Marimon report were on the agenda at the Competitiveness Council at the end of September 2004. The ministers took the view that it was a debate that should be pursued in the framework of the in-depth discussions on preparations for FP7, which should begin before the end of the year. To be continued...

To find out more

- www.cordis.lu/fp6/instruments_review/



REFERENCE POINTS... REFERENCE POINTS... R

Young scientists, the class of 2004

This year's Young Scientists Contest, the 16th, came to Dublin (IE) in late September. For four days, the Irish capital played host to the 73 finalists, aged between 15 and 20, from 34 European countries plus China and the United States. These young researchers were the winning competitors in their respective national competitions. Nine of them went home with one of the €28 500-worth of prizes. There were also various honorary prizes in the form of all expenses-paid visits to major European research centres – CERN, ESA, ESO, etc.

The three first prizes (of €5 000 each) went to young scientists from Austria, Denmark and Germany. The Austrians Martin Knöbel, 20, and Gerhard Schöny and Florian Grössbacher, both 19, designed and built



The 2004 winners. From left to right: Martin Knöbel and Florian Grössbacher (AT), Charlotte Strandkvist (DK), Gerhard Schöny (AT) and Mario Chemnitz (DE).

the first automated self-tuning device for condenser microphone membranes. This system, which requires no manual adjustment, should make it possible to reduce vibrations and, thereby, cut production time and costs.

Charlotte Strandkvist (DK), 18, worked alone. Her ambition is to be a chemical engineer or teacher. Her project is designed to improve the method for synthesising N-methyl fluoxetine in the laboratory – in other words, an original method of synthesising antidepressant drugs.

Mario Chemnitz (DE), 17, developed an ultrasonic detector for gas chromatography. This method is highly sensitive and also cheap compared with traditional detectors.

To find out more

- europa.eu.int/comm/research/youngscientists/index2.htm

Preparing the ground for more security research

Last September, the Commission confirmed the next steps in the launch, in 2007, of the future European research programme on security, which will be an integral part of the Seventh Framework Programme. By the end of this year, an advisory committee consisting of experts from the user groups, companies and research organisations will begin to advise the EU on the choices and means of implementation. This major five-year programme will be allocated a budget of around €1 billion.

Earlier this year, the Commission launched a three-year 'preparatory action' in the field of security research. The first call for proposals (budget: €15 million) closed on 23 June 2004 and more than 170 eligible proposals were submitted. The participants include many companies in the aerospace, information and communication technologies, systems integration and defence sectors. Twelve projects will be launched by mid-December in fields such as situation

perception, protection of networks, protection against terrorism, crisis management and the interoperability of control and communication systems. Two other calls for proposals will be published at the beginning of 2005 and 2006, each with a budget of €25 million.

To find out more

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

Erasmus Mundus

Erasmus Mundus is now up and running. This new and very appropriately named programme is destined, in the words of outgoing Education and Culture Commissioner Viviane Reding, to "restore Europe to a leadership position on the international university scene". It is aimed at all European institutes of higher education, as well as non-European students from every continent. With a budget of €230 million, Erasmus Mundus will be implementing four concrete actions:

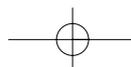
- ▶ the creation of a high-quality masters course, proposed jointly by at least three higher education establishments in different European countries
- ▶ the introduction of grants enabling top-level graduate students from third countries to take this specific training
- ▶ the possible creation of partnerships between the institutions participating in the programme and other higher educational establishments in third countries
- ▶ support for complementary actions likely to increase interest in and the visibility and attractiveness of these courses (especially in terms of mutual recognition of diplomas).

Nineteen masters courses started up for the 2004 autumn term, involving 82 European countries in 17 countries. One hundred and forty students and 42 academics were awarded grants to study in Europe for up to two years.

Note: Erasmus Mundus is not in any way a substitute for the 'classic' Erasmus programme that enables students to undertake part of their studies in another country.

To find out more

- europa.eu.int/comm/education/programmes/mundus/index_en.html



TS... REFERENCE POINTS... REFERENCE POINTS...



The world's rendezvous with space

On 16 February 2005, the European Union will be welcoming representatives from around 50 countries and 30 international or non-governmental organisations to the Third Earth Observation Summit in Brussels (BE). This comes on the heels of two earlier summits held in Washington (July 2003) and Tokyo (April 2004). The increased frequency of these gatherings reflects the degree to which the subject has become a global scientific priority.

More than 50 observation satellites are today circling the globe to observe its environment. These unique tools are proving increasingly valuable in monitoring climate change, meteorology, controlling sea and land pollution, as well as managing urban, rural or forest areas, etc. These environmental services are often inseparable from other, more social services that are now also managed from space, such as humanitarian aid following a natural disaster or conflict and transport management.

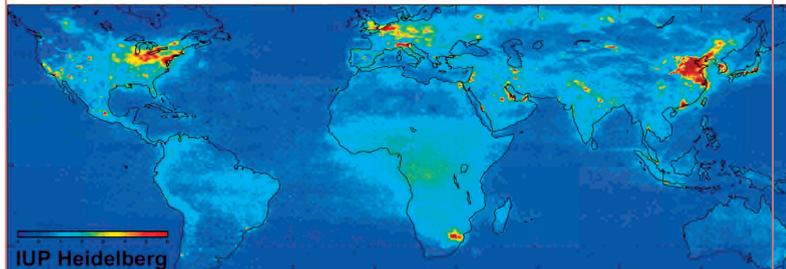
But this expanding network of satellites – connected to thousands of ground-based observation and measurement systems – suffers from a major handicap that prevents it from realising its full potential: the almost total lack of interconnection between the various observation devices.

It was to rectify this shortcoming that the Earth Observation Group (EOG) was set up at the international level in 2003. The goal of this broad political and scientific consortium is to deploy the new architecture of a 'system of systems' (GEOSS), making it possible to build bridges between present and future Earth observation devices. The Brussels Summit in February 2005 will be a major meeting enabling participants to endorse the 10-year GEOSS implementation plan.

Taking advantage of its status as summit host, the EU has decided to lend added impact to the event by having it coincide with the Earth and Space Week that runs from 12 to 20 February and should attract a wide public from Europe and abroad. The main attraction will be a major exhibition illustrating the fascinating knowledge and applications opened up by satellites in observing our planet. On 17 and 18 February, there will also be two international days on co-operation in space.

Watch out too for the 'Earth and Space' dossier that will be featured in next month's issue of RTD *info*.

To find out more
 ● europa.eu.int/comm/space/esw/index_en.htm



An improbable breath of fresh air

"Improbable research makes people laugh, and then makes them think." That is the slogan of the very original magazine *Air* (*The Annals of Improbable Research*), whose most valuable pearls of wisdom can also be appreciated in Italian, German and Chinese. Under the guiding hand of Marc Abrahams (Harvard University), the aim of the team of mischievous scientists and journalists is to awaken an interest in science by asking two good questions: 1) What is important and what isn't? 2) What is real and what isn't? They are constantly on the lookout, and in all the sciences, for the improbable, the useless, the incongruous, and the nonsensical – and at times the poetic.

To find out more

● www.improbable.com/

The *Air* team are also the originators of the Ig-Nobels (a word play on ignoble). Honouring authentic scientists who are authors of authentic studies, these prizes cover more fields than their Swedish namesake, most notably mathematics, psychology and 'interdisciplinarity'. The awards ceremony is held in the United States and is attended not just by the winners, who are systematically invited, but also genuine Nobel prizewinners who enter into the spirit. Following last year's event, some of the Ig-Nobels embarked on a tour of the United Kingdom and Ireland. The ceremony is held during National Science Week and is sponsored by the very serious British Association for the Advancement of Science (BAAS) and the *Times Higher Education Supplement*.

