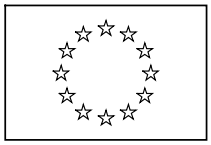

COMMISSION OF THE EUROPEAN COMMUNITIES

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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

RESEARCHERS IN THE EUROPEAN RESEARCH AREA: ONE PROFESSION, MULTIPLE CAREERS

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INTRODUCTION

Human resources are to a large extent the key of research efforts, excellence and performances. The number of researchers, as well as their mobility, are two important aspects of this issue. A third one, directly linked, less often addressed, and never at European level, is the question of the researcher profession and researchers careers.

This question is crucial, because this aspect of the research system has a deep impact on the way research works. It is especially the case in Europe, because the way, in which research careers are structured and organised in Europe, does not allow Europe to fully exploit its potential in this field.

The present Communication is deeply embedded in the implementation of the European Research Area and of its requirement to develop and enhance the human resource potential of European research. It aims to analyse the different elements which characterise the profession and defines the various factors which condition the development of researchers' careers at European level, namely: the role and nature of research training, the differences in recruitment methods, the contractual and budgetary dimension, and, finally, the evaluation mechanisms and the progress perspectives within the career.

The Communication reveals structural weaknesses as well as marked differences concerning each of these elements, according to the sectors in which researchers operate or the geographical, legal, administrative and cultural environments in which they work. These differences and the lack of openness of researchers careers in Europe, prevent the development of proper career perspectives at European level as well as the emergence of a real employment market for researchers in Europe, whether considered from a geographical, sectoral, or gender perspective. These differences also have significant repercussions on the attractiveness of young people for careers in R&D, as well as on the overall public recognition of researchers.

All these considerations are at odds with the priorities defined on several occasions by the Heads of State and Governments concerning the emergence of the knowledge economy, the implementation of the European Research Area and the "3 % objective".

At the same time, the Communication draws attention to a number of examples of good practice at national level and demonstrates that initiatives are being launched in several countries in order to alleviate the effects of the above-mentioned differences.

In this respect, this Communication proposes a series of practical initiatives in order to foster dialogue between the different stakeholders at European level, namely the European Community, the national governments and the scientific communities.

Likewise, this Communication proposes to deepen, wherever necessary the analysis of the causes and effects of the above-mentioned differences. It also aims to launch on a voluntary basis, a series of specific actions aimed at providing a better overall co-

ordination of efforts in favour of the recognition of the researcher's profession, as well as to establish a real European labour market based on the potential capacities of all actors, independently of their geographical location, the sector their are working in or their gender and it recognises the need for an overall view of Human Resources for R&D throughout the careers as well as for a set of sufficiently detailed, reliable and harmonised indicators for measuring it[1].

1. POLICY CONTEXT FOR HUMAN RESOURCES IN R&D

In January 2000, the Commission adopted a Communication proposing the creation of a European Research Area (ERA)[2] which emphasised, *inter alia*, the need to introduce a European dimension into careers in R&D, and appealed for more abundant and more mobile human resources. The latter concern became the subject of the Communication "*A mobility strategy for the ERA" [3],* which aims at establishing the dynamics required to set up and develop a favourable environment for mobile researchers throughout their careers. A series of concrete actions[4] mark the implementation of this strategy such as the development of the Researcher's Mobility Portal[5], the setting up of the European Network of Mobility Centres as well as legislative initiatives in the areas of conditions of admission of third country researchers.

The subsequent Spring European Councils (Lisbon 2000, Stockholm 2001, Barcelona 2002 and Brussels in 2003) have endorsed the ERA and set a series of objectives inviting the Commission and the Member States to take due account of the possible shortage of human resources in R&D as well as of the importance of enhancing the training and mobility of researchers. The issue of human resources in R&D was also raised in the context of the 3% objective[6], particularly in the Communication "*More Research for Europe – towards 3% of GDP*"[7] which underlined the fact that Member States and the research community need to be aware of the risk that a lack of sufficient human resources in R&D constitutes a bottleneck to the attainment of the 3% objective. This is further developed in the recently adopted Communication "Investing in research: an action plan for Europe"[8].

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1 Compiling harmonised statistical data of Human Resources in RTD, keeping track with the developments and regularly measuring the success of proposed actions should all be - as far as possible - set up within the European Statistical System.

2 COM(2000)6 final of 18.01.2000.

3 COM(2001)331 final of 20.06.2001 and SEC(2003)146 final of 04.02.2003.

4 See also SEC(2003)146 of 04.02.2003.

5 Available on http//:europa.eu.int/eracareers.

6 At the March 2002 Barcelona European Council, the EU agreed that overall spending on R&D in the Union should be increased with the aim of approaching 3% of GDP by 2010.

7 COM(2002)499 final of 11.09.2002.

8 COM(2003)226 final of 30.04.2003 and SEC(2003)489 final of 30.04.2003, see http://europa.eu.int/comm/research/era/3pct/index_en.html

Capacity generation, however, needs also to be linked to other factors, such as an ageing workforce in R&D[9]. This particular aspect has been addressed in the report "*Benchmarking Human Resources in RTD"*[10]*,* which highlights that *"there is a growing tendency to dispose of mid-career researchers through early or forced retirement schemes or transfer to non scientific posts…leading to a waste of talents and experience".*

Specific measures concerning the gender dimension in European research policy were presented in 1999 through the Communication "*Women and Science*"[11] and consequently implemented through the "*Science and Society action plan"*[12].

In addition, recommendations put forward by EURAB, the European Research Advisory Body[13] to the European Commission have been taken into account in the preparation of this Communication.

The reflection on the role of human resources in R&D is also linked to a broader perspective resulting from the various initiatives carried out at EU level in order to take into account developments of the labour market and the changing working conditions. Within this context, the present Communication complements the actions recently put forward within the proposal for a Council Decision on "*Guidelines for the Employment Policies of the Member States*"[14], particularly those related to "*Addressing change and promoting adaptability and mobility in the labour market"*, and "*Promoting development of human capital and lifelong learning*" with its focus on increasing investment in human resources.

Finally, the Communication builds on the work undertaken within the framework of "*The Action Plan on Skills and Mobility" [15]* and is in line with the implementation of the Commission's Communication "*Making a European Area of Lifelong Learning a Reality*"[16]. It is also consistent with the activities launched for *Enhanced Co-operation in Vocational Education and Training: the "Copenhagen process*"[17]; as well as with issues

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9 See also SN100/1/02REV1 of 16.03.2002, page 12.

