



Agents for change

Bringing industry and academia together to develop career opportunities for young researchers



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The European Science Foundation acts as a catalyst for the development of science by bringing together leading scientists and funding agencies to debate, plan and implement pan-European initiatives.

Foreword

One of the weaknesses of Europe's academic research system is its frequent inability to engage itself fully with industry. Both tend to operate in different worlds and yet they are bound together in many ways. Bridging the gap between them is an essential requirement in the creation of the European research area and for the continuing development of Europe's economy. To do this demands that we focus on the future and especially on young researchers. They need encouragement, especially to have sound career advice and opportunities to enable them to enter all sectors of the economy, so that they can fully exploit their potential for the benefit of us all.

Combining the goals of enhancing European competitiveness, through improved links between academics and industry, with that of helping and developing opportunities for the next generation has to be a priority for ESF and its Member Organisations. This report provides an Action Plan for the future. As an initial contribution to its implementation, ESF has entered into a partnership with *Science* magazine to provide a Web-based career information and mentoring service, Next Wave Europe.

I trust the Action Plan can form a template for new approaches and initiatives at both national and European levels and in universities, research institutes and industry across the whole of Europe and that we can all work together to really put the Plan into practical operation.

Enric Banda
ESF Secretary General

Preface

This is a report like few others. Rather than attempting to codify a set of important principles, it goes beyond principles. We take it on faith that most Europeans know all too well the systemic weaknesses of Europe's academic system and its tenuous links to industry. After all, these weaknesses have been articulated vividly in many meetings over the last decade. Consequently, this report goes right to the heart of the matter by putting forth an **action agenda for change**.

The recommendations to be found below were developed by an unusually diverse group of leaders of industry (see List of participants p. 8) who engaged in dialogue with a select cadre of directors of government funding agencies, heads of European foundations, and presidents and deans of European universities. Together, this group articulated fourteen **practical actions** that could dramatically enhance Europe's competitiveness. In so doing, the participants of the meeting were offering their support to the host organisations – the European Science Foundation (ESF), the Karolinska Institute (KI), and *Science* magazine – which pledged to pursue the recommendations developed that day.

In a recent, much praised book, author Malcolm Gladwell, identifies a little understood phenomenon called the "tipping point." Using examples from all walks of life, Gladwell proves that there can often be a moment in time when an idea, trend or example of social behaviour that has been heretofore expressed only by a small minority of people suddenly spreads like wildfire to alter the landscape forever. What if the ideas expressed at this meeting by a small number of Europe's leading figures were taken up by their

peers? What if a series of practical steps were taken throughout the academic and industrial sectors that empowered the next generation of European researchers to be more productive and competitive **within** Europe's borders?

Introduction

Europe's future health and prosperity depend very much on the next generation of researchers. But in meeting after meeting – most recently and perhaps best articulated in Strasbourg at a symposium co-sponsored by the Human Frontier Science Program and the European Science Foundation – it has been pointed out that Europe's academic system may be failing its young people. Moreover, the links between industry and academia that empower young, entrepreneurially minded researchers in the United States are frequently lacking in Europe.

What will it take to ensure that Europe's best and brightest stay in – or return to – Europe? What will it take to attract the best and brightest from outside Europe to Europe's academic and industrial laboratories? What will it take to enhance the flow of professors, students, and industrial researchers among Europe's universities and European-based multinational corporations to achieve the research synergies that have often been achieved elsewhere, especially in the United States of America?

On 25 March 2002, 50 key figures in industry, academia, foundations, and government agencies gathered at the Nobel Forum in Stockholm, Sweden, at the invitation of the ESF, KI and *Science's* global career resources Web site, Next Wave, to develop a series of practical strategies to effect systemic change in Europe.

The stated objectives were to:

1. Help academia to prepare the best and the brightest for careers in industrial research.
2. Develop mechanisms for Europe's academic institutions to be able to reward excellence in a public manner.
3. Seed the creation of public databases that would compare research departments in

universities, thereby empowering industry and graduating students to seek the best.

