



European
Commission

However, their presence at the top of scientific and academic careers is scarce. Only 18% of full-time researchers are women; 13% of heads of higher education institutions and 22% of board members in research organizations. Women's skills, knowledge and qualifications are grossly underused in the labour market. The imbalance in decision making positions throughout the science and technology system is a waste of human resources and economies cannot afford. Nor can Europe afford to waste the professional contributions of so many of its best and brightest citizens, particularly in the present context of the global economic recession and the emerging global competition from competitors in Asia and Latin America. The Grand Challenges facing Europe (including climate change and demographic change) require the full participation of women in its science and technology system if it wants to develop suitable solutions for all its citizens and does not want to continue losing ground in the new economic world order. The global economic recession has focused attention on the ingredients required for robust sustainable economies. It is widely acknowledged that research and innovation (R&I) are the main drivers of a prosperous economy. In today's global R&I marketplace, Europe has to compete with other regions where highly educated talent pools and markets for innovation exist, such as Singapore, China, India, Latin America, South Korea and the US. Many corporations are undertaking organizational change of their science and technology systems to adapt to these new conditions and are already established a presence in these regions in order to move their research and technology work closer to where scientific talent and market opportunities lie. In this context, Europe needs to get the best out of its R&I systems and there is an urgent need to advance on gender equality in science. The mainstreaming of gender in the scientific endeavour through more effective deployment of the female human capital; creating new markets that recognize the importance of gender; and increasing the international competitiveness of Europe's research workforce in general. Promoting gender equality will also allow industry to benefit from a wider talent pool of human resources. It assists in the development of new economic opportunities by widening the experiences and expertise brought to creating innovation and to identifying and understanding new markets. More women among scientific decision makers would ensure the robustness of the decisions made due to an increase in the diversity of viewpoints. Diversity also plays a role in producing goods and services informed by a broad and in-depth knowledge of the society for which they are produced. This is already acknowledged not just in the US, but by many leading European and international R&I companies who have focused attention on ensuring that they recruit, retain and promote the best talent. Diversity of knowledge and social capital in teams is vital to produce new ideas. It is also an issue of real excellence in research. After integration of the gender perspective in research alongside a better inclusion of women in the R&I workforce to improve the quality, objectivity and relevance of knowledge, technology and innovation for the benefit of all members of society. Through a better consideration of the sex and gender variables throughout the research process will reduce bias and identify gaps and missed opportunities. A system which does not provide equal possibilities for professional development to men and women is not getting the best value from the available talent. As a result it does not produce the best results. The full participation of women in science and technology will also contribute to social progress. Ensuring effective equality of opportunities between men and women in science and technology is not only an issue of justice. Equality between men and women is one of the European Union's founding principles. Research findings consistently demonstrate that those countries which score highly on equality indicators are those which are more successful in wellbeing, social cohesion and integration. The costs of inequality include unemployment, crime, and poor health. Since 1957 and the Treaty of Rome, the principle of equality between women and men has formed an essential part of European Union's political, social and economic development. The principle of equality for equal work is also part of the Treaty of Rome. The Treaty of Amsterdam includes the provision of eliminating inequalities and promoting equality between women and men into all its activities (also known as 'gender mainstreaming'). Legislation has been developed to ensure equal opportunities and treatment for women and men in all fields of employment, working conditions and social security. In Europe, there has been significant progress in equal opportunities in the field of education- 58% of university graduates and 45% of PhD graduates are women. European women's increased intellectual and social capital, and higher career aspirations, would provide an important competitive advantage in international markets for innovation and technology. The Commission's commitment to gender equality was further confirmed in its Strategy for Equality between women and men 2010-2015, which includes amongst its priority areas equal economic independence for women and men, equal pay for work of equal value and equality in decision-making. In 2010, the EU Competitiveness Council stressed the need to step up support for structural change for the modernization of universities and research institutions, and to integrate gender issues into research as a resource to create new knowledge and stimulate innovation. Current understanding of the role of gender in science has evolved over time from the early and oppositional associations of 'gender' with women and men to gender as an organizing principle for both institutions and scientific disciplines, then further to gender as biological and social factors affecting research itself. Under the leadership of the European Commission's DG Research (marked by the publication in 2001 of the ETAN report), around 20 key reports have been produced over the last 10 years in support of gender equality policies. Sufficient research evidence and expertise is now available across Europe to address many of the adverse effects of the gender imbalance problem in order to enhance excellence of scientific knowledge making and procedures related to scientific institutions. There is also evidence indicating that integrating gender perspective in research can improve its relevance and quality. Many projects have been designed to increase interest among women and girls in specific fields of science, technology, engineering and mathematics (STEM). Over the last 10 years, the EU has funded numerous projects in the field of women in science, and, in particular, and more recently concerning structural change (e.g. GENSET on gender action plans in science, and GENDERA on best practices). Many universities and research institutions have sought to address the lack of women in their science departments, as students and as staff. There are significant variations in the extent to which the relative lack of women in some STEM subjects and in senior positions in the academy is recognised as a problem. In different countries. There are differences too in how successful initiatives designed to address the issue have been. It is not always equality policies that have the most effect; more transparency in hiring can make a difference. Despite growing recognition of the gender imbalance in science, and the development of various projects and policies in Member States and their universities and research institutions, progress has been slow. The organization of R&I in Europe still relies on male and female stereotypes to the disadvantage of science, technology and the economy. In addition, the lack of role models for women in senior positions has had a negative impact on high-level aspirations of other women. The outcome is a waste of talent, missed opportunities for scientific advancement and innovation, and a lack of clarity of what is meant by scientific excellence. Gender mainstreaming has been one of the major strategies adopted by the European Union and the Member States for achieving gender equality (and as a social policy strategy it is considered a success). However, in science it is a more recent strategy that has not yet been embraced widely in universities or research institutions. Consequently, in relation to the problem of the under-representation and under-promotion of women in science, it has not produced the hoped-for results. Similar problems to those existing in Europe have been identified in the US, where the National Science Foundation (NSF) has invested substantially in the ADVANCE Programme in supporting universities to undertake institutional transformation to enhance the participation of women in science. Disaggregated statistics on the hiring of faculty, the size of their pay cheques, and even the size of their laboratories have demonstrated that gender is a key organizing principle in academia. Investment in this process through the ADVANCE Programme reflects the value NSF attaches to addressing structural issues at US universities. Structural change in universities and research institutions means making them more gender-aware, the organizational culture. This has important implications for equal opportunities, full use of talents, and quality of scientific research. It implies systemic, integrated, long term approaches and short term measures. Following on from the 10th anniversary of the launching of its Gender Equality and Science Unit in DG Research and the Helsinki Group (which was created in 1999), the