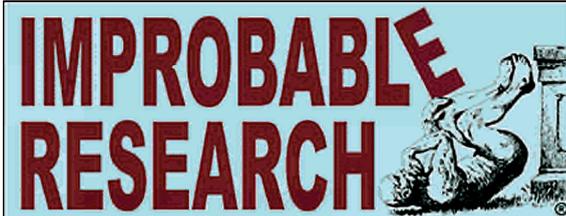
So who gets the prizes? The 2004 Ig-Nobels, announced on 30 September, included awards for the following:

Medicine: The effect of country music on suicide

Public health: Investigating the scientific validity of the 'five-second' rule (considering whether it is safe to eat food that has been dropped on the floor or if it has had time to be contaminated)

Physics: Coordination modes in the multisegmental dynamics of hula hooping

Annals of



REFERENCE POINTS... REFERENCE POINTS... R

European Research Council garners more support

The proposal to create a European Research Council (ERC) is receiving more backing all the time. The most recent was from the 52 European scientific organisations that have signed the petition drawn up and published by the Initiative for Science in Europe (ISE). Headed by José Mariano Gago, a scientist and politician who was one of the architects of the Lisbon Strategy, the ISE followed up this action by organising,

To find out more

- www.initiative-science-europe.org/

in Paris (FR) last October, a conference on the subject of the future ERC, with the aim of stimulating debate and action.



Incubating future Nobel laureates

To find out more

- www.esf.org/



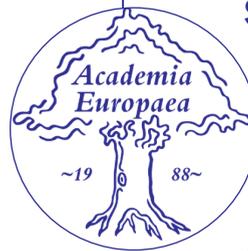
"It is often scientists just starting out on their careers who formulate new concepts that later overturn accepted scientific paradigms, sometimes subsequently being honoured with a Nobel Prize. To support creativity and the progress of knowledge, it is important to recognise up-and-coming generations of scientists by granting them the necessary means to ensure the necessary independence to pursue their own ideas," believes Bertil Anderson, executive director of the European Science Foundation (ESF) and member of the Nobel Committee.

That is the idea – generous in monetary terms – behind the launch of the new European Young Investigator Awards (EURYI), inaugurated this year by the ESF and the association of European Research Councils (EUROHORCs). Last year's call for proposals elicited 800 responses, 130 of which went on to the preselection stage.

At the end of August 2004, at the Euroscience Forum in Stockholm, 25 research awards were granted, ranging from €1 to €1.25 million. Such prizes, although not by nature comparable to a Nobel Prize, are important in a different respect. These personalised budgets enable young researchers working at European scientific organisations to pursue original lines of research and to set up their own research teams.

A fundamental innovation is that EURYI represents the first pooling of resources of national organisations for the funding of a joint project.

A plea for the social sciences



Founded in 1998 and with some 2 000 members (including 38 Nobel laureates), the Academia Europaea aims to harness efforts to develop and promote the social sciences at European level. It has just launched an appeal to research policy-makers for these disciplines to be taken into account when giving practical shape to the European Research Area. The social sciences are increasingly treated as the poor relations when allocating budgets

To find out more

- www.acadeuro.org

and suffer from a lack of interest on the part of the various players (research officials, policy-makers and economic decision-makers). In many people's minds, society's progress is often linked to progress in the so-called exact sciences. Yet the social sciences are essential for understanding both one's own socio-cultural environment and that of others, and is a useful tool of analysis at a time when Europe is enlarging and needs strengthened integration. This is one of the reasons why the association is strongly urging the future European Research Council to promote and support the social sciences to the same degree as the exact sciences.

The European dream

A nonconformist who defies categorisation, the socio-economist Jeremy Rifkin already sparked some lively discussions, as well as some sharp criticism, with his earlier works, especially *The End of Work* (1995). More recently, the controversial Rifkin took a surprisingly stimulating and positive look at economic changes and their relationship to the world of technosciences with his constructive book entitled *The Hydrogen Economy*, published in 2002.

His latest book – *The European Dream – How Europe's Vision of the Future is quietly eclipsing the American Dream* – has just been published. Taking issue with the US export model and its devotees, as well as analysts who mock 'Old World' models that have apparently had their day, Rifkin advocates a contemporary European vision. He sees this as better suited to the challenges of a globalised world than a kind of American addition to the past based on a shortsighted vision in which there is seen to be no limit to the accumulation of wealth or the availability of the planet's resources. He believes that the values defended by Europe – sustainable development, cultural diversity, quality of life, human rights – are both realistic and effective, constituting the ingredients of the "social cement on which the global world is being built".



TS... REFERENCE POINTS... REFERENCE POINTS...

Taking the pulse of teaching

Eurydice, the Commission-backed network, provides the educators with regular news on the programmes and policies that concern them and often takes the temperature of the teaching world. One of the network's recent publications is *Keeping teaching attractive in the 21st century*, the final volume of a four-part study that also covers teacher training, teacher supply and demand, working conditions and salaries. This in-depth look at the profession shows that most European teachers are fairly satisfied with their work, although they bemoan the increased workload and the seemingly low regard in which their profession is held (an impression that is not borne out by various opinion polls).

This relative satisfaction is not, however, serving to attract new comers to the profession and one of the most serious problems facing the sector, virtually throughout Europe, is the ageing of teaching staff and the lack of motivation among experienced teachers. To improve the situation, new initiatives are being launched in an attempt to tackle the problem at both ends of the age spectrum. In the Netherlands and the United Kingdom, non-traditional training courses are being



made available to individuals unable to follow the traditional teacher training programmes. For older teachers in many countries, a lightening of the workload at the end of their careers should help limit the numbers lining up for early retirement.

To find out more

- www.eurydice.org

Documents available in English

- www.eurydice.org/Doc_intermediaires/analysis/en/teachers_frameset_EN.html

CERN celebrates its golden jubilee

In October 2004, CERN (the European Centre for Nuclear Research) celebrated half a century of existence. On both sides of the Franco-Swiss border near Geneva, the lighting of the 50th candle was symbolised by a spectacular illumination of the 27-kilometre ring of the Large Hadron Collider accelerator.

To find out more

- www.cern.ch/

Its specialist field is admittedly 'nuclear' in the widest sense of the term, but not in the sense associated with energy production. Since the very beginning, it has been at the service of particle physics, for which it is today

The name of this prestigious scientific organisation is perhaps rather misleading.

Its specialist field is admittedly 'nuclear' in the widest sense of the term, but not in the sense associated with energy production. Since the very beginning, it has been at the service of particle physics, for which it is today

recognised as being the largest and most prestigious laboratory in the world. Through the five decades of its existence, CERN has been engaged in developing and acquiring the very best and the very rarest of experimentation tools, making it today a genuine 'multinational platform' for fundamental physics. It is home to around 6 000 resident or visiting researchers of all nationalities and every generation, from senior Nobel prizewinners to young and promising PhD students. It is engaged in an ever deeper penetration of the mysteries of the infinitely small components of matter and the forces of interaction that govern them. An investigation that, paradoxically, is gradually permitting progress in answering some of the big questions about the

mysteries of the origins and destiny of the Universe as a whole.

The ERN jubilee is of rich symbolic value to Europe. The founding of this institution – the idea was launched in 1949 – was the very first pioneering experience of a joint enterprise by 32 European countries. In this respect, it was a testing laboratory in which the spark of the concrete desire to create a unified Europe was already apparent. Another reason for its symbolic importance is that it incorporated a visionary dimension of a priority that today, 50 years later, is so very pertinent: the need to create a European Research Area based on the optimising of excellence.

The present LHC site: transporting the heavy, long and fragile superconductor magnets. Replacing the LEP, the LHC will enter into service at the beginning of 2007. It will be the most powerful and sophisticated accelerator ever built. The United States is a partner in the project.