4. Lay the foundations for strengthened and improved industry/academic partnerships across Europe.

The results of the deliberations of the 50 participants were greater than the sum of the objectives placed before them. In the following pages, you will be able to evaluate for yourself a series of calls to action to effect change. In each case, specific strategies for reform are proposed. At the end of the series – in a final section of this report – there is an invocation to you, the reader, to join this small community of **agents for change** so that we can, together, make the reading of this report, the tipping point for the empowerment of Europe's youngest researchers and, therein, of Europe's own global competitiveness.

Action plan

Section I: Increasing interaction between academia and industry

It is generally accepted that academia and industry need each other, but there is confusion as to how to structure this relationship, due to the many serious misperceptions which exist in addition to real difficulties in bringing very dissimilar organisations together. These misperceptions are a serious impediment to the recruitment of young scientists and to structuring education and training in scientific research. The profile of young scientists emerging from universities, especially those at the postdoctoral level, may not appeal to industry, which seeks a versatility of approach in this cadre of researchers. At the same time, careers in industry may not appeal sufficiently to young people, in part because the prospects for future career advancement are not clear. These occasionally opposing views can only be changed through open-minded dialogue that is based on clear "rules of engagement" so that both sides can accept each other's limitations.

Action Item 1: Bring more industrialists into universities

➤ STRATEGY:

Industry and academia should make more extensive use of existing schemes and opportunities already promoted by governments and other agencies. However, industry, foundations, and government funding agencies need to develop additional mechanisms to further involve industry scientists in university teaching by:

- Appointing industrial scientists to adjunct faculty positions in universities.
- Introducing real problems from industry into the lecture theatre, allowing young scientists to gain a better understanding of the practice of commercial science and its quality, and demonstrating industry's need for a multidisciplinary, team-orientated approach to problem solving.
- Offering young scientists access to mentors in industry, thus demonstrating that leaving academia for industrial research needs to be seen as a success and not a 'failure.'

Action Item 2: Provide more opportunities for academics to spend time in industry

➤ STRATEGY:

Foundations, government funding bodies, and industry itself should support:

- Sabbatical fellowships to allow academics to spend short periods working in industrial laboratories.
- The creation of new professorial chairs and centres of excellence within universities that explicitly involve cooperation with industry.

Action Item 3: Create opportunities for academic scientists to interact with industrialists

➤ STRATEGY:

Broad-based scientific meetings, such as the AAAS meeting and the one planned by

Euroscience to be held in Stockholm in 2004 typically represent venues in which academic researchers can interact with scientists working in different disciplines, as well as with journalists and politicians. However, the utility of these meetings in fostering interactions among academic and industrial scientists – and in demonstrating a richer range of career options to young scientists and engineers – have not been fully exploited.

This should change. In particular,

- Special funding should be made available to enable PhD students and postdoctoral fellows to attend such meetings.
- Companies should encourage their scientists to present their work at academic meetings, as these provide fora for demonstrating the quality of their research.
- Universities should develop informal platforms for bringing together their researchers with local industry scientists, as has been done in many institutions such as, for example, the KI's biological enterprise club.
- Companies should undertake and publish 'knowledge-sharing reporting' – annual audits of the efforts they have made to share their research findings with a wider scientific audience.

Action Item 4: Develop opportunities for scientists-in-training to interact with industry

➤ STRATEGY:

While greater interaction between senior academic scientists and their industry equivalents has numerous benefits for the training of the next generation of scientists, there is no substitute for direct and early experience of research in a commercial setting. This can be facilitated by:

- Developing more joint academia/industry research projects so that many more postgraduate students have the opportunity to spend at least part of their PhD training period in industry labs and ensuring that such industrial placements are genuinely relevant to the student's research objectives.