Structural change in research institutions: Enhancing excellence, gender equality and efficiency in research and innovation

Research and
Innovation

EUROPEAN COMMISSION

Directorate-General for Research and Innovation
Directorate B – European Research Area
Unit B.6 – Ethics and Gender: Sector B6.2 – Gender
European Commission
B-1049 Brussels
E-mail: rtd-womenscience@ec.europa.eu

Structural change
in research institutions:

Enhancing excellence, gender equality and efficiency
in research and innovation

Europe Direct is a service to help you find answers
to your questions about the European Union

Freephone number(*):
00 800 6 7 8 9 10 11

(*)Certain mobile telephone operators do not allow access to 00 800 numbers or these calls may be billed

LEGAL NOTICE

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.

The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

More information on the European Union is available on the Internet (<http://europa.eu>).

Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2012

ISBN 978-92-79-22394-5

doi 10.2777/37288

© European Union, 2012

Reproduction is authorised provided the source is acknowledged.

Printed in Belgium

printed on elemental chlorine-free bleached paper (ecf)

Contents



Executive Summary	6
Glossary	8
Introduction	10
Chapter 1: Setting the scene and the objectives	12
1.1 Why Europe needs more women in science and technology	13
1.2 Progress so far in legislation, participation and policy	13
1.3 Engaging research institutions in structural change	14
1.4 Cost of no action	15
Chapter 2: Problems faced by research institutions	18
2.1 Opaqueness in decision-making processes	19
2.2 Institutional practices inhibiting career opportunities	20
2.3 Unconscious bias in assessing excellence	20
2.4 Wasted opportunities and cognitive errors in knowledge, technology and innovation	21
2.5 Employment policies and practices	22
Chapter 3: Essential elements of structural change	26
3.1 Knowing the institution	27
3.2 Securing top-level support	27
3.3 Generating effective management practices	28
Chapter 4: Solutions: Bringing about structural change	30
4.1 Making decision-making transparent	31
4.2 Removing unconscious bias from institutional practices	32
4.3 Promoting excellence through diversity	32
4.4 Improving research by integrating a gender perspective	33
4.5 Modernising human resources management and the working environment	34
ANNEX – Gender Equality Strategy: Key steps for actors at the EU, national and institutional level	42

Foreword

Just over a year ago, in October 2010, the European Commission presented its most ambitious policy for stimulating research and innovation to date - the Innovation Union flagship initiative. This initiative is one of the cornerstones of the Europe 2020 Strategy to stimulate smart, sustainable and inclusive growth in Europe. Boosting innovation means increasing the number of researchers in Europe by at least one million if we are to remain competitive and build on our strengths. We also need to make sure that people starting research careers find it attractive to stay in science. This is especially true for women: while 45% of doctorates are awarded to female students, only 30% of active researchers and 18% of full professors are women.