10 Final report of 28.06. 2002.

11 COM(1999)76 final of 17.02.1999; see also the "Women and Science initiative": ETAN working group report "Science policies in the European Union: promoting excellence through mainstreaming gender equality", 1999; Resolution of the European Parliament on Women and Science of 03.02.2000 (EP 284.656); Commission working document "Women and science: the gender dimension as a leverage for reforming science" SEC(2001)771 of 15.05.2001; Council Resolution on science and society and on women in science of 26.06.2001; OJ C 199, p.1 of 14.07.2001; Report by the Helsinki Group on Women and Science "National policies on women and science in Europe" – March 2002.

12 COM(2001)714 final of 04.12.2001.

13 See http://europa.eu.int/comm/researc/eurab/index_en.html.

14 COM(2003)176/4 of 07.04.2003.

15 COM(2002)72 final of 13.02.2002.

16 COM(2001)678 final of 11.11.2001.

17 "The aim of this process is to promote transparency and mutual trust as a means of enhancing the transferability of vocational qualifications and competencies throughout Europe and at all levels, as well as to improve the quality and standing of vocational education and training", Council

put forward in the Communication "*Investing efficiently in Education and Training: an imperative for Europe*"[18] and in the Communication *"European Benchmarks in education and training: follow-up to the Lisbon European Council*[19].

2. DEFINITION OF A RESEARCHER

In order to have a clearer understanding of the factors conditioning a career structure of researchers it is necessary to include a large number of variables that make up a "typology" of researchers in their different professional contexts. Such a "typology" of researchers builds upon the internationally recognised Frascati definition of research[20]:

> *"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".*

As a consequence, researchers are described as:

> *"Professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned".*

The above mentioned definition covers professional activities related equally to "basic research", "strategic research", "applied research", experimental development and "transfer of knowledge" including innovation and advisory capacities, depending upon whether the discovery or acquisition of knowledge is aimed at a particular application (either in industry of for social purposes) or not.

These different research activities are to be found in a variety of research settings, namely:

- Universities, which normally are more oriented towards long-term basic and strategic research projects and are recognised as essential to the knowledge-based economy.

- Public or private research organisations or academies of science, which differ from country to country and from one type of research activity to another with a combination of strategic and applied (market oriented) research.

Resolution on the Promotion of Enhanced European Co-operation in Vocational Education and Training" 14343/02 of 06.12.2002.

18 COM(2003)779 of 10.01. 2003.

19 COM(2002)629 of 20.11.2002.

20 In: *Proposed Standard Practice for Surveys on Research and Experimental Development*, Frascati Manuel, OECD, 2002.

- Certain large scale industrial actors which are usually less focussed on strategic research and most large scale industrial actors and technologically based SMEs, which engage in market oriented research and technology transfer.[21]

It is observed that the status of researchers is appreciated differently by the scientific community depending on the sector, the research setting or the type of research undertaken. Given, however, that all contributions are essential to the development of the knowledge society it is necessary to consider any activity directly or indirectly related to R&D including the management of knowledge and intellectual property rights, the exploitation of research results or scientific journalism as an integral part of a career in R&D. The policy lesson is that any of those careers will have to be treated and valued on equal footing without maintaining the preponderance of an academic research career as the only benchmark for attracting young people into such a career track[22]. In addition, lifelong professional development opportunities in different research settings should be made more relevant for a wider variety of careers than in the past.

3. PROSPECTS FOR CAREERS IN R&D

3.1. Prospective workforce needs in R&D

The recent Commission Communication "*Investing in research: an action plan for Europe"*[23] stresses that *"More and more adequately skilled researchers will be needed in Europe in order to fulfil the targeted increase of investment in research by 2010. Increased investment in research will raise the demand for researchers: about 1.2 million additional research personnel, including 700.000 additional researchers, are deemed necessary to attain the objective*[24]*, on top of the expected replacement of the ageing workforce in research".*

In 2001[25] some 1.8 million full-time equivalent (FTE) R&D personnel were employed in Community R&D, of whom less than one million are considered as researchers[26]. The last available figures show a slight increase (2%) in the total number of researchers in EU-15 between 2000 and 2001. These developments are broadly in line with those related to the volume of R&D expenditure.

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21 Moreover many small SMEs are involved above all in research into process and/or product innovation.

22 See also document " Towards a paradigm for education, training and career paths in the natural sciences" presented by HFSP/ESF, available on www.esf.org.

23 COM(2003)226 final and SEC(2003)489 of 30.04.03.

24 In head count. These are orders of magnitude, the precise results depending on hypotheses retained. There were about 1.6 million researchers in Member States and acceding countries in 2000.

25 R&D Expenditure and Personnel in Europe: 1999-2001, Statistics in Focus, Science and Technology Theme 9 – 3/2003, EUROSTAT, European Communities, 2003

26 Figures vary from 40 to 75 % according to different EU-15 Member States and to industry or academic research activity.

Generally speaking there is a risk that the supply of human resources in R&D and of teachers to train this resources may become inadequate for future needs, at least inadequate to achieve the 3 % objective[27] as was shown by the first results of the benchmarking exercise for national RTD policies[28]. Moreover there is a gap between seemingly favourable prospects, as established by recent macro-economic analysis (job opportunities for thousand of researchers) and less favourable anticipations, as most of the research organisations experience slow increases or even decreases in private and public investments and less commitment to sustainable positions for researchers.

In order to obtain consolidated career prospects for researchers making it possible to attain the 3% objective, it is therefore of utmost importance to reduce this apparent divergence between global needs and microeconomic behaviour.

While recognising that teaching, learning and R&D comprise the potential wellspring of economic growth in the knowledge-based society this will only be achieved in reality if demand conditions for successful innovation, investment and diffusion are greatly enhanced in the EU compared to that enjoyed by our major international competitors.

Achieving the challenging objectives set at Lisbon and Barcelona must involve a dramatic increase of capacity in the education system and care must be taken that this increase of quantity is not achieved at the price of lowering quality standards.

The success of efforts to build sufficient capacity to satisfy the 2010 objectives [29] will also be affected by perceptions of young students of career prospects and employability in the research sector. Should they fear that the demand for such qualifications will not be forthcoming from the research institutes and innovative enterprises then they may not opt for such studies or, if they do so, may emigrate on graduation.