In July 1974, work was completed on a tunnel with a circumference of 7 km, straddling the Franco-Swiss border at a depth of 40 metres. This was the first cross-border accelerator, the SPS (Super Proton Synchrotron), equipped with what was at the time a futuristic computer control system.



The construction of the LEP (large Electron-Positron Collider), an underground ring with a circumference of 27 km, again between France and Switzerland, was, in the 1980s, the biggest European construction site before work began on the Channel tunnel.



DISCOVER... DISCUSS... EXPLO

Special focus

Science and society. Science and culture. The new Ingenious site presents, in an intelligent and imaginative way, the complicity between these worlds and the often little apparent and little known links that have long existed between them. The key aim is to instil a desire to know more: "We invite you on a voyage of discovery through the content, exploring new perspectives on human ingenuity. The rich resources

offer authoritative re-interpretations that challenge traditional views. You can contribute to these discussions by offering fresh opinions on the issues that have changed our lives, thereby creating dialogues within communities and with the museums."

The proposed voyage covers some 30 fields, including the birth of humanity, the phenomenon of migration, links between science and science fiction, the beauty of maths, the power of science and technology over our lives and our ways of thinking, and the notion of voyage and exploration. The dynamism and clarity of the virtual presentation is an invitation to 'total immersion' by navigating a path through various fields: "read", "debate", "see", "create". This remarkable website is the work of experts with solid experience

Ingenious

©Science and Society Picture Library



School and television... in days gone by



©Science and Society Picture Library

behind them, acting on an initiative stemming from co-operation between five major British museums (Science Museum; National Museum of Photography, Film & Television; National Railway Museum; Science & Society Picture Library; Science Museum Library). They all brought their 'specific touch' to the project in terms of knowledge, educational experiences and communication, as well as their iconographic resources. Some 30 000 original images (archives, cinema, scientific documents) alone make the site well worth a visit. These illustrate brief explanatory texts that, although easy to read, never fall victim to the simplistic. A 'step-by-step' approach is possible for those who want to delve deeper. All these documents are waiting to be discovered on a virtual site that is as effective as it is attractive.

To find out more

- www.ingenious.org.uk/

Rediscovering our dark nights



Light pollution is causing some sleepless nights, in more ways than one. The electric lighting in our cities and along our highways is creating despair among astronomers, and in recent years the issue has been taken very seriously indeed. The first initiative was in the United States where the International Dark-Sky Association (IDA) was set up in 1988.

The IDA lists among its members some very determined Europeans, such as the Czech Jenik Hollan (professor of physics and astronomy at the Brno observatory)

who is one of the driving forces behind pioneering legislation – the first at national level. In the Czech Republic, light pollution is regulated in the same way as the emission of chemical pollutants – Prague street lamps now have to cast their beams down to the ground.

"We estimate that between 30% and 50% of the light emitted by external lighting is totally lost as it shines up into the sky," explains Philippe Demoulin. This astrophysicist at Liège University knows what he is talking about as Belgium is the European country familiar to astronauts for having the most 'phosphorescent' roads and motorways in the world. He also advocates the use of low-pressure sodium lamps that are more economical and less polluting but still able to produce a good light. In Lombardy (FR), a petition bearing over 25 000 signatures won approval for a measure similar to the Czech initiative. In the United Kingdom, the CfDS (*Campaign for Dark Skies* - www.dark-skies.org/) has been

trying since 1989 to establish dialogue with local and national authorities as well as with industry to secure measures to promote darkness, while the courts regularly hear cases of inhabitants complaining of excessive light.

So, it is not only astronomers who are bothered by this light pollution. It can disrupt sleep, pose problems to pedestrians and motorists by limiting their ability subsequently to adapt to the dark, and also upset the circadian rhythm of animals. To find out more – and perhaps to make your voice heard – check out the IDA's international site for details of the various national movements, such as *CieloBuio* in Italy or *CelFosc* in Spain.

To find out more

- www.darksky.org



EXPLORE... SUPPORT... CONSORT

WYP 2005, and long live Einstein

Unesco is promoting 2005 as 'World Year of Physics' (WYP). This is in homage to Einstein who, 100 years ago, discovered the theory of relativity, the first key step in rethinking our whole understanding of space, time and the Universe. The champagne will be flowing on 13 January in Paris, in the presence of many Nobel prizewinners and other leading figures from the world of science and industry – plus 500 young people carefully chosen from all over the world as budding scientists. Events will include two round tables on the role of physics in the 21st century, and public perceptions of science.

Young people will be very actively involved in the numerous events that will mark this WYP. The EuroPhysics Fun project, for example, will bring to many new countries the activities of the Danish Physics Show created by Aarhus University (DK). The idea originated

during the Danish Science Festival in 1998 when physics students played host to primary schoolchildren. Using practical demonstrations, they presented science as a magical subject that anyone can understand. It was such a success that the university decided to support the initiative financially – two students were assigned to it and the idea was expanded to include secondary school pupils.

Today, the Physics Show is a mini-enterprise employing 20 students from the university's Department of Physics to put on events regularly in schools, museums, cultural centres, etc. The Aarhus group attributes its success to a combination of elements: the way its educational approach is continually reappraised, the youth of the 'teachers', the presence of girl students to counter the popular image of science as a male subject, the focus on experimentation and links between physics and day-to-day life, and a presentation that always includes

the fun aspect. In 2001, the Aarhus students 'played' to 5 000 people. Thanks to the WYP, they hope to double that number in 2005 by disseminating their initiative throughout Europe.

**To find out more**

- www.wyp2005.org
- www.phys.au.dk/~epf/

A special issue of *Ciel & espace* (in French) devoted to Einstein on the occasion of the WYP:

- www.cieletespace.fr/front/default.asp?name=sinformer/ciel_espace/hs_einstein.htm

Education corner**Science teachers – webstop**

First click on an age group (3-7, 7-11, 11-14, 14-19 yrs). Then choose a subject (earth sciences, biology, science museums, laboratory equipment, parent-school relationships, distance learning). You can now click and discover a list of works, organisations, contacts, good teaching ideas, exhibitions to visit, etc. along with details of where to obtain documents, and put your questions to experts by e-mail. As the Scienceonestop organisers suggest, the intermediary between a science teacher and the quality of his teaching... is a mouse.

To find out more

- www.scienceonestop.com/

Students – what to choose?

To increase awareness of the reality of science, the Scientist@work project, launched in Belgium by the Flanders Interuniversity Institute for Biotechnology (VIB), has had the good idea of bringing together pupils (aged 14-18), their teachers and scientists. The scientists are opening the doors to the reality of science, welcoming pupils into real laboratories to carry out real experiments. The students then report their impressions in the form of a written document and poster that can be entered for an inter-school competition. The second of these competitions has already received 77 entries, with contributions from 845 pupils.

To find out more

- www.ecod-bio.org/school3.htm

Never too

German schoolchildren are to be introduced to the concept of sustainable development as early as kindergarten. Educational kits, known as the *Agenda-21 Boxen*, and including books, CDs, videos and games, are to be distributed in schools. Different kits will be available for different levels and in each case sustainable development will be studied by focusing on very concrete elements, such as buildings, textiles, food, and mobility. "This is an in-depth educational concept. It not only deals with the environment but also seeks to highlight the cultural dimension and the social structures involved in sustainability," stresses Alexander Leicht, head of the German Commission for Unesco, the initiator of the project.

**To find out more**

- www.hagemann.de/agenda21box/
- www.aktionsaubereandschaft.de



Pedro Duque
juggling in space
©ESA

DVD – Newton in Space

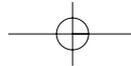
Lessons in Newton's laws have been filmed on-board the International Space Station, as well as on Earth. In space, the astronauts Pedro Duque (Spain) and Alexandre Kaleri (Russia) carried out experiments similar to those done by German, Spanish and Irish secondary school pupils 'on the ground'. The results were recorded and are now available on an educational DVD, *Newton in Space*, produced by the ESA. "We learned about science without really knowing we were doing it," was the view of Stephen Rigney, from Ireland. In a sense, that is what the developers of this educational kit had in mind. Available in 12 languages, it includes a DVD, teacher's manual, documentation on the International Space Station, details of multidisciplinary activities, and web references.