A group of high level experts has been brought together in order to investigate the reasons behind existing trends. This is their report. The experts have reviewed a large body of evidence, have identified where the problems lie, and have clearly formulated the conditions needed to remedy a waste of talent which has already lasted too long. The report argues that gender-aware management of universities and research organisations would have a positive impact on policies and practices in the recruitment, promotion and retention of both women and men, thus ultimately benefiting the very quality of research. There is no trade-off to look for between promoting gender equality and excellence in research. Instead we can achieve a win-win situation for all researchers, their institutions, and for Europe. We need to address these issues, not only for the sake of fairness and equality, but for the sake of science and research itself – we need to build our research capacity in Europe.

This report on Structural Change in Research Institutions comes at a critical moment for the implementation of the



Innovation Union flagship initiative. The Commission has just launched an open consultation on the best way of creating a truly unified European Research Area where we can exploit our research potential – including the potential of both men and women researchers – to the fullest. And later this year, the Commission will present its proposal for Horizon 2020 which will be the next-generation programme for supporting research and innovation.

The report rightly stresses that progress in integrating gender in research and innovation relies on firm and sustained top-level commitment. It is my wish that reading this report will inspire decision-makers and researchers alike – the men and women who are engaged in making the Innovation Union a success.

A handwritten signature in black ink that reads "Máire Geoghegan-Quinn".

Máire GEOGHEGAN-QUINN

Executive Summary



The key role given to research and innovation in striving towards a smart, sustainable and inclusive growth in Europe means that the EU should make full use of its human capital – thereby involving both men and women. Evidence shows that research performance is limited by the perpetuation of direct and indirect sex discrimination and that promoting gender equality at all levels contributes to achieving excellence and efficiency.

Initiatives to promote gender equality in research have been developed in Europe and the US over a number of years. The focus was initially on specific programmes to help women pursue scientific careers. However, those programmes have proved to be insufficient to increase the number of women in science, particularly in positions of responsibility, and have not helped to address the structural barriers contributing to the well known leaky pipeline phenomenon.

This has led to a shift in focus towards addressing the structural transformation of institutions, using a systemic, comprehensive and sustainable approach. The US has led the way with the ADVANCE programme, funded by the National Science Foundation. Some initiatives have also been taken in Europe, but the scale of these needs to be increased.

Based on recent scientific findings and research practices, this report analyses the progress made so far in legislation, participation and policy, describes the problems remaining

for research institutions in Europe and stresses the role that EU policy-makers, science institutions and gatekeepers of excellence must play in order to advance gender equality in research and innovation.

Five main problems faced by research institutions are identified. The first is opaqueness in decision-making: despite significant progress in Europe, lack of transparency continues to affect structures and processes, with the associated phenomenon of “old boys” networks and patronage. Evidence suggest that women and men would both benefit from a system where there is clarity of what is required from researchers, information is freely available, and clear criteria are used in decision making.

A second set of problems relate to institutional practices which, while appearing to be neutral, do have negative effects on the career opportunities of women. Cognitive errors in assessing merit, suitability for leadership, or evaluation of performance are embedded in institutional practices, often despite good intentions and a commitment to fairness.

Thirdly, a number of studies have demonstrated the considerable effect of unconscious gender bias in what is the hallmark of science: the assessment of excellence and particularly the process of peer review. The practice of evaluating excellence often conceals gender bias.

Fourth, gender inequality generates wasted opportunities and cognitive errors in knowledge, technology and innovation. Research has shown that gender bias has important implications for the content of science itself. The integration of sex and gender analysis in the research content increases the quality of research and improves the acceptance of innovation in the market.

Finally, despite the many years of European legislation on equal opportunities, statistics show that EU Member States still have a gender pay gap, and gender continues to be a structuring factor in the workplace, also in research. Work is organized in gendered ways, which makes it difficult for talented women to reconcile work and family; harassment, concentration of power, and the guru/acolytes model of power relations are also factors affecting women negatively.

This report proposes structural change in science institutions as the means to address each of these five sets of problems, so that decision making is more transparent, unconscious bias is removed from institutional practices, human resources management is modernized, excellence is promoted through diversity, and research and innovation are improved by the integration of a gender perspective.

In addition, it signals three essential elements which should be considered as a prerequisite by all organisations

undertaking structural change: knowing the institution, by developing statistics and indicators, so that the situation of each institution becomes widely known and acknowledged; getting top level support from persons in positions of responsibility; generating effective management practices, by ensuring gender expertise and by raising awareness.

While a lead is required from the EU and its Member States, a wider range of actors also need to play an active role in modernizing the way in which R&I is conducted in Europe. Some of the most successful innovators are paving the way but others are still lagging behind. Universities and research institutions, funding bodies and some learned societies still operate with the stereotypical gender regime of a full time breadwinning man and a female second earner. This report also proposes key recommendations to help different types of actors to improve their performance.