3.2. The public recognition of careers in R&D

The issue of public support for researchers is clearly linked to the ways science is perceived as a means to contribute to the development of society. The general public is aware of the impact of technological innovation on the quality of life[30], but impacts can be perceived as both positive and negative. The general public generally does not

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27 COM(2003)226 final of 30.04.03.

28 SEC(2002)929 final of 11.09.2002, see figure point 5.23. R&D intensity and human resources intensity in S&T by country.

29 On the 5th May 2003 the Council (Education Ministers) adopted conclusions on Reference Levels of Average European Performance in Education and Training (Benchmarks). Among the five adopted Reference Levels of Average European Performance one is in the area of mathematics, science and technology. The Council called for an increase of 15% in the total number of graduates in these three subjects in the European Union by 2010, while at the same time decreasing the level of gender imbalance (Council Conclusions of 5 may 2003 – official Journal of the EU C 134/4 of 07.06.2003).

30 See Eurobarometer from both the Member States (EUROSTAT report number 55.2 "Europeans, Science & Technology", December 2001) and Candidate Countries (EUROSTAT report number 2002.2. "Public opinion in the Countries applying for EU membership", Gallup org. Hungary, March 2003).

understand what researchers do, why they do it and what the benefits for society are. Public recognition is usually linked to the status of employment of researchers and often limited to titles such as "professor" in academia and "doctor" within the medical profession.

In order to raise the political significance of research as crucial to the development of society, the link between the content of research and the net benefit to society must be clearly highlighted. Likewise, society should be better placed to recognise the role of research, the relevance of doing research and the value of careers in R&D. From this point of view the commitment from politicians in recognising the importance of researchers for society is fundamental.

On the one hand, the development of the ERA provides a framework for raising public awareness of the value of research and researchers to society and initiatives have successfully been developed in some European countries[31]. However, there has never been a co-ordinated European strategy to improve and promote a better public recognition of careers in R&D. A good way to overcome this gap, to take the message down to the general public would be to organise a "European Year of Researchers" which would place new emphasis on the human factor and would therefore be a core element in such a strategy[32].

On the other hand, the Commission is establishing within the implementation of the *Science and Society action plan* a pan-European initiative aiming at supporting science education in schools. Science taught at schools plays a pivotal role. Young people are from the earliest age interested in science and related issues but this interest fades during formal education[33]. At the time when choices are being made on study courses that determine future career paths, often pupils consider science studies uninteresting and too hard. The focus is on teachers but the participants in this initiative are expected to come from a wider community of actors with an interest in the use and development of science skills among young people (teachers, educationalists, scientists and researchers, including industrial researchers). The initiative will provide advice on best practice and techniques for demonstrating science in real settings. The involvement of professional scientists will bridge the gap between how science is taught and how science is used. A High Level

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31 Awareness raising events of the Engineering and Physical Science Research Council or the "Dialogue with the public initiative" in the UK; the various "Money for Cancer Research Funding Events" in the different countries; best professors open their doors to a wide public for lectures which has generated an enormous media coverage and consequently the public attitude towards research and science has changed within a very short time span in Hungary or in Finland where students in engineering have created a particular slang and it is "cool" to be an insider of that discipline. Other examples can be found by looking at foundations and how they attract money for research (e.g. cancer research in Italy): they promote the idea that science is important for society, and this idea is widely supported by the public. In Germany, the Alexander von Humboldt Foundation used a marketing strategy to improve the attractiveness of research fellowships; etc.

32 An example of good practice exists in Finland where the Academy of Finland has launched the initiative "What about a career in science", see: www.aka.fi/eng.

33 EUROSTAT report number 55.2. "Europeans, Science & Technology", December 2001.

Group has been set up to look at other measures for increasing participation in science among young people.

But whereas the value of research to society can be encapsulated in a mission or vision, individual choice as to career options is linked more closely with issues such as satisfaction, stability, level of remuneration, paths to career progression, and status rather than to arguments based on societal needs.

3.3. Pathways between academia – industry

Collaborative partnerships between academia and industry or private and public funded research organisations have emerged as a critical imperative necessary to sustain transfer of knowledge and innovation but it is still unclear how to structure such relationships, let alone how to exchange personnel or to promote common training programmes.

One of the reasons can be found in the concept of academic freedom which researchers are keen to preserve. In recent years, social, political and financial pressures have grown to justify the practical relevance of research carried out in academia. Despite these changes, in many fields applied research projects are still granted a lower status, and academics involved in industry are not seen as serious candidates for academic promotion. In such a context, a job in industry may be regarded as a second-class option and, equally, the formal requirement (a doctoral degree) for academic positions makes it difficult for industrial researchers to move to academia. Issues, such as the transfer of pensions and social security rights[34], the loss of acquired benefits and professional status, the totally different cultures regarding on the one side confidentiality of research results and intellectual property protection and on the other publishing also make it difficult to move from one sector to another

In short, there is a very limited culture of movement from academia to industry (or the public and private sector) and vice-versa. It is important to stress that both sectors have to evolve and jointly foster an adequate supply of labour in all sectors of R&D thus allowing for more structured exchange of personnel[35].

Some examples of good practice[36] do exist in most of the European countries and in this context the report from the European Science Foundation on "*Agents for Change: bringing industry and academia together to develop career opportunities for young researchers*" is worth mentioning as it proposes an agenda for change via fourteen practical actions[37].

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34 The modernisation and simplification of the Council regulation 1409/71 on the co-ordination of social security systems (COM(1998)779 final of 21.12.1998) will play a significant role in facilitating such moves from one sector to another.

35 See also the new Marie Curie Action in the 6th Framework Programme.

36 See final Report of the HLG on Mobility, in particular paragraph 2.5.2. *Good Practice Examples.*

37 The report is available on www.esf.org.

The European Commission will continue the efforts undertaken within the implementation of the "*Mobility Strategy for the ERA*"[38] and the "*Action Plan on Skills and Mobility"*[39] and will also launch a series of targeted initiatives to exchange examples of good practice from all European countries and to disseminate them widely to the research community.

