

INCREASING THE ATTRACTIVENESS OF SCIENCE, ENGINEERING & TECHNOLOGY CAREERS

Recommendations

1. The Public Awareness of Science

- All EU research proposals should contain a sum for appropriate dissemination of results.
- A coherent Framework Programme publications policy for the dissemination of the results of EU funded research projects to the public, Parliament and Council should be drawn up. An analysis of the possibilities of a “European Scientific Press Agency” should be undertaken. The Alphagalileo News Service should be strengthened and extended to all Member States.

2. Primary and Secondary Schools

- Innovative, hands-on science education should be introduced into all Europe’s primary schools. Creative Science Teaching modules should be introduced into the formal training period of all primary school teachers.
- Concerted efforts should be made to mainstream science, engineering and technology curriculum and teaching innovation into secondary school systems.
- All organisations – universities, companies, research funders and government agencies - should strengthen their practical commitment to supporting the development of school science, engineering and technology education.
- A review of innovative career and pay systems for science, engineering and technology teachers should be undertaken, with a view to supporting Member States in developing a high-status and high-pay profession.
- DG Research should strengthen their work with DG Education and Culture to encourage recruitment to Scientific and Technical Studies. A Joint Action Plan, with clear milestones, should be published and progress reported in the DG Research Annual Report.

3. The Training & Careers of Researchers

- Examine current best practices in opening up of science, engineering and technology undergraduate courses to interdisciplinary influences, to research experience, to industrial interaction, and to a clearer indication of the variety of career paths open to such students. Support such change in universities.
- Examine the most progressive training structures for doctoral researchers and support their diffusion into the Member States.
- Examine progressive employment and human resource development practices in academic doctoral and postdoctoral labour markets and support their diffusion through EU and Member States’ research funding policies.
- EU funding mechanisms should provide for a number of larger “Principal Investigator” contracts to support the move of the very best young researchers towards independence.
- Member State research training and employment positions should be opened up to competition at a global level.

- Examine the mechanisms of research mobility between industry and academia and diffuse the most effective mechanisms, using research funding within the Framework Programme.
- Expand research training to support the EU move to invest 3% of GDP in R&D by 2010.
- Highlight the entrepreneurial research careers and start-up companies which have developed from EU research.

4. The Gender Dimension

- Develop consistent gender-disaggregated information. Increase transparency in research recruitment and promotion processes. Gender-proof research employment and training policies and practices. Mainstream into all EU research activities and funding mechanisms

5. Reporting on Progress

- DG Research should publish an Annual Report on the state of Europe's science, engineering and technology human resources and associated policy issues.
- Include a section on "Improving the Attractiveness of Science, Engineering and Technology Careers" in DG Research's Annual Report.

1.1 INTRODUCTION

Despite a relatively positive image of science, technology and research as well as of scientists and engineers themselves, many young Europeans are unwilling to commit themselves to studying the traditional disciplines in sciences, engineering and technology and to taking up an associated career. When asked why, they point to school science as both dull and difficult, and to the associated careers as being unattractive. Given current demographic trends and increasing science, engineering and technology replacement requirements in European industry and research, such attitudes represent a major challenge to future European economic and social development.

In considering this problem, EURAB starts from two argued premises¹ (or conceptual recommendations) which inform our more practical recommendations:

- Studies in science, engineering and technology and research training are the basis for a broad spread of careers, which naturally branch out at different periods from such studies. This is our Tree Paradigm, and we consciously move away from the purist “Leaky Pipeline” image, which seems to withhold full legitimacy and value from the careers of those whose talents and desires merge their science, engineering and technology training with other activities in industry, commerce and government. The paradigm also suggests a particular focus on nurturing the roots of science and technology.
- That science, engineering and technology as well as research are profoundly social activities, and that if those involved and their institutions – in industry, academia and government – do not take a full and active part in setting society’s agenda and developing society’s wider institutions, then they are not being fully effective researchers, scientists, engineers and technologists. This sets an “activist agenda” for all.

1.2 NURTURING THE ROOTS

Nurturing of the roots of science is essential not simply for labour market supply and economic development, but also for democratic citizenship: issues ranging from being able to establish an effective dialogue on the objectives and ethics of science and technology to being able to participate fully in Life Long Learning.