Glossary¹

Sex refers to the biologically determined characteristics of men and women in terms of reproductive organs and functions based on chromosomal complement and physiology. As such, sex is globally understood as the classification of living things as male or female

Gender refers to the social construction of women and men, of femininity and masculinity, which varies in time and place, and between cultures. The notion of gender appeared in the seventies and was put forward by feminist theorists who challenged the secondary position of women in society. It departs from the notion of sex to signal that biology or anatomy is not a destiny. It is important to distinguish clearly between gender and sex. These terms are often used interchangeably while they are conceptually distinctive

Equal opportunity indicates the absence of barriers to economic, political and social participation on the grounds of sex. Such barriers are often indirect, difficult to discern and caused by structural phenomena and social representations that have proved particularly resistant to change. Equal opportunities, which is founded on the rationale that a whole range of actions are necessary to redress deep-seated sex and gender-based inequities, should be distinguished from equal treatment, which merely implies avoiding direct discrimination

Gender mainstreaming is the systematic integration of the respective situations, priorities and needs of women and men in all mainstream policies with a view to promoting equality between women and men²

In **gender-sensitive** research, gender is consistently taken into account throughout the research cycle

Gender-specific research focuses on gender itself as a subject matter

Gender-blind research does not take gender into account, being based on the often incorrect assumption that possible differences between men and women are not relevant for the research at hand

Gender bias is the often unintentional and implicit differentiation between men and women by placing one gender in a hierarchical position relative to the other in a certain context, as a result of stereotypical images of masculinity and femininity. It influences both the participation of men and women in research (hence the underrepresentation of women) and the validity of research. An example of gender bias in research is research that focuses on the experience and point of view of either men or women, while presenting the results as universally valid

Gender audits are evaluations that monitor and evaluate the implementation of gender issues into procedures. Unlike regular audits, they are based on self-assessments of how gender issues are addressed in internal organizational processes, and not on external evaluation

Gender impact assessments provide help for policymakers in incorporating a gender perspective into policies that take account of the different needs, characteristics and behaviours of the users at whom they are aimed

Gender proofing is a check carried out on a policy proposal to ensure that any potential gender discriminatory effects arising from that policy have been avoided and that gender equality is promoted³

Gender analysis is the process of considering the impact that a development programme or project may have on women / girls and men / boys, and on the economic and social relationships between them⁴

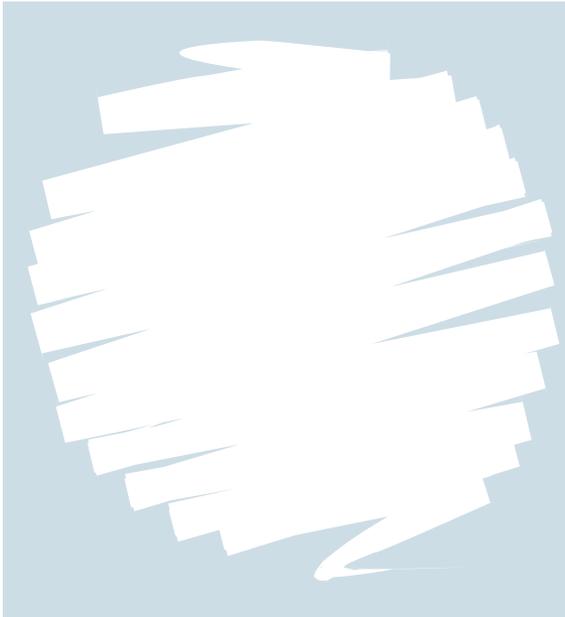
Acronyms

ERA European Research Area

R&I Research & Innovation (including technical development)

NSF National Science Foundation (US)

STEM Science, technology, engineering and mathematics



Endnotes

- ¹ Definitions from Gender Toolkit: http://www.yellowwindow.be/genderinresearch/downloads/YW2009_GenderToolKit_Module1.pdf
unless otherwise indicated
- ² <http://www.ofmdfmi.gov.uk/index/equality/gender-equality/gender-vocabulary.htm#genderproofing>
- ³ <http://www.ofmdfmi.gov.uk/index/equality/gender-equality/gender-vocabulary.htm#genderproofing>
- ⁴ <http://www.acil.com.au/glossary.htm>

Introduction



With the 7th Framework Programme in research, the European Commission's activities on women in science changed character: from *women scientists*, the focus moved to the *institutions* that employ them in order to address gender management issues and work towards a better representation and retention of women at all levels of their scientific careers. This is known as Structural Change.

In February 2011 the European Commission convened the Expert Group on Structural Change to assist the Commission in identifying the most appropriate means to reinforce structural change activities in cooperation with EU Member and Associated countries, as requested by the EU Competitiveness Council in May 2010. The Group was tasked to summarise its work in a report which would feed into the discussions on possible recommendations to the Member States.