3.4. The European dimension of careers in R&D

Prospects for careers in R&D are linked to the size of national labour markets. A recent study[40] highlighted the fact that, as in Europe each national market for R&D human resources is limited, "*a given individual does not have a large number of alternative job opportunities which increases the value of establishing oneself in a more efficient labour market (...) Better integration of the labour markets for scientists and top engineers across Europe will go a long way in reducing its thinness".*

It is often said that geographical and intersectoral mobility constitutes one of the instruments that make a career in R&D more effective. However, this will only be the case if the professional experience gained at all the stages of a career in R&D, is fully valued and consequently taken into account for career advancement purposes.

Mechanisms and instruments[41] are needed which enable the recording of the different professional achievements and the added value of such mobility. They should be based on quality requirements regardless of employment conditions of researchers, on comparative guidelines and comparable criteria, which include the impact of mobility on both the professional development of researchers as well as their knowledge production.

The development of a "F*ramework for the recognition of professional experience of researchers"* would constitute the basis for a dynamic professional development, and would contribute to introduce changes in the perception of uncertainty regarding the employment situation of researchers, who are often faced with many different and precarious employment contracts.

By developing such a framework, synergies should be sought with the experience and ongoing work for the development of both the *European Higher Education Area* and *the European Area of Lifelong Learning*[42]. In the wake of the recent introduction of "EU Masters" (as the core building block of the ERASMUS-Mundus programme) and in view of the increased emphasis placed by the Bologna Process[43] on the third (doctoral) level of the emerging European framework of reference for qualifications, the time may be right to take a fresh look at the notion of "European" doctorates and the recognition of doctoral

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38 COM(2001)331 final of 20.06.2001.

39 COM(2002)176/4 of 07.04.2003.

40 Second report of the European Economic Advisory Group (EEAG, Chapter 5: *Should we worry about the brain drain?),* February 2003.

41 The already existing Euro PhD could be taken as an example of good practise for this.

42 COM(2001)678 final of 21.11. 2001.

43 For more information about the "Bologna Process" see: http://europa.eu.int/comm/education/policies/educ/bologna/bologna_en.html

degrees in Europe for the purpose of careers in R&D. This could take the form both of a challenge put to universities themselves, i.e., that they cross-recognise their highest level of academic degrees for the purpose of professional activities in academia and industry, and of a call to Member States to adjust the legislative framework so that joint doctorates become easier to implement. Synergies should also be sought with the initiatives to implement the "*Enhanced Co-operation in Vocational Education and Training: the "Copenhagen process"*[44], and the "*Action Plan for Skills and Mobility*"[45] as well as other initiatives at Commission and Member State level such as the intergovernmental working group established by the Member States' Directorates General for Public Administration. Moreover, work will build on the achievements as outlined in the Communication "*Free movement of workers – achieving the full benefits and potential"* [46].

Finally, the promotion of the European dimension in R&D careers needs to be embedded in a structured and co-ordinated legal framework at European level which should guarantee researchers and their families a high level of social security thus minimising the risk of loosing already acquired social security rights. Within this context researchers should be able to benefit from the ongoing work at EU level aiming to modernise and simplify the co-ordination of the social security systems[47], (including the extension of these provision to third country nationals[48]) and to introduce the European Health Insurance Card. In this framework the specific needs of researchers and their families should be taken fully into account.

3.5. Gender differences in careers in R&D

As already mentioned in the policy context outlined above, the EU and Member States[49], as well as associated countries, are well aware that the under-representation of women in R&D must be tackled if optimal use is to be made of human resources devoted to research. Increasing the talent pool of women researchers will thus be critical in reaching the 3% objective.

Women account for approximately 30 % of the research population in the public sectors[50], but for only 15 % in industrial research[51]. These percentages regarding the

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44 Council Resolution on the *Promotion of Enhanced European Co-operation in Vocational Education and Training*, 14343/02 of 06.12.2002. "The aim of this process is to promote transparency and mutual trust as a means of enhancing the transferability of vocational qualifications and competencies throughout Europe and at all levels, as well as to improve the quality and standing of vocational education and training".

45 COM(2002)72 final of 13.02.2002

46 See COM(2002)694 final of 11.12.2002, in particular paragraph *5.3. Recognition of professional experience and seniority* and paragraph *5.4. Recognition of qualifications and diplomas.*

47 COM(1998)779 final of 21.12.1998.

48 Council Regulation 859/2003 of 14.05.2003 extending the provisions of Regulation (EEC) 1408/71 and Regulation (EEC) 574/72 to nationals of third countries who are not already covered by those provisions solely on the ground of their nationality.

49 This awareness is also underlined by the Council (Ministers of Education) Conclusions of 5th May 2003 – official Journal of the EU C 134/4 of 07.06.2003.

50 National Policies on Women and Science in Europe – a report of the Helsinki Group on Women and Science – June 2002 – ISBN 92-894-3579-8.

overall participation of women should not mask the now well-known phenomenon of the "leaky pipeline", by which women tend to decrease in disproportionate numbers as they approach the top of the ladder: they represent indeed less than 10 % of the full professors in the EU.

Latest data for 2001 have revealed that women now account for some 40 % of the doctoral degrees awarded in the European Union, showing that there is a growing pool of highly educated women researchers. This trend should, however, not be considered as the solution to greater gender equality. As has been evidenced in the *Third European Report on Science and Technology Indicators 2002*[52], the under-representation of women in R&D is the result of different complex factors, which combine as subtle, but cumulative, forms of discrimination, and as such call for different types of action.

Recruiting, retaining and promoting women in research requires innovative practices in terms of performance evaluation and rewarding systems. In order to be attractive to women researchers, careers in R&D should cease to appear as being in conflict with having a family, a conflict that continues to apply almost exclusively to women[53]. Similarly, women need to be recognised for their achievements and not be put under excessive pressure to outperform male colleagues. Networking and mentoring are also important mechanisms to support women researchers in their careers. Business enterprises and research organisations should promote good practices, such as flexible working time, dual track careers, "girls days", etc.

Beyond specific measures, it is of utmost importance that "gender lenses" be applied in analysing research careers. This implies recognising and taking account of the different impacts that the structuring characteristics of careers in R&D have on male and female researchers. This is also true when considering how to make science attractive to young people at an early stage: maximising the attractiveness requires a wide spectrum of approaches to trigger the interests of both boys and girls. This is what mainstreaming calls for, and this is why the gender dimension has the potential to produce not only true gender equality, but also to open up new perspectives.

4. FACTORS SHAPING CAREERS IN R&D

In order to overcome the mechanisms that hinder a dynamic development of careers in R&D it is necessary to analyse the different factors and current trends, which shape such careers at European level.