To find out more

- To obtain the DVD:
- www.esa.int/spaceflight/education

Contact

- elena.grifoni@esa.int



Overview of calls for proposals

Here is the latest news on the nature, closing dates and indicative budgets of calls for proposals already launched or scheduled for the coming months. For additional specific information on each of these calls, go to the page indicated on the Europa site which provides direct links to the on-line documents and procedures available on the CORDIS server.

europa.eu.int/comm/research/fp6/calls_en.html

Abbreviations used – IP: Integrated Projects – NoE: Networks of Excellence – STREP: Specific Targeted Research Projects – CA: Coordination Actions – SSA: Specific Support Actions – Nd: not determined

CALL IDENTIFIER	RESEARCH FIELDS OR ACTIONS TARGETED	CLOSING DATE	INDICATIVE BUDGET (IN MILLIONS €)
INTEGRATING AND STRENGTHENING THE EUROPEAN RESEARCH AREA			
Life sciences, genomics and biotechnology for health		rtd-genomics@cec.eu.int	
FP6-2004-LIFESCIHEALTH-5	Fundamental knowledge and basic tools for functional genomics in all organisms, as well as health applications; combating major diseases (cardiovascular disease, diabetes, rare diseases, diseases of the brain and nervous system, cancer, poverty-related transmissible diseases); study of human development and the ageing process; combating resistance to antibiotics and other drugs	16/11/2004	540 ⁽¹⁾
<i>(1) Of which €405 to €432 million is for IP-NoE; of which €108 to €135 million is for specific SSA, STREP, CA; of which €8 million is for strategic SSA as a whole</i>			
Information society technologies		ist@cec.eu.int	
FP6-2002-IST-C	Future and emerging technologies (FET) – continuous submission of proposals ⁽¹⁾ : call open until 31 December 2004	31/12/2004	60
<i>(1) see: www.cordis.lu/ist/fet/int-o.htm</i>			
Aeronautics and Space		rtd-aerospace@cec.eu.int	
P6-2004-Hydrogen-1	Joint call with the "Sustainable energy systems" and "Sustainable surface transport" priorities – Component development and systems integration of hydrogen and fuel cells for transport and other applications	08/12/2004	35 ⁽¹⁾
P6-2004-Hydrogen-2	Joint call with the "Sustainable energy systems" and "Sustainable surface transport" priorities – Coordination, assessment and monitoring of research to contribute to the definition phase for a hydrogen communities technology initiative	08/12/2004	4,5 ⁽²⁾
FP6-2004-TREN-3	Joint call with the "Sustainable energy systems" and "Sustainable surface transport" priorities – Air Traffic Management (ATM) ⁽³⁾ and efficiency of airport activities ⁽⁴⁾	08/12/2004	64 ⁽⁵⁾⁽⁶⁾
<i>(1) Global budget for the IP & STREP in the three priorities</i>			
<i>(2) Global budget for the IP in the three priorities</i>			
<i>(3) IP, STREP & SSA</i>			
<i>(4) IP only</i>			
<i>(5) Specific budget for Aeronautics and Space</i>			
<i>(6) The total budget for the joint call (€252 million) makes provision for setting aside €176 million for the IP and €76 million for the STREP, CA & SSA</i>			
Food quality and safety		rtd-food@cec.eu.int	
FP6-2004-Food-3-B	Research on the food chain, traceability, safety and durability of production processes, methods of analysis, detection and control, impact on health	08/02/2005	59 ⁽¹⁾
FP6-2004-Food-3-C	Call for SSA	07/09/2005	5
<i>(1) STREP and CA: €54 million – SSA: €5 million</i>			

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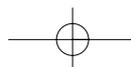
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Sustainable development, global change and ecosystems		rtd-sustainable@cec.eu.int	
FP6-2002-Transport-2	Periodic call for the SSA (participation of SMEs – international co-operation – candidate countries – exploitation of results – objectives of the ERA, EU strategy and support for policy) in the field of “Sustainable surface transport” – Final closure in March 2006	ND ⁽¹⁾	ND ⁽¹⁾
FP6-2004-Hydrogen-1	Joint call with the “Aeronautics and Space”, “Sustainable energy systems” and Sustainable surface transport” priorities – Component development and systems integration of hydrogen and fuel cells for transport and other applications	08/12/2004	35 ⁽²⁾
FP6-2004-Hydrogen-2	Joint call with the “Aeronautics and Space”, “Sustainable energy systems” and “Sustainable surface transport” priorities – Coordination, assessment and monitoring of research to contribute to the definition phase for a hydrogen communities technology initiative	08/12/2004	4,5 ⁽³⁾
FP6-2004-TREN-3	Joint call with the “Aeronautics and Space” and “Sustainable surface transport” priorities – Sustainable energy systems (supply and integration of renewable energies, polygeneration, alternative motor fuels, thematic promotion and diffusion) ⁽⁴⁾	08/12/2004	132 ⁽⁵⁾⁽⁶⁾
	Joint call with the “Aeronautics and Space” and “Sustainable energy systems” priorities – Sustainable surface transport (public transport and innovation in urban transport, Civitas II – intermodal freight technologies, systems and management – road safety – information for travellers – tolls, right of use and sharing of cost of infrastructures)	08/12/2004	56 ⁽⁶⁾⁽⁷⁾
FP6-2004-Energy-3	Research with a medium- and long-term impact (fuel cells, new technologies for energy carriers, renewable energy technologies, capture and sequestration of CO ₂ , socio-economic tools and concepts) ⁽⁴⁾	08/12/2004	190 ⁽⁸⁾

(1) Closing dates and budgets for 2005 still to be announced

(2) Global budget for the IP & STREP in the three priorities

(3) Global budget for the IP in the three priorities

(4) IP, STREP, CA & SSA

(5) Specific budget for Sustainable Energy Systems

(6) The total budget for the joint call (€252 million) makes provision for setting aside €176 million for the IP and €76 million for the STREP, CA & SSA

(7) Specific budget for Aeronautics and Space

(8) IP and NoE: €124 million – STREP and CA: €66 million

Specific support measures for international co-operation		inco@cec.eu.int	
Abbreviations: DEV: developing countries – MPC: Mediterranean Partner Countries – Russia + NIS: Russia and the other Newly Independent States – WBC: Western Balkan Countries			
FP6-2002-INCO-DEV/SSA-1	Periodic call for SSA (health, natural resources and food safety) for the DEV	07/03/2005 ⁽¹⁾	ND ⁽²⁾
FP6-2002-INCO-MPC/SSA-2	Periodic call for SSA (environment, cultural heritage, health) for the MPC	07/03/2005 ⁽¹⁾	ND ⁽²⁾
FP6-2002-INCO-WBC/SSA-3	Periodic call for SSA (environment, health) for the WBC (environment, health)	07/03/2005 ⁽¹⁾	ND ⁽²⁾
FP6-2002-INCO-Russia+NIS/SSA-4	Periodic call for SSA (adaptation of industrial production and communication systems; environment; health) for Russia + NIS	07/03/2005 ⁽¹⁾	ND ⁽²⁾
FP6-2002-INCO-COMultilaRTD/SSA-5	Periodic call for SSA in the framework of multilateral coordination of national RTD activities and policies	07/03/2005 ⁽¹⁾	ND ⁽²⁾