This Report titled ***Structural Change in Research Institutions: Enhancing excellence, gender equality and efficiency in research and innovation*** reflects the mandate for the Group which required a) Problem analysis, b) Defining the objectives, c) Examining options and impact, d) Planning of future work. Therefore, Chapter 1 sets the scene for the issue of structural change and describes the objectives. Chapter 2 details the problems

faced by universities and research institutions due to their institutional practices. Chapter 3 brings to the fore the essential elements of structural change: knowing the institution, securing top-level support and generating effective management practices. Solutions to the problems described in Chapter 2 are detailed in Chapter 4. The Group's recommendations form the Annex of the Report – expressed as a gender equality strategy, with key steps for actors at the EU, national and institutional level.

The Expert Group on Structural Change consisted of 8 members:

Ines Sanchez de Madariaga (*Chair*) is Director of the Women and Science Unit, Cabinet of the Spanish Minister of Science and Innovation, and Professor of city planning at the Madrid School of Architecture. Ex-Fulbright grantee, she has been Visiting Scholar at Columbia University, NY, the London School of Economics and Political Science, and the School of Architecture Bauhaus-Weimar.

Tiiu Raudma (*Rapporteur*) works for the Estonian Ministry of Education and Research. She was Estonia's first representative in the European Commission's Helsinki Group on Women in Science, and rapporteur for the Commission's report *Mapping the Maze: Getting more women to the top in research*. As seconded national expert to

the Commission, she co-authored the report *Stocktaking 10 Years of Women in Science Policy by the European Commission 1999-2009*.

Thomas Eichenberger is head of the Office for Faculty Affairs at ETH Zurich. His expertise lies in the area of faculty hiring on an international scale, dual career aspects, mobility of researchers and their families and the career development of young researchers.

Alice Hogan brings expertise and experience on transforming academic institutions to advance excellence through greater participation of women. As a Program Director at the U.S. National Science Foundation, she chaired the design and the implementation committees charged with created new approaches to enhancing the advancement and full participation of women in academic science. She served as the first Program Director of the ADVANCE Program, and now serves as a consultant to universities seeking institutional transformation.

Elizabeth Pollitzer was a lecturer and researcher in the area of Human Computer Interaction. She is director of Portia Ltd, a not-for-profit organization promoting the role of women in STEM through a range of multi-stakeholder projects and support actions linking scientists, policy makers, gender research experts and other relevant actors.

Teresa Rees is Director for Wales of the Leadership Foundation for Higher Education and a Professor in the School of Social Sciences, Cardiff University. She is a long term expert adviser to the European Commission on gender mainstreaming and women and science. She was made a Commander of the order of the British Empire for services to higher education and equal opportunities.

Martina Schraudner studied Biology and Biotechnology at the Technical University of Munich. Since 2001 she has led projects in strategic research planning at the Fraunhofer headquarters, and since 2008 she is also Professor of Gender and Diversity in Organisations at the Institute for Machine Tools and Factory Management at the Technical University of Berlin.

Sophie Sergent is a specialist in labour and employment law and has worked for over 15 years in the Human Resources Department at Ifremer, the French Research Institute for the exploitation of the Sea. As deputy director, in charge of researcher/ engineer career development, she initiated the Institute's commitment to a voluntary approach towards professional equality between men and women (formalized agreement). Currently in the Department for European Affairs, she is a member of the "Parity" Network under the supervision of the French Ministry of Research.

Chapter 1:

Setting the scene and the objectives

1.1 Why Europe needs more women in science and technology

In the European Union, while men's and women's access to science in schools and universities has improved immeasurably, the same cannot be said for women's access to scientific careers. Women account today for almost 60% of university degrees in Europe, and they achieve excellent grades, better on average than their male counterparts. However, their presence at the top of scientific and academic careers is scarce. Only 18% of full professors in Europe are women; 13% of heads of higher education institutions and 22% of board members in research decision-making.¹ Women's skills, knowledge and qualifications are grossly underused in the labour market.

The low numbers of women in decision making positions throughout the science and technology system is a waste of talent that European economies cannot afford. Nor can Europe afford to waste the professional contributions of so many of its best-prepared citizens, particularly in the present context of the global economic recession and the emerging global competitors in Asia and Latin America. The Grand Challenges facing Europe (including climate change and demography) require the full participation of women in its science and technology system if it wants to develop suitable solutions for all its citizens and does not want to continue losing ground in the new economic world order.

The global recession has focused attention on the ingredients required for robust sustainable economies. It is widely acknowledged that research and innovation (R&I) are the main drivers of a prosperous economy. In today's global R&I market place, Europe has to compete with other regions where highly educated talent pools and markets for innovation exist, such as Singapore, China, India, Latin America, South Korea and the US. Many corporations are undertaking organizational change of their science and technology systems to adapt to these new conditions and have already established a presence in these regions in order to move their research and technology work closer to where scientific talent and market opportunities lie.