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51 Women in Industrial Research - A wake up call for European Industry – January 2003 – ISBN 92-894-4400-2.

52 "Third European Report on Science & Technology Indicators" EUR 20025 (2003), page 249.

53 See in particular section 2: "Are women more affected by the family double standard?"

4.1. Research training

4.1.1. A changing environment

The development of adequate research training will become increasingly important if Europe is going to meet the estimated need of 700.000 researchers, as outlined in the recently adopted Communication "Investing in research: an action plan for Europe[54].

Despite their heterogeneity[55], universities have a central role to play as regards the training of researchers, as was already stressed in the Communication "*The role of the Universities in the Europe of Knowledge*[56]. However, doubts have arisen about the capacity of universities to satisfy all the demands made on them as industry seems eager to employ researchers without doctoral degrees, considering that those with a doctoral degree are too specialised[57].

Policy advisers to the research community have called for making the training of researchers more relevant for a wider variety of careers than in the past. As pointed out in the report: "*Developing foresight for the development of higher education/research relations in the perspective of the European Research Area"*[58] more and more research is currently being conducted by "non-academic" institutions (companies, non-profit public or private organisations, private and public independent research centres, etc.). Consequently, "*the perspective of preparing research students to enter the "non-academic" market is a true challenge. Currently, in most European Higher Education/Research institutions, graduate students are trained in an "endogenous" perspective, that is, on the assumption that most of their career as professional researcher would take place in an academic research setting"* [59].

Therefore, postgraduates should be trained and prepared to enter not only the endogenous academic market but also a broader exogenous market. Preparing postgraduates, however, for a research profession in other types of contexts constitutes a fairly radical shift from current practice and attitudes, as *"it could imply more involvement of the research apprentice in collaborative projects with "non-academic" partners and also more direct involvement of "non-academic" partners in the training of researchers (for example, they could be involved in the design and/or management of some university second or third degree programmes, certainly in more applied areas)"*[60].

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54 COM(2003)226 final of 30.04.2003 and SEC(2003)489 final of 30.04.2003

55 Differences exist between institutions as regards the position of university research in scientific systems as referred to in OECD/DSTI University research financing DSTI/STP (99)18. Paris OECD.

56 COM(2003)58 final of 05.02.2003, in particular paragraph 5.2.3. *Excellence in human resources*.

57 The US is the only country in the world, which has a tradition in which industry actively seek out PhDs in science for employment (OECD, 1998).

58 STRATA ETAN report on "Developing foresight for the development of higher education/research relations in the perspective of the European Research Area (ERA)", by Prof. Etienne Bourgeois, Rapporteur, 2002.

59 See above mentioned STRATA ETAN report.

60 See above mentioned STRATA ETAN report.

4.1.2. Consequences for doctoral programmes

The most recent doctoral programmes contain initiatives to enhance the employability of researchers by including in the training both core skills (e.g. training in research skills and techniques) and wider employment related skills (e.g. research management, communication skills, networking and teamworking) in order to respond to the changing demands put upon them in an uncertain and open employment market[61]. In other words research trainees are given the opportunity to learn by doing. It implies that training through research be part of the actual research activity being conducted by the laboratory to which a doctoral candidate is attached [62].

Such developments will have an impact on the structure of training for researchers and on the ways in which such training might be reviewed within the discussion governing the Bologna Process and the development of the European Higher Education Area. When the Ministers of Higher Education look into the next phase[63] they may integrate doctoral programmes in a more proactive way into the Bologna Process. This is particularly relevant as the establishment of the European Research Area has set ambitious deadlines for 2010, and it is essential to see these two processes together.

Doctoral programmes are organised differently in different countries throughout Europe, from individually organised training to standard training programmes for groups of doctoral candidates in related fields. The idea of organised training (e.g. in research schools, graduate schools, or doctoral schools) is developing in some European countries, particularly in the Nordic countries[64], in the Netherlands and the UK, and on an experimental basis in other countries such as Germany or Spain[65].

Another important element within such structured training is related to the existence and the quality of a supervisor. The quality of the supervisor may be variable, and in some countries doctoral candidates have no real possibility to change supervisor without discontinuing their ongoing research project. Consequently, doctoral candidates should have better access to a supervisor at all levels, and, if necessary, each institution delivering doctoral programmes should appoint an "independent ombudsman" or a specific committee to support and assist a doctoral candidate if there is a need to change supervisor.

As pointed out by a number of professional organisations of doctoral candidates, experienced researchers should be personally involved in mentoring doctoral candidates,

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61 See, for example, the "*Joint Statement of the Research Councils'/AHRB'S Skills Training Requirements for Research Students in the UK"*..

62 This is also the main objective of the Marie Curie Host Fellowships for Early Stage Researcher Training action. See http://europa.eu.int/mariecurie-actions.

63 The European summit of Higher Education Ministers is scheduled for 18-19 September 2003 in Berlin.

64 See report from Nordic Academy for Advanced Study (NorFA): *The Nordic research training: common objectives for international quality*, 2003, available on www.norfa.no.

65 In Germany *the Graduiertenkollegs*, in Spain *the International Graduate School of Catatonia* (IGSOC)

thus integrating them fully into the research environment, highlighting alternative careers, when appropriate, and introducing the doctoral candidate to as many new contacts as possible. Even though the nature of mentoring varies, it should "*share a commitment to nurture on-going, in depth relationships through dialogue, decision-making, and reflection that has often been absent in traditional university-field site settings".*[66] Mentoring should thus become an integral part of any doctoral programme.

Funding doctoral programmes still represents a problem, as doctoral candidates may have to guarantee funding for the whole period of study in order to be admitted and sources of funding can be very diverse even within one single country[67]. This issue is linked to the above mentioned ambiguous recognition of a doctoral degree in a broad employment context. Moreover, the category of doctoral candidates forms a highly heterogeneous group in the different European countries. Doctoral candidates are considered to be students, staff members, workers or even researchers. Thus, the financial situation and social security rights of many doctoral candidates are still precarious. Even in countries providing extensive social benefit measures to doctoral candidates, maternity rights during doctoral studies remain largely unsatisfactory.