In this context, we support, in the strongest terms, the dialogue which the EU’s “Science and Society” programme is opening up with the citizens and institutions of Europe. However, some activities are so important that they should be mainstreamed into all EU funded research activities. Further, Framework Programme information and communication functions towards the public, politicians and media should be substantially strengthened and the possibility of a European Scientific Press Agency rapidly assessed. In the meantime, the Alphagalileo News Service should be extended to all Member States. In addition, there is a need for a much stronger, more direct dialogue to be developed with politicians – European and national – in these areas, and particularly in relation to “Attractiveness of Scientific Careers”.

¹ A Working Group Background Document is available with the full discussions (http://europa.eu.int/comm/research/eurab/index_en.html).

1.3 SCIENCE, ENGINEERING AND TECHNOLOGY EDUCATION

Primary Schools: Despite young children being natural explorers and experimenters, Europe's primary schools are rarely able to offer proper vent to such enthusiasm. Yet somehow by their teenage years, opinions are formed and decisions made – often strongly gendered -which exclude many of these natural experimenters from science, engineering and technology. This could be alleviated through the introduction of hands-on scientific education into all Europe's primary schools and the introduction of Creative Science Teaching modules into the formal training of all primary school teachers.

Secondary Schools: Across Europe, the traditional “hard” sciences - maths, physics and chemistry – have seen falling secondary school participation rates. Few students see themselves entering associated careers. On the other hand, we have met many exciting, innovative approaches to developing science, engineering and technology curricula. The problem is that they affect few students – the need is for their mainstreaming. Efforts should be made to concentrate on mainstreaming science, engineering and technology curriculum and teaching innovation into secondary schools.

Teachers: Education authorities find “hard” science teachers difficult to recruit – a result of the general problem of the poor public perception of science, engineering and technology careers. A review of innovative career and pay systems for science, engineering and technology teachers would be appropriate, with a view to supporting Member States in their moves towards developing a high-status and high-pay science, engineering and technology teaching profession.

European Commission Coordination: The challenges above are, of course, not new. The European Council work programme on the “Follow-up of the Objectives of Education and Training Systems in Europe” indicates the need to tackle such issues. DG Research and DG Education & Culture should publish a joint Action Plan, with verifiable milestones, based on this document. The DG Research Annual Report should indicate progress.

An Activist Agenda for All: Schools cannot turn round the science, engineering and technology problem on their own. Our schools are our responsibility. All science, engineering and technology organisations – funding agencies, companies, academic, professional and governmental institutions – should reassess and strengthen their commitment – at a local, national and European level - to supporting the development of school science and technology education. All such organisations should publish their policy and activities in support of school science and technology on their Web sites. Regional, national and European awards might be developed for such activities.

1.4 TRAINING SCIENTISTS, ENGINEERS AND TECHNOLOGISTS

Undergraduate Programmes: Undergraduate recruitment to courses in the traditional sciences and a number of areas of engineering has become highly problematic in many Member States. At the same time, reforms and innovations have been occurring in some universities which might be of benefit not only to universities but to the wider educational systems. The European Commission, in conjunction with Member States, Associated States and Candidate Countries, through the open coordination provisions, should explore current best practices in opening up of science, engineering and technology undergraduate courses to interdisciplinary influences, to

research experience, to industrial interaction, and to a clearer indication of the variety of career paths open to such students.

Doctoral Studies: The attractiveness of doctoral studies, the first step in the development of a science and engineering research career, is confronted by two main challenges: the level of funding provided for doctoral studentships and improving the quality of the research training. These problems are even more acute in the social sciences and humanities. As in so many areas, we have met many important developments, which are “professionalising” and making doctoral research more attractive, and where there is a need to diffuse such innovation. The European Commission, in conjunction with Member States, should examine doctoral research training structures globally to develop a policy – to be operated through its research spending – to attract and to retain the most creative and talented doctoral researchers in Europe. EU research funding, and particularly that aimed at research training should be used *explicitly* to encourage the improvement of doctoral training structures and practices. Since the European Science Foundation (ESF) and the European Heads of Research Councils (EUROHORC) are also developing mechanisms to the same end, such as the European Young Investigators (EURYI) Awards, the European Commission and these organisations should closely co-operate on this subject, including starting a European Excellence Fellowship Programme.