In this context, Europe needs to get the best out of its R&I systems and there is an urgent need to advance on gender equality in science. The mainstreaming of gender in the scientific system and in the R&I marketplace offers an important competitive advantage for strengthening the scientific endeavour through more effective deployment of the female human capital; creating new markets that

recognize the importance of gender; and increasing the international competitiveness of Europe's research workforce in general.²

Promoting gender equality will also allow industry to benefit from a wider talent pool of human resources. It assists in the development of new economic opportunities by widening the experiences and expertise brought to creating innovation and to identifying and understanding new markets³. More women among scientific decision makers would enhance the robustness of the decisions made due to an increase in the diversity of viewpoints⁴. Diversity also plays a role in producing goods and services informed by a broad and in-depth knowledge of the society for which they are prepared. This is already acknowledged not just in the US, but by many leading European and international R&I companies who have focused attention on ensuring that they recruit, retain and promote the best talent. Diversity of knowledge and social capital in teams is vital to produce new ideas⁵.

It is also an issue of real excellence in research. A better integration of the gender perspective in research alongside a better inclusion of women in the R&I workforce will improve the quality, objectivity and relevance of knowledge, technology and innovation for the benefit of all members of society. Through a better consideration of the sex and gender variables throughout the research process, it will reduce bias and identify gaps and missed opportunities. A system which does not provide equal possibilities for professional development to men and women is not getting the best value from the available talent. As a result it cannot produce the best results.

The full participation of women in science and technology will also contribute to social progress. Ensuring effective equality of opportunities between men and women in science and technology is obviously an issue of justice. Equality between men and women is one of the European Union's founding principles. Research findings consistently demonstrate that those countries which score highly on equality indicators are those which are more successful in wellbeing, social cohesion and integration. The costs of inequality include unemployment, crime, and poor health⁶.

1.2 Progress so far in legislation, participation and policy

Since 1957 and the Treaty of Rome, the principle of equality between women and men has formed an essential part of European Union's political, social and economic development. The principle of equal pay for equal work is also part of the Treaty of Rome. The Treaty

of Amsterdam includes the provision of eliminating inequalities and promoting equality between women and men into all its activities⁷ (also known as ‘gender mainstreaming’). Legislation has been developed to ensure equal opportunities and treatment for women and men on the fields of employment, working conditions and social security. In Europe, there has been significant progress in equal opportunities in the field of education – 58% of university graduates and 45% of PhD graduates are women⁸. European women’s increased intellectual and social capital, and higher career aspirations, would provide an important competitive advantage in international markets for innovation and technology.

The Commission’s commitment to gender equality was further confirmed in its *Strategy for Equality between women and men 2010–2015*⁹, which includes amongst its priority areas equal economic independence for women and men, equal pay for work of equal value and equality in decision-making. In 2010, the EU Competitiveness Council stressed the need to step up support to structural change for the modernization of universities and research institutions, and to integrate gender issues into research as a resource to create new knowledge and stimulate innovation¹⁰.

Current understanding of the role of gender in science has evolved over time from the early and oppositional associations of ‘gender’ with women and men to gender as an organizing principle for both institutions and scientific disciplines, then further to gender as biological and social factors affecting research itself. Under the leadership of the European Commission’s DG Research (marked by the publication in 2001 of the ETAN report¹¹), around 20 key reports have been produced over the last 10 years in support of gender equality policies¹².

Sufficient research evidence and expertise is now available across Europe to address many of the adverse effects of the gender imbalance problem in order to enhance excellence of scientific knowledge making and procedures related to scientific institutions. There is also evidence indicating that integrating a gender perspective in research can improve its relevance and quality.¹³

Many projects have been designed to increase interest among women and girls in specific fields of science, technology, engineering and mathematics (STEM)¹⁴. Over the years, the EU has funded numerous projects in the field of women in science, and, in particular, and more recently, concerning structural change¹⁵ (e.g. genSET on gender action plans in science¹⁶, and GENDERA on best practices¹⁷). Many universities and research institutions

have sought to address the lack of women in their science departments, as students and as staff. There are significant variations in the extent to which the relative lack of women in some STEM subjects and in senior positions in the academy is recognised as a problem in different countries¹⁸. There are differences too in how successful initiatives designed to address the issue have been. It is not always equality policies that have the most effect; more transparency in hiring can make a difference.