In principle, doctoral candidates should benefit from adequate funding either in form of a grant, a loan or a salary and, whatever the source of funding, minimum social security benefits, including parental leave should be provided.[68]

It will be necessary to analyse the different status of the heterogeneous community of doctoral candidates so as to initiate a systematic inventory on how research training is structured and organised in the different European countries and what the requirements for accessing it are in order to gain a more complete overview about the characteristics of research training opportunities in Europe.

4.2. Various recruitment methods

The question of recruitment is linked to the level at which it takes place and the types of organisation in which positions are available. Positions may be open at the national, European or international level for early stage or experienced researchers within a public sector organisation or in a teaching position in universities that includes research capabilities. As regards the private sector, industry recruits researchers at any stage of their career through national, European or international labour markets.

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66 Quote from "*Bring context to mentoring*", Dean Cristol, Ph.D., Old Dominion University.

67 For example, figures from 2001 on the financing of doctoral programmes in France reveal that 36% of doctoral candidates rely on personal sources of funding; 33% have a grant from ministries, regions, associations; 7% are financed by sources from a foreign country or by EU fellowships; 20% are already working and 4% are funded under a*n industrial agreement* (CIFRE contract). JJ. Paul, Research Institute on the Economic of Education, Dijon, France.

68 The contractual conditions developed to implement the Marie Curie Actions in the context of the 6th Framework Programme impose to the host institution to offer adequate social security coverage.

Systems of recruitment differ from country to country, from discipline to discipline, and from public to private organisations. Long established recruitment procedures within the public system are in place in all European countries[69]. The organisation of recruitment is most often based on advertisements in the press, through Internet, or through national or international competitions. In most cases, in the public sector, selection committees exist, and the Commission has already highlighted the necessity to remove remaining barriers that prevent foreign researchers from participating in such selection and evaluation committees[70]. In reality however, recruitment still depends to a large extent on factors such as the influence of the supervisor, agreements based on local cultures, the lack of external panel members or the fact that open competitions become local competitions, reflecting somehow the limited openness of academic or public research structures.

Another issue that needs to be tackled is related to recruitment integrity based on scientific standards. Selection methods are either entirely based on paper selection (CV and publications), written tests, interviews or a mixture of these. The recruitment criteria are essentially based on the level of education officially required, as well as on other requirements more specifically linked to the structure of needs of the organisation. In the case of posts in academia, a doctoral degree or to have published already in scientific journals of international repute is normally required.

By contrast, in the private sector recruitment of researchers often operates in a more global context and is linked to the culture and the needs of each company, particularly as regards the value attributed to a doctoral degree.

One of the elements for the establishment of an European open market for researchers is linked to the real and effective opening up of national public sector positions to EU and third country researchers which has already been made explicit by the European Commission[71]: "*All (...) recruitment procedures have to be open[72] (...) Furthermore, Member States are not allowed to refuse migrant workers the status of civil servants, if relevant, once they have been integrated in the public sector. On all these points the Commission intends to monitor closely the relevant national rules and practices and to take the necessary steps to ensure effective compliance with Community law, including starting infringement procedures if necessary".*

As regards the presentation of the professional experience, current practice shows that a researcher's CV normally requires the listing of the different experiences in chronological order with precise references to education and work experiences, additional skills, proficiency in foreign languages etc. One of the most important factors however,

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69 See "*Employment and Working conditions of Academic Staff in Europe"*, J. Enders (ed.), Gewerkschaft, Erziehung und Wissenschaft, Materialien und Dokumente Hochschule und Forschung, Oktober 2000.

70 See COM(2001)331 final of 21.06.2001, point 4.1. Actions aimed at establishing the dynamics to improve the environment for mobile researchers.

71 See COM(2002)694 final of 11.12.2002, in particular paragraph 5.2.

72 The only exception is for cases where "*nationals who are not working in the same service of the public sector would also not be allowed to apply to these kind of posts or competitions".*

seems to be that professional experience is based on a "linear" career path, similar to the structure of a "ladder" with no chronological gap.

Many researchers perceive this as a "penalising" factor particularly in the case when they move from one discipline to another, which is considered as an important feature in the whole innovation process but often not recognised as such, or in the case of a temporary interruption for personal or family reasons. It has been suggested that researchers should have the possibility to remove a certain number of years from their CV, if they consider it necessary and appropriate, when applying for a post. This would imply a change of attitude on the part of the different actors of the research community who would need to be more open towards "non-linear" career paths and base their judgement on merit and not necessarily on chronological order.

A "code of conduct for the recruitment of researchers" based on best practice ought to be developed so as to improve recruitment methods which reflect the needed openness at European level and different ways of judging merit and excellence.

4.3. Employment and working conditions

4.3.1. A tendency towards deregulation in the academic career system

The career system of researchers is characterised by various types of scholarships or fellowships, a series of contract tracks, periods of tenure tracks or regular employment. Hence, the development of such a research career structure is dependent upon formal employment and working conditions regulated by legal and contractual rules, which differ from country to country, from public to private research institutions and from discipline to discipline.

As regards the employment relationships of staff in R&D there are, generally speaking, three basic ways of regulations: by state law, by collective bargaining between representatives of employers and employees or, in the case of academic staff by employment regulations of the higher education institution.

Furthermore, according to the study "*Employment and Working Conditions of Academic Staff in Europe*[73]*: A Comparative Study in the European Community" various higher education systems have traditional mechanisms of individual bargaining between members of academic staff on the one hand and representatives of the employer (state authority or institutional leaders) on the other hand. The regulations and rules might, therefore, be laid down in legal documents, employment contracts, depending on the principle ways they have been determined: either unilaterally by state law or employer regulations or bilaterally by national, local or individual bargaining or a composite mix of elements of both types. Typically, these rules cover regulations for salary and working load, job security and tenure, procedures for recruitment and promotion, fringe benefits, sabbatical, pension arrangements, and so on.*

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[73] J. Enders (ed.), Gewerkschaft, Erziehung und Wissenschaft, Materialien und Dokumente Hochschule und Forschung, Oktober 2000

Higher education systems are undergoing many changes, towards a growing decentralisation as regards the regulation of academics employment and working conditions. Such shifts of responsibility and decision making processes vary according to each country[74] and could lead to an increased complexity in the system if not integrated in a more co-ordinated framework.

As regards working conditions for researchers several issues should be further expanded and investigated. These include flexibility at work (teleworking, flexitime), the right of access to lifelong training, the possibility to ask for a sabbatical period and, last but not least, the quality of infrastructures and equipment, including the development of eResearch or Cyberinfrastructures[75].