(1) Forthcoming pooled intermediary assessments: 07/09/2005; 06/03/2006

(2) 2005 budgets not yet announced

Support for coordination activities		rtd-coordination@cec.eu.int	
FP6-2002-ERA-NET/1/CA-SSA	Periodic call: support for co-operation and coordination of research activities at national and regional level (ERA-NET system)	02/03/2005 ⁽¹⁾	58,6 ⁽²⁾

(1) Forthcoming acceptance date for assessment: 04/10/2005

(2) Global budget for 2005

STRUCTURING THE EUROPEAN RESEARCH AREA

Human resources and mobility (Marie Curie Actions)		rtd-mariecurie-actions@cec.eu.int	
FP6-2004-Mobility-1	Research training: “interdisciplinary” and “intersectorial” networks	02/12/2004	45
FP6-2004-Mobility-2	Host fellowships for early-stage training	02/12/2004	170
FP6-2004-Mobility-13	“Researchers for Europe” initiative	02/12/2004	3
Science and society		rtd-sciencesociety@cec.eu.int	
FP6-2004-Science-and-Society-11	Science education and careers 2004	15/12/2004	3

RESEARCH AND TRAINING IN THE FIELD OF NUCLEAR ENERGY

		rtd-euratom@cec.eu.int	
Euratom Call Open	Open call: SSA, transnational access to large infrastructures, actions to promote and develop human mobility	12/04/2005 ⁽¹⁾	ND ⁽²⁾

(1) Forthcoming closing dates: 11/10/2005, 11/04/2006

(2) Not yet announced for 2005

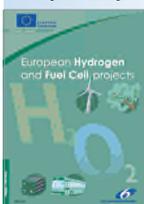
Research DG publications

On-line catalogue of all publications edited by Research DG:
europa.eu.int/comm/research/publications/pub_en.cfm

Presentation of Sixth Framework Programme projects

European Hydrogen and Fuel Cell projects

Project summaries – Publication: 9/2004
 66 pp – ISBN: 92-894-8003-3
rtd-energy@cec.eu.int



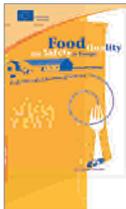
European CO₂ Capture and Storage

Project summaries
 Publication 9/2004 – 24 pp
 ISBN: 92-894-8002-5
rtd-energy@cec.eu.int



European distributed energy resources project

Project summaries – Publication 9/2004 – 24 pp
 ISBN: 92-894-8001-7 – rtd-energy@cec.eu.int



Food safety and food quality in Europe

Project summaries – Publication 9/2004 – 39 sheets
 ISBN: 92-894-6811-4
rtd-food@cec.eu.int

Environment

Research for sustainable urban development and land use

UN-Habitat and the EU – Creating a world of sustainable cities

Brochure – Publication 8/2004 – 12 pp
 ISBN: 92-894-7704-0 – rtd-sustainable@cec.eu.int



EU Research for sustainable urban development and land use – Land use and mobility

Keeping our cities moving – Brochure
 Publication 8/2004 – 12 pp – ISBN: 92-894-7706-7
rtd-sustainable@cec.eu.int



EU Research for sustainable urban development and land use

New technologies for the future of our past

Brochure – Publication 8/2004 – 12 pp
 ISBN: 92-894-7708-3
rtd-sustainable@cec.eu.int



Science and society

Gender and Excellence in the Making – Study

Publication 8/2004 – 179 pp – ISBN: 92-894-7479-3
rtd-sciencesociety@cec.eu.int



National regulations on ethics and research in the new Member States and candidate countries

10 bilingual brochures (national language and English)
 Publication 8/2004 – 14 to 20 pp
rtd-ethics@cec.eu.int



Human resources

Training researchers – High-level scientific conferences – Brochure – Publication 8/2004
 37 pp – ISBN: 92-894-5616-7
rtd-mariecurie@cec.eu.int



Diary

Meetings under the Dutch presidency

- **European Leadership in E-Science and Grids**
 18-24/11/2004 – The Hague (NL) – www.arcade-eu.org
- **Fifth European Vehicle Passive Safety Network Conference**
 1/12/2004 – Amsterdam (NL) – www.passivesafety.com/08_documents/docs_conf/5th_conf_program.pdf
- **Images of Science – New Interactions between Science and Society** –
 6-7/12/2004 – Amsterdam (NL) – www.imagesofscience.nl



- **Manufacture 2004 – European Manufacturing of the Future: Making Research Work**
 6 –7/12/2004 – Enschede (NL)
www.manufacture.utwente.nl

- **European Platform for Biodiversity Research Strategy (EPBRS)** – 10-13/12/2004
 Amsterdam (NL) – www.biodiversity-chm.nl



European notebook

- **ECEL 2004 – 3rd European Conference on e-Learning**
 25/11/2004 – Paris (FR) – www.academic-conferences.org/ecel2004/ecel04-home.htm
- **First International Conference on Research in Air Transportation (ICRAT 2004)**, ‘focused on young researchers’ – 22-24/11/04 – Zilina (SK)
www.icrat.org/



- **Integration of Renewable Energy Sources and Distributed Energy Resources**
 1-3/12/2004 – Brussels (BE)
www.conference-on-integration.com/
- **Brussels IP2004 (Intellectual Property)**
 2-3/12/2004 – Brussels (BE)
www.ipsummit.info/

- **IADIS International Conference e-Commerce 2004**
 14-16/12/2004 – Lisbonne (PT) – www.iadis.org/ec2004/cfp.asp
- **Research Ethics committees in Europe: Facing the future together**
 27-28/1/2005 – Brussels (BE) – europa.eu.int/comm/research/conferences/2005/recs/index_en.htm
- **Earth & Space Week** – 12-20/2/2005
 Brussels (BE) – www.europa.eu.int/comm/space/esw/index_en.htm



The Directorate-General for Research -
Building Europe's Future
 Brochure – Publication 9/2004
 20 pp research@cec.eu.int



Brochures

Scientific support to policies
 Brochure – Publication 8/2004 – 6 pp
rtd-policies@cec.eu.int

Strengthening European research

At the beginning of 2004, the European Commission launched a very ambitious debate on the future of European research policy, proposing to double its budget. In June, it sketched the essential strategy to be pursued by this strengthened policy. RTD *info* talks to Achilleas Mitsos, Director-General for Research at the European Commission.



Achilleas Mitsos, Director-General for Research at the European Commission. ©Thierry Maroit

■ *Among the Commission's principal proposals, the plan to set up a European Research Council (ERC), following urgent demands from the scientific community, is a major innovation. What will this new instrument bring?*

The course set by the Union – known as the Lisbon Strategy – is to secure its prosperity and competitiveness by meeting the challenges of the information society. To do so, it is clearly necessary for the EU to increase its capacities and its excellence in the field of fundamental research, the aims of which are often uncertain and the results as random as they are original. That raises new questions. It is hard to see on what knowledge basis the Council, the Commission, or the Parliament, could say to scientists “carry out research on this or that puzzling physical or biological particularity, and come up with something for us...”.

That is why the particular innovation of setting up an ERC lies in granting the scientific community the freedom to choose its own research priorities that can then be financed out of a European budget. It is not a question of treating scientists to a particular largesse. The aim is to introduce a rigorous principle of competition for excellence, subject to control by peer review.

■ *Is the notion of an ERC accepted by the Member States and what scale of financing are we talking about?*

The idea has gained ground. It is a formula that has shown its worth. The value of the research carried out by the National Science Foundation (NSF) in the United States is recognised worldwide. Structures of excellence of this kind exist in the United Kingdom and other Northern European countries.

As for the resources, first of all, there must be consensus on the increase in the global budget allocated to European research. After that, we can talk about how it is to be allocated. But we may assume that launching the ERC will require major sums. In fields targeted with relative precision, we can initiate ‘pilot instruments’ that will test the needs to be met and existing capacities. But we will not undertake fundamental research on a pilot scale; that would not make any sense.