Postdoctoral Research: In some Member States, postdoctoral research overlaps with what has been called the “academic proletariat” – doctoral and postdoctoral researchers funded by a stream of short-term research contracts offering poor welfare and employment conditions. Some national research bodies and funding agencies are moving to reform the area. The European Commission, in conjunction with Member States, Associated States and Candidate Countries, through the open coordination provisions, should examine good employment and human resource development practices in academic doctoral and postdoctoral labour markets and develop a research funding policy which supports their diffusion.

1.5 DEVELOPING RESEARCH CAREERS

Principal Investigator: There is a need to develop a progressive stairway of recognised research career positions leading from doctoral studies to the most senior position. In many Member States, the growth of well structured postdoctoral fellowships and reforms of the “academic proletariat” will still leave the step to independent researcher with independent means uncertain and too often a political or age-related decision. To encourage and attract young researchers, there is a need to strengthen and clarify how such a merit-based career move can be made. Here EURAB supports the emphasis many funding agencies are now placing on well funded principal researcher positions. EU funding mechanisms for individual researchers should be developed to promote the career structures of researchers. In particular, there is a need for a number of larger “Principal Investigator” contracts to support the move of the very best young researchers towards independence. In addition, EU funding mechanisms for Integrated Projects and Networks of Excellence should recognise the needs for the development of the careers of high-level individual researchers.

Permanent Research Posts: The vitality and attractiveness of national and regional research systems and institutions could be significantly improved by opening such systems to greater EU and global competition for employment and training. The European Commission, in conjunction with Member States, Associated States and Candidate Countries, through the open coordination

provisions, should examine policy and mechanisms which assist in the opening up of training and permanent research positions to global competition.

Industrial Researchers: If the Barcelona objective of increasing the R&D/GDP ratio to 3% is to be met, then not only will universities, as well as industry, have to train substantially more researchers, but the interchange of researchers will have to improve. Equally, improving the bridging and mobility of researchers between university and industry is important in the development of flexible and secure career structures. The European Commission, in conjunction with Member States, Associate States and Candidate Countries, through the open coordination provisions, should examine the mechanisms Member States use to encourage research mobility between academia and industry. The best practices should be grafted onto research funding within the Framework Programme. Additional researchers should be trained to support the expansion of R&D activities expected in expanding R&D to 3% of GDP. In addition, the Commission should highlight the entrepreneurial research careers and start-up companies which have developed from EU research.

The Gender Dimension: EURAB fully supports the Commission and Member States in their work on the gender dimension in science, engineering and technology and believes it essential to developing attractive career structures. In line with current work in this area: 1) statistics should be consistently gender-disaggregated, and appropriate gender monitoring and evaluation practices implemented, 2) human resource management in science, engineering and technology should be improved, along with much greater transparency in recruitment and promotion processes, 3) awareness raising and equality training, along with support for the gender-proofing of policies and practices should be implemented. These practices should be mainstreamed into all EU research activities and funding mechanisms.

1.6 REPORTING ON PROGRESS

There is a need in Europe for information about employment and career developments in science, engineering and technology. An Annual Report on human resources should be produced, covering: employment and training patterns, career developments, policy trends etc. The report could act as a focal point for European activities in this area. Within the Framework Programme, the Annual Activity Report should indicate progress in the implementation of the present recommendations.

1.7 CONCLUSIONS

The recommendations are made according two conceptual approaches:

- That we move to the Tree Paradigm for science, engineering and technology careers, recognising the legitimacy and utility of such research training to many careers outside research and emphasising the necessity of nurturing the roots of science and technology in the wider society.
- That we, our science, engineering and technology colleagues and institutions adopt an “Activist Approach” not only to our immediate career attractiveness challenges but also to setting the broader social agenda and ensuring the role of science, engineering and technology activities therein.

And three operational approaches:

- Strengthening and mainstreaming the EU’s “Science and Society” Programme,

- Investment and the support of all science, engineering and technology individuals and institutions for our school system
- The development of a strong, transparent, professional training and career structure for science, engineering and technology research activities.