Within this context it is worthwhile noting that the future of fixed term contracts, including research contracts is also related to the implementation of the "*EU Directive on Fixed Term Work"*[76]. The Directive aims to prevent fixed-term employees from being less favourably treated than similar permanent employees; to prevent abuse arising from the use of successive fixed terms contracts; to improve access to training for fixed terms employees; and to ensure fixed-terms employees are informed about available permanent jobs.

It will be worth analysing how the associated developing legislation in the different EU Member States fits into the above outlined working environment. This implies a major rethink of the structure and future of postdoctoral fellowships and contract research in the different European countries.

Researchers and their employers should discuss the development of researcher's working conditions within a framework of social dialogue to achieve this more easily.

4.3.2. Remuneration as career incentives

Salaries constitute one of the most visible issues of career recognition. Salaries of researchers seem to have fallen behind, for example in comparison with those who are engaged in management positions. This is perceived as a reason for career shifts that can imply a loss of public capital invested in the training of researchers. Increased mobility, the need for more transparency and comparability in order to assess the attractiveness of researchers' careers requires comparative studies on researchers' financial conditions and salaries.

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74 To this end see e.g. the text of the new Act in Austria posted at: www.bmbwk.gv.at.

75 See also the eLearning Action Plan (COM 385 of 18 July 2001 as well as the Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure, January 2003, available at: http://www.cise.nsf.gov/evnt/reports/tocs.htm.

76 Council Directive 1999/70/EC concerning the "Framework agreement on fixed term work" concluded by ETUC, UNICE, and CEEP adopted on 28 June 1999.

So far, such studies[77] have not been carried out in a systematic way. This is due to difficulties related to: the different status or the definition of staff, the lack of comparable international statistics, the difference between gross and net income (which is very different from country to country because of heterogeneous tax and social security systems) and lastly the researcher's financial contribution to the scientific results obtained or the capacity to lead research contracts for which it is possible to negotiate individual benefits. In order to gain a complete picture, comparison of the earnings of staff employed in a scientific capacity in the private sector and financial benefits resulting from licensing or other exploitation activities should also be carried out and made available to researchers.

This will be a great challenge in the sense that it covers a wide range of issues and because the supporting data are complex and controversial[78]. Therefore a study at European level should be carried out; such work is essential for establishing conditions of work and career development possibilities as well as for identifying possible salary level adjustments in order to facilitate comparison between supply and demand.

4.3.3. A growing need for alternative tenure opportunities

The need to establish a career structure for researchers has only been realised relatively recently, by taking into account two factors which hinder long-term perspectives: the awareness of the career structure and the consciousness of the lack of long-term employment perspectives particularly for a career in academia[79].

On the one hand, career structures, especially for contract researcher staff has been analysed[80], discussed and further strengthened in some European countries, and examples for such initiatives can be found in the UK through the "*Research Career Initiative (RCI)*"[81] or in Ireland through the initiative "*Attracting & retaining researchers in Ireland"*[82]. On the other hand, the issue of the "US tenure track model" is under discussion in several European countries, particularly in the light of the reform of the higher education systems, e.g. the "Junior-Professorship" model in Germany[83].

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77 See F. Thys-Clement: *"Changes in research management: The new working conditions of researchers"*, June 2001.

78 Some studies and reports have looked into these issues and can be taken as the starting point for this initiative such as: UK Roberts Report "The supply of People with Science Technology and Mathematics Skills", April 2002, OECD: Education at a glance 2001, "Employment and Working conditions of Academic Staff in Europe", J. Enders (ed.), Gewerkschaft, Erziehung und Wissenschaft, Materialien und Dokumente Hochschule und Forschung, Oktober 2000.

79 This is partly linked to the changing role of universities and the way research is funded. Consequently there will be more and more project based contracts, which provide little or no opportunity for planning a career in R&D. See also COM(2003)58 of 05.02.2003.

80 See study "*Academic Research Careers in Scotland: a longitudinal study of academic contract research staff, their jobs and career patterns"*, Institute for Employment Research – Scottish Higher Education Funding Council.

81 For more information see: www.universitiesuk.ac.uk/activities/rci/asp.

82 See www.sfi.ie.

83 The introduction of the "Junior Professorship" was adopted in the service law reform [Dienstrechtsreform] of 23 February 2002, for more information see: www.bmbf.de.

INSERM, the French National and Public Institute has launched a new tenure track model in 2002 for biomedical research, in collaboration with hospitals and universities. The new system offers tenure with, depending on professional experience, a fixed yearly salary (including family medical insurance and pension scheme) and a five-year renewable contract with complementary salary paid by the hospital or university.

Such changing tenure patterns may also foster new opportunities for developing pathways between "academic" and "industrial" careers in research. This is particularly relevant as long as rigidities in the academic employment conditions still constitute one of the main obstacles to intersectoral mobility, as pointed out in the Final Report of the High Level Group on Mobility[84]. If such rigidities are softened, paving the way for a combined approach of employment and remuneration, new partnerships can develop and lead to an 'industry/academia' tenure track for researchers[85].

In order to include researchers into regular and sustainable staff structures, such alternative tenure tracks need to be developed e.g. through more structured partnerships between higher education institutions and national or regional research centres/laboratories, or through industry/academic partnerships. The advantages of such a new career track are manifold, from better organising links between applied and basic research to stimulating motivation through more flexibility, thus including the three dimensions: teaching, research and industry/enterprise related issues such as transfer of knowledge and innovation.

4.3.4. Career evaluation systems

The more an alternative tenure track includes diversified working experience the more importance will be attributed to adequate evaluation/appraisal systems.

Publications in the form of articles in high impact journals, international publications, books and chapters are considered as a fundamental factor for the appraisal and productivity of a researcher. However, "other indicators" such as computer programmes, scientific prizes, conference speeches, participation in exhibition, seminars and workshops, organisation of such events, professional appointments, teaching activities, national and international collaboration, management of research, research income, and to a lesser extent patenting, licensing and spin off creation activities are becoming equally as important, as highlighted by a study "*Researchers' Appraisal at European Universities"*[86].