- Using Web sites frequented by students and postdoctoral fellows to display the excitement of careers in industry.

Section II: Increasing multi- disciplinarity

It takes industry an average of 3 to 5 years to train a scientist coming out of university to contribute fully in a multidisciplinary environment. This process must be speeded up.

Action Item 5: Teaching ‘soft skills’ and problem solving and fostering flexibility

➤ STRATEGY:

Multidisciplinarity itself cannot be taught, but is an increasingly indispensable facility in scientists and engineers and is greatly valued in industry. What can be taught, though, and should be a part of all postgraduate training, are the skills that enable one to work well in both a team and a multidisciplinary environment. One key requirement in this regard – and one that is essential for success in multidisciplinary environments in industry and academia – is flexibility.

Industry seeks “T-shaped people,” in which the down-stroke represents depth and specialist knowledge in a discipline and the cross-stroke represents breadth and flexibility. Many students learn such skills, but typically only in departments of social sciences and in business and management schools. Therefore:

- Universities should ensure that the teaching methods they employ create an awareness of the weaknesses, as well as the strengths, of individual disciplines.
- Institutions which train postgraduate researchers should ensure that their training includes elements of such skills as problem solving, team working, communicating outside one’s discipline, and especially to industry, policy makers and the general

public (all of which require subtly different skills), project management and leadership.

- Students should also be given the opportunity to learn about patenting, the law, and economics, in so far as they relate to research. Of course, there also has to be instruction in ethics of research.
- Funding agencies may have to take the first steps in “forcing” this approach on universities until it becomes a standard part of education and training in research.
- The mentors of young researchers need to make clear to them the requirement for and career advantages of a flexible approach.
- Industry and teaching organisations should explore the possibility of working together to create short-courses within masters and PhD level education that would provide specialist researchers the tools they need to prosper in the rapidly changing environments that frequently occur in industry. These courses might take the form of an internet-based ‘graduate school’ that could offer, for example, a ‘Masters of Applied Knowledge.’

Action Item 6: Earmark funding for multidisciplinary research

➤ STRATEGY:

European policy makers should:

- Develop a dedicated funding approach specifically for multidisciplinary projects.
- Ensure that public funding for multidisciplinary research is long-term. A time frame on the order of 5 to 10 years is necessary to properly support the development of emerging research disciplines.

Section III: Increasing mobility

Precedent, as well as legal and cultural barriers, can inhibit young scientists and engineers from searching as widely as possible for education and career opportunities. These barriers should be diminished or broken down.

Action Item 7: Tackle the legal obstacles to mobility at the highest political level

➤ STRATEGY:

In order to break down barriers relating to tax, social security and pension regulations between European countries:

- Pressure has to be brought to bear, at the highest political levels, to address this issue. Eventually, this must be a matter for interior and finance ministers.

Action Item 8: Make moving easier

➤ STRATEGY:

Fellowships can encourage students and young scientists to move around, and gain a wide experience of different scientific approaches and cultures but:

- Funding bodies must ensure that they are sufficiently generous to cover the extra expense that mobility incurs.
- Funding bodies, employers and other agencies should provide more assistance and advice with personal matters; moving with a family can be particularly difficult.
- Young scientists themselves should seek attractive placement opportunities in the knowledge that international experience, and the initiative it demonstrates, is attractive to employers.
- The EC's planned 'Mobility Portal' and network of assistance centres are expected to tackle some of these issues, but other groups, for example, universities or existing partnerships, should be encouraged to

develop their own national or international solutions.

- *Science's Next Wave*, through the ESF/*Science's Next Wave Europe* portal, should provide first-person accounts by role models demonstrating through their own stories the rewards of crossing geographical and disciplinary borders.