■ *What are the other boosts to research policy that justify doubling the budget?*

Increased resources will make it possible to develop three lines of research that have already been on the table for some time. In addition to fundamental research, the Lisbon Strategy calls for a drive to increase Europe's technological excellence. We are currently putting together a number of ‘platforms’ in which research players – universities, research centres and industry – can team up with

the world of finance and regulatory bodies to define development agendas and bring together European and national resources, both public and private, in a number of well-defined fields. The hydrogen economy, solar photovoltaic energy, nanoelectronics, mobile communications and on-board computer systems are all examples. The aim is to mobilise a critical mass of excellence, know-how and resources that could take concrete shape in the form of joint initiatives on a larger scale. One particular



possibility that can be envisaged is the creation of joint enterprises, a formula for which the Union Constitution makes explicit provision.

A second line is financing research infrastructures of European interest. There has been a consensus, in principle, on this subject for some time already, but it must be admitted that to date we have failed to act on it. It is not easy to choose a major investment in one sector rather than another, or to decide what country or region is going to reap the benefits of having it based there. But we must succeed in this. The needs exist and, in 2003, we set up the European Strategy Forum for Research Infrastructures (ESRI) that is organising an independent debate on the choices to be made.

The third component to be strengthened is one of the essential foundations of the European Research Area: increased coordination between national science and technology programmes and policies. This goal is currently being tested in the present ERA-Net actions to support the networking and mutual opening up of programmes. As the Treaty states, the aim is also for the Union to make a significant contribution to 'variable geometry' programmes carried out jointly by a limited number of Member States.

■ ***But do these new deployments of research policy not relate poorly to the present Framework Programme's thematic priorities?***

Certainly not. These developments broaden the horizon of the future Framework Programme. But it will continue to allocate a large part of its budget to supporting co-operation between teams within the European Research Area and on identified priorities.

The Sixth Framework Programme, which is only now really getting into its stride, will finance projects until 2006. In particular, it introduced support for Networks of Excellence and Integrated Projects. The impact of these new dynamic tools on restructuring research potential in the Union has just been analysed by a group of experts, and they will make it more efficient.

As for adapting choices for the thematic priorities, this will be the result of the evaluation and consultation exercise which begins in 2005 on technical preparations for the next Framework Programme that will commence at the end of 2006. In any event, there is wide-rang-

ing political agreement to integrate in full two new fields into the research priorities. Programmes and applications in the field of space science is one of them, a field of competence that the Constitution clearly entrusts to the Union. To this end, the ESA and the Commission have already signed a co-operation agreement

to develop common lines of research. Secondly, there is the major security challenge, which is currently the subject of a preparatory action to set up the elements of a specific programme.

■ ***And what about the horizontal themes that generated such intense action at Community level, such as the 'science and society' issue or support for research in favour of the new Member States? International scientific co-operation was previously a well-identified programme. Has this not become less visible within the thematic priorities?***

The reason science and society is not featured as such in the orientations currently being discussed is because this is not an issue that is posed, in the present context, in financial terms. But I do not understand why this should mean that the Commission has lost interest in this problem. Since the science and society action plan was launched in 2001 – an initiative we are very proud of – we have not ceased highlighting the issue. This is a very important battle – such as enhancing the role of women in science – which, of course, we intend to continue.

As regards co-operation with third countries, the Sixth Framework Programme goes beyond financing small, specific projects in a multitude of countries. This approach was too fragmented and offered no real guarantee of results. On the other hand, we are continuing to back more horizontal support measures – in

the field of research on health, diet, the environment or researcher training, etc. – by trying to coordinate them at the level of large regions.

But a new and important feature is that Europe is offering its third country partners – and, until this year, the new Member States were still outside the Union – the opportunity to benefit in full from Community support by participating in European projects. This opening up of our programmes is a very valuable opportunity. If a Chilean, Algerian or Philippine university or laboratory has in-depth scientific experience in a given field, we can finance its integration into a Network of Excellence project on exactly the same basis as a Union Member State. This is a genuinely stimulating and egalitarian concept of co-operation that we believe is much more profitable for our partners – and also for the Union.

As regards the new Member States, it should be stressed that their research potential must not only be exploited and increased through participation in the Framework Programme but also as a result of a global approach to their integration in the Union. In this respect, all European policies that concern the redeployment of this potential must be mobilised, especially in the framework of the European Structural Funds. ■

“ It is hard to see on what knowledge bases the Council, the Commission or the Parliament could say to scientists, “carry out research on this or that puzzling physical or biological particularity, and come up with something for us...” ”

To find out more

Site of the Research DG on the future of European research

- http://europa.eu.int/comm/research/future/index_en.html

Commission Communications

Strategic guidelines for European research policy

- http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0353en01.pdf

Financial perspectives 2007-2013

- http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0101en02.pdf

Fundamental research

- http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0009en01.pdf

Neighbourhood science

Students at the Wageningen (NL) science shop analysing the water quality at the Beerendonck site at the request of the Dutch Association for Underwater Sports.

©Guy Ackermans

In a sense, science shops are both shop and embassy. Rooted in the local community and working hand in hand with universities, they place research and know-how at the service of needs on the ground. Citizens, associations and NGOs make up their 'clientele', whose concerns they meet by carrying out audits, studies, investigations, research and sometimes even proposing innovative technical solutions. Originating in the Netherlands, this 'science and society' formula has now spread to much of Europe.

The idea was inspired by a French initiative launched at the end of the 19th century which is still alive today: *boutiques de droits*. Based in working-class neighbourhoods, they comprise centres staffed by volunteer lawyers who offer information and social and legal advice free of charge. In 1908, at Delft University in the Netherlands, the first 'science' variation on the model opened its doors. This pioneering

centre initiated the idea that citizens could contact students and graduates to ask them to look into issues of concern to them, in the field of health, working conditions or any other aspect of society.

The wind of '68

It was also in the Netherlands that, in the seventies, the concept took on a new lease of life and started to spread to many other countries. May '68 gave rise to a spirit of revolt and a quest for justice and equality. It was a time of protest against a research that was seen as too profit-oriented and of demands for access to knowledge for all and a research response to the needs of communities or bodies with limited financial resources. In 1974, the first science shop opened.

Over the next 20 years the idea gained ground throughout Europe. Each 'shop' has its speciality, its own approach and its own clientele. But they share the common objective of bringing science and society together. Some of them initiate original research, while others act as intermediaries between those who ask the questions and those who are able to provide part of the answer. Their activities cover very different disciplines – medicine, the environment, the social and human sciences, as well as requests linked to development co-operation. Despite being called 'shops', they are not businesses and do not charge fees, except a strict minimum for organisations in a position to contribute.

The sociologist Alan Irwin of Brunel University (UK) believes that the science shops experience shows that, when it comes to responding to





In Zijpe, in the Netherlands, pesticides are used in agriculture and floriculture. By studying a collection of dust samples, Utrecht University's biology science shop was able to evaluate their potential nuisance.



citizens' concerns, the divide between pure and human sciences is much less clear-cut than in traditional scientific work⁽¹⁾. Could this be one of the reasons for the reluctance in certain scientific circles to acknowledge the importance of their work? "We sometimes have to fight to show that a study carried out by a science shop is of intrinsic scientific merit, even if it is not published in the most prestigious journals," explains Caspar De Bok, coordinator of the biology science shop at Utrecht University and active member of the ISSNET European network (see box).

(1) Irwin, A., *Citizen Science – A study of people, expertise and sustainable development*. London and New York, 1995.

some of them are linked to NGOs and financed by public bodies, most are rooted in an academic structure. "For universities, their science shops are an interesting public showcase, allowing people to discover how they can be useful to their local community," explains Eileen Martin, one of the managers at the Queen's University science shop in Belfast.