Some organisations responsible for evaluation are in favour of using those "other indicators" to identify and reward excellent researchers, while others see them as only complementary information confirming an opinion of a researcher. According to this

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84 Final Report, in particular paragraphs 2.5.2. *Good Practice Examples.*

85 Such a specific tenure track may also include a launching phase for spin-offs. See also the *French law on innovation* available on http://www.recherche.gouv.fr/technologie/mesur/loi/inovloi.htm

86 The study was commissioned by DG RTD Directorate K and is not yet published; it was realised by Eurotech Data Luxembourg.

study, evaluation of researchers may take place at different stages of a career: before a promotion; during the evaluation of projects for funding; in the form of a regular appraisal (e.g. yearly appraisal); when preparing for a discussion on salaries or involving employment conditions.

This study also provides an overview of procedures for the evaluation of researchers in academia in the different Member States. Depending on the type of evaluation and the country, the organisations responsible for evaluation may vary from research councils and ministries to university deans and research groups. In the UK and elsewhere in Europe (Germany, Ireland, the Netherlands, Norway etc), researchers are evaluated according to the national frameworks relating to generic human resources policies including individual performance and targets. Most universities, however, will have a human resources protocol dealing with researcher evaluation, which will list key performance dimensions. France, Denmark, Portugal and Spain list indicators to be used in the evaluation of researcher activity other than publication records and teaching activities. In some countries (Germany, Portugal) new evaluation approaches are being developed and implemented.

Given the fact that different careers in R&D ought to be treated on equal footing it will be necessary to develop procedures and indicators for evaluating researchers with respect to the type of research activities they are involved in. This implies also that the above mentioned "other indicators" are incorporated into any evaluation process and that evaluation of achievements and outputs is not focusing primarily on citation frequencies and journal impact factor calculations. If these "other indicators" are not taken into account this could discourage researchers from carrying out activities such as the exploitation of research results which in socio-economic terms means that the benefits of research are not brought back to society.

This leads to the need for greater understanding of these different approaches, which embrace peer review, performance related systems, and individual appraisal systems based on local, national or international standards. This ought to be done by means of a series of workshops at European level dealing with best practice as regards these issues.

Within this context, it is also important to investigate how geographical and intersectoral mobility is evaluated as part of career advancement. The High Level Expert Group[87] in their final report identified some disadvantages related to working or training periods abroad or in another sector for researchers who had not yet secured a permanent position before leaving and for researchers with permanent positions.

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[87] See final report of the High-Level Expert Group on Improving Mobility of Researchers and consequently the Communication "A mobility strategy for the ERA", COM (2001) 331final of 20.06.2001 and Commission Staff Working Paper on "First implementation report on A Mobility Strategy for the ERA" SEC (2003) 146 of 4.02.2003

5. PROPOSED ACTIONS AND INITIATIVES

The aforementioned issues and considerations demonstrate the need to undertake actions along the following lines:

– Improve data collection and analysis so as to draw more in-depth conclusions;

– Create more structured dialogue mechanisms between the different stakeholders of the research community in order to improve career prospects for researchers overall in Europe;

– Launch, whenever possible, specific initiatives and actions in certain areas. These initiatives and actions will contribute to the Barcelona objective of investing 3% of GDP in R&D.

To this end, based on the work carried out so far and relying on the exchange of best practice, benchmarking and voluntary co-operation, the following is proposed:

The Commission will:

- ***Continue to implement the actions foreseen in the Communication "A Mobility Strategy for the ERA"[88] as well as continue to implement the Science and Society action plan[89] and the Women and Science Action Plan[90].***

- ***Set up a High Level Group in order to identify more examples of good practice related to different employment opportunities, such as intersectoral mobility or new tenure track models, and disseminate them widely to the research community.***

- ***Launch the development of the "European Researcher's Charter", a framework for the career management for human resources in R&D, based on voluntary regulation***.

- ***Launch impact studies to assess and benchmark the multiple career paths of researchers***.

- ***Outline a "Code of conduct for the recruitment of researchers" based on best practise, to improve recruitment methods.***

- ***Develop the means to enable the research community to compare salaries, including social security benefits and taxes, between countries, between disciplines, between sectors and between male and female researchers.***

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88 COM(2001)331 final of 20.06.2001 and SEC(2003)146 of 04.02.2003

89 COM(2001)714 final of 04.12.2001

90 COM(1999)76 final of 17.02.1999.

The Commission in co-operation with the Member States intends to:

- ***Take the necessary steps to develop a Framework for recording and recognising different professional achievements throughout the career of researchers, including reference to "common quality criteria" for career development and tools enabling to increase the transparency of qualifications and competencies acquired in different settings.***

- ***Set up a series of workshops on the exchange of best practice as regards career evaluation systems, in order to make them more visible, transparent and comparable with international standards.***

- ***Initiate a systematic inventory of the status of doctoral candidates, of how doctoral programmes are structured and organised in the different European countries and what the requirements for gaining access to them are in order to provide the research community with a more complete overview about the characteristics of training opportunities in Europe. The inventory would include the characteristics of training delivered in a transnational collaborative framework, supported through programmes such as Socrates-Erasmus and notably the human resources actions of the Framework Programme.***

The Commission proposes to the Member States and to the stakeholders of the research community to:

- ***Launch a European Year of Researchers to strengthen the public recognition of careers in R&D.***

- ***Develop a European platform for the social dialogue of researchers.***

- ***Take into account broader needs of the labour market and the necessary evolution of the content of research training within the context of integration of doctoral programmes into the Bologna Process.***

- ***Integrate structured mentoring as an integral part into doctoral programmes***.

- ***Offer doctoral candidates better access to a supervisor at all levels and, if necessary appoint an "independent ombudsman" (or a specific committee) to support and assist a doctoral candidate if there is a need to change supervisor***.

- ***Ensure that, in principle, doctoral candidates have access to adequate funding either in form of a grant, a loan or a salary, and to include, whatever the source of funding, minimum social security benefits, including parental leave.***

- ***Encourage – in line with the Barcelona objectives – a significant increase in investment in higher education and in R&D in the European Union.***

- ***Devote specific attention to the growing role of ICT in the research environment, especially its ability to enhance training and support services and the need of high quality level infrastructures for eResearch (such as Geant and Grids)***.

- ***Develop all these actions in seeking equal benefit for men and women researchers by paying attention to the different impact they may have on men and women's lives.***

- ***Set-up - in close co-operation with the Researcher's Mobility Portal and the European network of mobility centres - specific researchers' guidance centres at local, regional and national level in all European countries in order to advise on new opportunities for multiple careers in R&D and on the necessary requirements to engage in them***.