Action Item 9: Create sources of information about the full range of careers available to scientists and engineers

➤ STRATEGY:

It is relatively easy for young people to find information once they know what they want to do. However, information about the range of professions they *could* pursue with a degree in science or engineering is lacking. Although young scientists have an obligation to exploit their own networks to find out about different career paths, support mechanisms are needed that would allow young scientists access to:

- Information about all the career alternatives open to them.
- Information not generally provided by job advertisements, such as the publication policies of a company, and the atmosphere and career prospects within a given organisation.
- Case histories providing specific examples of industry career paths.

Action Item 10: Create conditions that encourage academic scientists to stay where they are

➤ STRATEGY:

Much as it might like to attract the best and the brightest, industry recognises that it also needs excellent scientists and engineers in academia. Therefore universities, through external actions and internal reforms, need to make university careers more attractive to young researchers.

This might be achieved by:

- Offering appropriate and competitive salaries.
- Providing access to good laboratories.
- Reforming the many restrictions that exist on qualifying researchers as ‘university teachers’ (for example, Germany’s habilitation system).

Section IV: Managing information

Universities, companies and young scientists themselves all need access to the right information at the right time if Europe is to become more competitive. But what kinds of information, and how can it best be provided?

Action Item 11: Ensure that the quality of information is high

➔ STRATEGY:

Often the problem is not so much a lack of information as too much. So,

- Information must be focused, with some active filtering mechanism, so that the user can find the right information in the right place at the right time.
- Data-gathering organisations should cooperate to develop common structures for databases so that the information is readily comparable.
- Careers advice must be, and must be seen to be, independent.

Action Item 12: Share best practices in research training

➔ STRATEGY:

There is a need to look beyond Europe for best practices, just as industry looks beyond Europe for academic partners. Therefore:

- Mechanisms must be developed for sharing best practices at a pan-European level, drawing on worldwide experiences.

Action Item 13: Identify the best science

➔ STRATEGY:

Industry is reasonably good at identifying the top researchers in the largest, best known universities. The difficulty lies in doing this effectively across many countries simultaneously, and in identifying up-and-coming researchers in up-and-coming research fields. It is even harder for younger, less experienced researchers to identify the groups with which they should aim to work. Thus, we must support and promote the creation of:

- A ‘registry of researchers’ that would help to identify who is doing promising work in a particular field.
- Pan-European mechanisms for identifying and rewarding top young researchers and their research.

Action Item 14: Make the information real

➔ STRATEGY:

Young scientists need more than hard statistics; the information needs to be made relevant. Thus, information delivery mechanisms must:

- Provide information about career development alongside the hard facts on employment trends.
- Provide accessible role models who can describe the opportunities they’ve taken professionally and show how their flexibility has helped propel their careers.

Invocation to action

Europe – for now, at least – remains a collection of diverse nationalities and diverse perspectives. Every European who reads the list of actions proposed just above will quickly recognise the “limiting factors” that have hindered reforms in the past: academic rigidity, industrial short-sightedness and frequent lack of transparency, the absence of a robust tradition of personal philanthropy, bureaucratic tendencies in national and supra-national agencies, and so forth. And yet, all of us can see that Europe is changing. Moreover, these problems are not unique to Europe but they may be exacerbated by the continent’s complex mix of competing national and international structures. We need to turn this diversity ‘weakness’ into a diversity ‘strength’ by adopting best practice and learning from each other’s successes and failures.

Many of Europe’s leaders want to effect change. As was mentioned at the start of this report, we firmly believe that the actions of a few can influence the actions of the many. With this in mind, the ESF, *Science* and its Web site, *Science’s* Next Wave – together with the KI – have all pledged to develop mechanisms that will ensure the dissemination of the wisdom in this document. More than that, we are intent on following up not only with those who

participated in the meeting but with academia and industry in general in Europe. The goals will be twofold: to enlarge the community of “agents for change” and to invoke their support in actually implementing those elements of change that we as a group can inspire.

We believe that this is an initiative to which all who wish to implement these changes can subscribe.

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ESF/*Science’s* Next Wave Europe: <http://nextwave.sciencemag.org/europe/>

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