Despite growing recognition of the gender imbalance in science, and the development of various projects and policies in Member States and their universities and research institutions, progress has been slow. The organization of R&I in Europe still relies on male and female stereotypes to the disadvantage of science, technology and the economy.¹⁹ In addition, the lack of role models of women in senior positions has had a negative impact on high-level aspirations of other women. The outcome is a waste of talent, missed opportunities for scientific advancement and innovation, and a lack of clarity of what is meant by scientific excellence.²⁰

Gender mainstreaming has been one of the major strategies adopted by the European Union and the Member States for achieving gender equality (and as a social policy strategy it is considered a success). However, in science it is a more recent strategy that has not yet been embraced widely in universities or research institutions. Consequently, in relation to the problem of the under-representation and under-promotion of women in science, it has not produced the hoped-for results.

Similar problems to those existing in Europe have been identified in the US, where the National Science Foundation (NSF) has invested substantially in the ADVANCE Programme²¹ in supporting universities to undertake institutional transformation to enhance the participation of women in science. Sex disaggregated statistics on the hiring of faculty, the size of their pay cheques, and even the size of their laboratories have demonstrated that gender is a key organizing principle in academia. Investment in this process through the ADVANCE Programme reflects the value NSF attaches to addressing structural issues at US universities.

1.3 Engaging research institutions in structural change

‘Structural change’ in universities and research institutions means making them more gender-aware, thereby modernising their organizational culture. This has important implications for equal opportunities, full use of

talent, appeal of scientific careers, and quality of scientific research.²² It implies systemic, integrated, long term approaches rather than piecemeal short term measures.

Following on from the 10th anniversary of the launching of its gender policies in science (the Women and Science Unit in DG Research and the Helsinki Group²³ were created in 1999), the European Commission continues to promote the structural transformation of science institutions in order to become a world leader in science and technology. To this end, and following the explicit call for the reinforcement of the 'structural change programme' by the EU Council²⁴, the European Commission is reflecting upon a recommendation to the EU Member States. This is also in tune with the recent agreement on women in science, engineering and technology (SET) adopted by the UN in March 2011 that referred to 'mainstreaming a gender perspective into science, technology and innovation policies and programmes'.²⁵

There is scope for the European Commission and the Member States to step up their commitment to gender equality in research institutions. By enhancing its policy initiatives, and investing in a well funded programme like ADVANCE in the new European Framework Programme for research and innovation (Horizon 2020), the EU has the chance to capitalize on the investments made over the last twelve years²⁶, and to become a world leader in R&I.

Promoting organizational and cultural change implies that the academic administration of universities, research institutions and funding bodies remove obstacles to women's professional careers. Action at institutional level is required to ensure a greater presence of women in science and technology, particularly at the top of scientific careers. This can only be achieved in the framework of strengthened EU and national government policies and investments on gender equality, effectiveness of equality legislations throughout Europe, as well as incentives for cultural changes. Greater gender equality in science will ultimately also help the EU to compete on an equal footing with world economic powers.

1.4 Cost of no action

There are four consequences that are of concern:

- 1) Danger of flawed research or diminished relevance of results
- 2) Missing innovation and market opportunities
- 3) Unfulfilled use of human capital (women scientists) in a competitive global R&I economy

- 4) Increased societal distrust of, and reduced support for, science and its institutions

The core of the EU strategy for economic and social development is innovation in research and in taking ideas to markets. The Grand Challenges of the EU 2020 Strategy (i.e. energy, climate change, aging, health) have a strong gender dimension, which, if ignored, can result in missed opportunities for innovation in research and in development of markets. Not including gender perspectives in addressing the core EU2020 themes means that chances for increasing the broad acceptance of new technologies within Europe will be lost. Without strengthening the inclusion of women and integrating the gender dimension within the Innovation Union, its aims to deliver higher levels of employment, productivity and social cohesion, and to strengthen Europe's knowledge base, are simply not achievable.

Securing the supply of scientific expertise in Europe is a challenge for the European Research Area. Current practices – such as neglecting the development of transferable skills of European R&I human resources capacity or not fully utilizing the trained talent already available (in particular, women) – are not sustainable in the longer term, and will threaten European competitiveness internationally. Inaction will lead to a loss of highly educated and trained women scientists who may choose other careers or move to other global regions²⁷. It will also force an even greater rate of transfer of industrial R&I functions from Europe to regions where there are ready-made markets and talent pools.

There is research evidence that shows how the integration of gender analysis in research processes can lead to innovation²⁸. Ignoring how sex and gender bias limit creativity and diminish excellence in research will create barriers to the full realization of the benefits that society expects from its investment in science and engineering.

The EU and Member States' aspirations for economic and societal development enabled through R&I can only be realized through novel research planning, design and implementation, where the gender perspective is an essential element. Sufficient examples and methods for the deployment of gender analysis in R&I are available. Not utilizing this knowledge will perpetuate gender biases in the practices and content of science, which have already been shown to impact negatively on scientific quality²⁹.