A showcase for universities

The universities – and indirectly scientists – tend to be the natural home for science shops. Although, as is the case in Germany and Austria,

Opened in 1988, this is quite a success story. "We receive more than 200 research requests a year. The most difficult task is to find enough students and teams ready to follow them up. We are able to respond to just over half of these requests, carrying out research of a guaranteed high standard. Most of this research is in the field of sociology, political science and the environment."

In most countries, students can enter details of their work for science shops to earn course credits. "This is often a very positive experience," continues Ms Martin. "Some students discover a field of interest in which they would like to work in the future. Or, on the contrary, they realise that a particular direction is not for them – also useful in terms of deciding which direction to take." Based on a bottom-up approach, research carried out by science shops can also open up new avenues of knowledge that can be of interest to the scientists themselves. Zijpe, a small coastal town in the northern Netherlands,



Science shops supported by the Union

In its Science and Society action plan, the Commission views science shops as a very useful tool in reducing the divide between the general public and the scientific community. Initially, the Union supported the SCIPAS (Study and Conference on Improving Public Access to Science through science shops) project, which ran from 1999 to 2001. This involved evaluating the opportunities, the conditions and the potential social impact of a network of science shops. The SCIPAS carried out a number of studies on optimising the work and organisation of a science shop, the launch of an international magazine and the compiling of a databank with free public access. The role and benefits of science shops for research, education and communication were also studied. In January 2001, a first conference entitled Living Knowledge was attended by more than 100 participants from 19 countries on every continent.

In 2003, this was followed by Commission support for the launch of the ISSNET (Improving Science Shop Networking) workshop. Coordinated by the University of Utrecht, this aims to enable science shops to meet, debate, and share experiences. Living Knowledge is the name given to the ISSNET liaison newsletter, which also manages an interactive databank providing information on science shops, their projects and priorities, and permitting the exchange of know-how.

To find out more

ISSNET

- www.scienceshops.org/
- www.livingknowledge.org/

Science shops – knowledge in the service of the Community

Downloadable document published in French, English and German by the European Commission (Science and Society, Research DG).

- europa.eu.int/comm/research/science-society/scientific-awareness/shops_en.html

Diary

The second Living Knowledge conference will be held in Seville, from 3 to 5 February 2005, on the subject of 'Advancing Science and Society Interaction'.

- www.cienciaysociedadsevilla.org/ingles/index.html

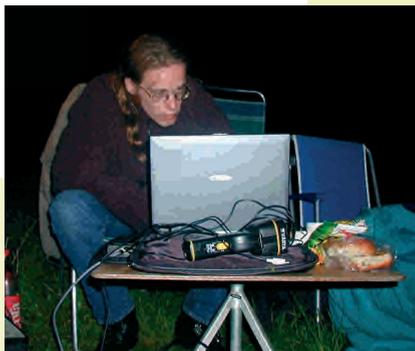
provides one such example. A local residents' association had questions about the worrying use of pesticides in cereal farming and intensive bulb culture. Utrecht University's biology science shop launched an impact study, carried out in co-operation with one of its research units and managed by one of its doctoral students. Dust samples were collected in local homes and farm buildings to assess the potential nuisance of pesticides. "In addition to the analysis results that confirmed the exposure of residents – especially farmers – to the harmful ingredients in the products used, the protocols used for collecting the samples were innovative and convincing," explains Caspar De Bok. "The validity of the methodology is now being cited in discussions with a Dutch parliamentary committee. It is enabling us to ask the minister concerned to develop a large-scale study on the subject, in co-operation with the residents and farmers."

From the Netherlands to Romania

A useful project for civil society and one that also attracts the attention of researchers, brings progress to scientific methods and has an impact at policy level... It is an ideal case. The long tradition of the Netherlands in this field makes it something of a pilot country. Its 13 universities each have up to ten specialised science shops which receive thousands of requests a year in the most diverse fields. This dynamism is not due solely to the desire of students and researchers, but also to a political authority that is attentive to its universities and citizens.

It was, moreover, with the logistics support of Groningen University's chemistry and biology science shops, that it proved possible to sponsor the launch of this formula in Romania, with the support of the Dutch Government. Eight science shops, under the InterMediu label – *médiu* meaning environment in Romanian – now exist at the universities of Bacau, Bucharest, Brasov, Iasi, Galati, Oradea and Ploiesti. The first studies undertaken by InterMediu concerned water quality (drinking and bathing water) and environmental education. Romanian researchers and students hope to be able to develop other initiatives of this kind in the health field.

Night work.



Day work.



The Europe of Knowledge 2010 conference, Liège (BE) – 2004.



The InterMediu network in Romania.

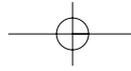
A mix of 'clients'

Although the environment and health are clearly major subjects of concern to the population, some science shops find themselves confronting more specific issues. In Spain, for example, a competition launched by the Arquitectura y Compromiso Social science shop at the Seville School of Architecture culminated in a concept for 'customised' housing for Romanians. Consultation between representatives of their community, NGOs, architects and sociologists made it possible to develop projects for fixed homes that took into account their outdoor lifestyle and scrap-recycling activities.

In France, the recently opened science shop at the Ecole Nationale Supérieure in Cachan, just outside Paris, looked at the question of agricultural practices and water management, especially in the face of floods. "Shrinking pastures, the reduced organic-matter content of soils, and compaction under the weight of heavy equipment are reducing soil porosity and thus decreasing their permeability," explains Fabien

Amiot. "The role of the science shop is to set up co-operation between a group of farmers and a group of civil engineering students to make a study on the interests of these users who are not very familiar with the devices of scientific production."

Two recent Belgian initiatives, launched by the Vrije Universiteit Brussel (VUB) and Antwerp University, started up after consulting various NGOs and associations to gauge the situation on the ground. The aim was to evaluate the fields in which such organisations could be interested in contacting a science shop. Based at the universities, these science shops act as 'intermediaries', directing 'clients' to the relevant faculties. "The studies are carried out by students and supervised by scientists," explains Sofie Van Den Bossche of the Brussels Wetenschapswinkel. "At present, there are a lot of requests concerning socio-economic questions. This enables students to become aware of the needs of the society they live in and to consider the question of how their scientific practice can meet them. Conversely, our work makes it possible to increase public awareness of the benefits of scientific research." ■

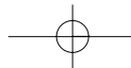


A growing concern

Traditional agrofoculture landscape in the Dauphiné, France. The trees are widely spaced and are isolated or planted in rows or clumps, but always in close vicinity to arable crops.

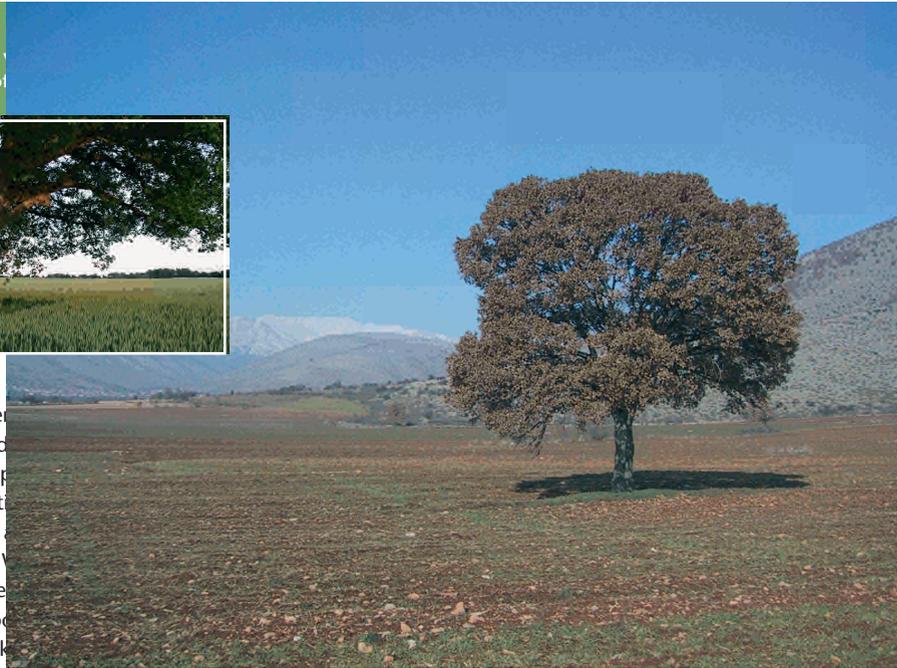
© Fabien Liagre - Agrooof

Could the European countryside be about to undergo radical change? The promising results of the SAFE (Silvoarable Agrofoculture For Europe) project, on which 70 researchers from eight countries worked for four years, suggest that this could well be the case. Their work calls into question a growing trend in recent decades associated with the drive to boost agricultural productivity: the disappearance of trees. The findings could well influence the future direction of the common agricultural policy.



A lone oak standing in the middle of an agricultural plain in Greece. Reparcelling has destroyed traditional agroforestry landscapes. The inset shows another ancient solitary oak that still stands in the middle of wheat fields in rural France.

© Fabien Liagre - Agroof



© Christian Dupraz - INRA

Scarcely more than 50 years ago, trees were a constant feature of rural landscapes. Standing on the edges or even in the middle of fields and pastures, they provided wood, fruit, shade and protection. They had their rightful place. But the intensification and mechanisation of farming since the Second World War has proved fatal to this tradition. Trees have been felled and pulled up all over the countryside, to the point where it is not unusual to witness kilometre after kilometre of agricultural land without a tree in sight. For forestry and for the dominant agriculture, trees belong in the forest and the crops belong in the fields.

Overturning accepted ideas

The results of the SAFE project suggest that this trend, defended on the grounds of productivity, is an aberration. Contrary to accepted ideas, the researchers established that by alternating the planting of rows of trees and crops, carefully selecting the species and varieties, and adopting specific management methods, it was possible to achieve dramatic increases in yields – up to 30% – for both farming and forestry. It is this mix of trees and crops that is the fundamental principle of agroforestry.

Let us take just one example to illustrate the point. The SAFE researchers showed that the production from one hectare of a poplar/wheat mix is the same as for 1.3 hectares separated into two plots,



Experimental plot at Leeds University (United Kingdom) where poplars and wheat grow in close proximity. © Christian Dupraz - INRA

one for wheat covering 0.9 hectares and another for poplars covering 0.4 hectares. This is on the basis, of course, of a complete cycle for the trees (in this case, 20 years for the poplars) and a tree density in agroforestry that is lower than for traditional poplar plantations and makes it possible to maintain satisfactory yields for the wheat until the trees are felled.

What can be the reason for such a result, when our very rational agriculture considers that an improvement of just a few percent, when it is produced by a new variety, is a genuine breakthrough? The answer is simply that given the right association and appropriate management, trees and annuals establish a synergy in the sharing of the vital resources of light, water and soil nutrients.

“By having to compete with the crop, the tree naturally lays down deeper roots,” explains Christian Dupraz, a researcher at the INRA (Institut National de la Recherche Agronomique) in Montpellier (FR) and SAFE coordinator. “The trees ultimately develop a network of roots that extends beneath the upper layers of the soil from which the crops draw their nutrients. This enables the trees to draw on water and nutrients that escape the roots of the crops – the main reason for the increased productivity, from a forestry point of view. Each tree also grows more quickly than it would in an exclusively forestry plot as the trees are no longer competing with an immediate neighbour. Finally, the trees actively help the crops by sheltering them from wind, violent rain or scorching sun.”

The benefits for farmers

Such a mix of trees and crops could be considered incompatible with the use of increasingly large and rapid agricultural machinery, but this is not so. Demonstrations carried out by the project have shown that this mix is compatible with the mechanical means currently used, provided the rows of trees stand between 15 and 40 metres apart, depending on the crops, and that the trees are pruned properly and rationally.

An essential argument in convincing farmers to opt for this kind of intercropping is, of course, the question of revenue. Economic analyses carried out by the SAFE project have established that for a constant





surface area, and by adopting a progressive rhythm of agroforestry plantations, a farmer can limit the immediate fall in revenue to under 5%. This is a sacrifice that will be more than compensated for over time as he builds up a considerable timber capital, diversifying his activities in the process. The price is just modest maintenance, concentrated above all in the first ten years in the life of a tree – during which time it must be given a good shape. Afterwards, it can simply be left to grow. The recommendation is to plant species with a high added value (service, pear, cherry, maple, walnut, etc.) which yield wood that is in great demand on the market and which, one day, may even be able to replace the tropical woods that Europe continues to import in large quantities.

In European terms – as regards the common agricultural policy (CAP) – one of the main strengths of agroforestry is that it lends itself to an almost infinite number of local combinations by varying the species, varieties and growing methods. The SAFE project is therefore also interesting in the way it has brought together countries as different as the Netherlands, Greece, the United Kingdom and Spain so as to confront very diverse situations, in terms of natural conditions (soil, climate, etc.) and the cultural and legislative environment.

Back to nature

In addition to the agricultural benefits of agroforestry demonstrated by the project, the researchers also stress the environmental benefits of this tree and crop combination. In strictly landscaping terms, the introduction of trees, and possibly of a variety of species, is an aesthetic improvement that can only benefit tourism, especially in areas dominated by cereal farming. Also, by encouraging the penetration of water into the soil, trees and their roots



Various projects are being carried out on experimental agroforestry plots at INRA (France):

1. Harvesting beneath the poplars, in Vézénobre, on a plot approaching the end of its cycle. This experimental parcel, under the SAFE programme, is making it possible to monitor crop productivity until the trees are felled, on reaching a good size, which is programmed for the near future.
2. Measuring young walnut trees growing in wheat fields.



3. Parasols' serve to stimulate the shadow cast by trees and thereby distinguish between the effect of shade and the competition for water and nitrogen between the trees and the arable crops.
4. Pruning and thinning hybrid walnut trees. With fewer than 100 trees per hectare, crop productivity is maintained over a very long period.

© Christian Dupraz – INRA

combat erosion. They help prevent floods by limiting the run-off that causes rivers to burst their banks, and to reduce water table pollution caused by agricultural fertilisers. Agroforestry trees also fix significant carbon quantities, both in their wood and deep in the soil that is enriched in organic matter due to the decomposition of their fine roots, year after year.

Finally, there is a fundamental impact on biodiversity. Trees very quickly attract all kinds of animals, insects and plants back to farm land. Some researchers believe that this too can have a favourable agronomic impact. They have already identified various auxiliary species (those that prey on pests) that have returned to these plots, including insect-eating birds, bats, and insects such as syrphus flies whose larvae have a big appetite for aphids. "However, one must not rule out the possibility that

Changing the law

To date, under European regulations, farm land that includes trees does not qualify for CAP subsidies. In other words, current European legislation on farming has the effect of 'outlawing' trees in fields throughout the Union.

Only France, since 2001 and following vigorous lobbying by farmers and scientists, has recognised the practice of agroforestry and, since 2002, has actively encouraged farmers who choose to combine trees and crops, by means of agri-environmental measures. This has brought immediate results: in the past two years, approximately 1 000 hectares have been co-planted with trees, and the trend is growing.

The recent proposal for a European Council regulation on rural development makes explicit reference to agroforestry for the first time. "As this is transposed into national legislations, farmers will be able to adopt these practices without compromising their right to traditional farming subsidies," stresses Christian Dupraz. "A lot of traditional agroforestry is in fact practised and it would be a disaster if farmers were driven to pull down trees so as to qualify for European farming subsidies."