Endnotes

- ¹ She Figures 2009 http://ec.europa.eu/research/science-society/document_library/pdf_06/she_figures_2009_en.pdf
- ² A nation's competitiveness depends significantly on whether and how it educates and utilizes its female talent. That is, to give women the same rights, responsibilities and opportunities as men. *World Economic Forum: Global Gender Gap Report 2010*
- ³ Women now drive the world economy.' ... women represent a growth market bigger than China and India combined—more than twice as big, in fact. Given those numbers, it would be foolish to ignore or underestimate the female consumer. And yet many companies do just that, even ones that are confident they have a winning strategy when it comes to women. Michael J. Silverstein and Kate Sayer, *The Female Economy*, Harvard Business Review, September 2009
- ⁴ NY Times: Why we need women in science: <http://www.nytimes.com/2010/03/06/world/europe/06iht-ffscience.html?pagewanted=all> 5 March 2010
- ⁵ <http://www.genderinscience.org.uk/consensus.report.html>
- ⁶ Wilson, R and Pickett, K (2009) *The Spirit Level: Why more equal societies almost always do better* London: Penguin
- ⁷ Article 8, Treaty on the Functioning of the European Union
- ⁸ She Figures 2009 – the statistical reference year is 2006
- ⁹ COM(2010)491
- ¹⁰ 3016th EU Council (Competitiveness) meeting - "Conclusions concerning various issues related to the development of the European Research Area", 26 May 2010
- ¹¹ Promoting Excellence through Mainstreaming Gender Equality: ftp://ftp.cordis.europa.eu/pub/improving/docs/g_wo_etan_en_200101.pdf
- ¹² summarised in *Stocktaking 10 years of "Women in Science" policy by the European Commission 1999-2009* http://ec.europa.eu/research/science-society/document_library/pdf_06/stocktaking-10-years-of-women-in-science-book_en.pdf
- ¹³ Gender and Excellence in the Making, 2004 http://ec.europa.eu/research/science-society/pdf/bias_brochure_final_en.pdf
See also *The Gender Challenge in Research Funding* http://ec.europa.eu/research/science-society/pdf/bias_brochure_final_en.pdf
- ¹⁴ STEM is seen as a major driver of innovation
- ¹⁵ <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1284&clang=1>
- ¹⁶ See Box 4.2
- ¹⁷ <http://www.gendera.eu/>
- ¹⁸ E.g. German concern: *Looking at the numbers of students in electrical engineering, the proportion of women is 11 % and in mechanical engineering it is 18 % ... we will only be able to win more women for these professions, and for our industry, if we help them reconcile family and work.*" Gabriele Sons, Director General Gesamtmetall (umbrella association of regional employers' associations in the German metal and electrical industries)
- ¹⁹ Report by the European Commission's High Level Group on Human Resources in Science and Technology: "Europe simply cannot reach the level of SET resources needed for its development without finding ways to remove its anachronistic science gender imbalance." http://ec.europa.eu/research/conferences/2004/sciprof/pdf/final_en.pdf Europe

- needs more scientists! conference, Brussels, 2 April 2004
- ²⁰ Responses to the question “*What actions should be taken at EU level to further strengthen the role of women in science and innovation?*” in the European Commission’s Green Paper - From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation funding’ emphasized the importance of the gender dimension in both the content and the processes in research (including the issue of gender balance).
http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=documents
- ²¹ see also Box 4.1
- ²² <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&tid=1281>
- ²³ Group of national representatives formed by the European Commission in 1999 in order to place the women and science debate on a policy footing http://ec.europa.eu/research/science-society/document_library/pdf_06/gender-and-research-beyond-2009_en.pdf
- ²⁴ 3016th EU Council meeting - “Conclusions concerning various issues related to the development of the European Research Area”, 26 May 2010.
- ²⁵ United Nations E/CN.6/2011/L.6 Economic and Social Council
- ²⁶ Stocktaking Report: http://ec.europa.eu/research/science-society/document_library/pdf_06/stocktaking-10-years-of-women-in-science-book_en.pdf
- ²⁷ What can be done to stop women leaving science? *The high cost of being a woman*. *New Scientist*, 16 July 2011
- ²⁸ Recognizing sex differences: Common colon cancer screening methods detect only 30% of cancer cases in women. *Bridging the Gender Gap: Combined Technologies Offer Promise for Detecting Colon Cancer in Women*, *ScienceDaily* July 20, 2010, www.sciencedaily.com/releases/2010/07/100719163241.htm
- ²⁹ Editors of peer-reviewed journals can require analysis of sex and gender effects when selecting papers for publication. The US Journal of the National Cancer Institute does it as a matter of “commitment to sound, scientific research”: “where appropriate, clinical and epidemiological studies should be analysed to see if there is an effect of sex or any of the major ethnic groups. If there is no effect, it should be so stated in Results”
Women in Science and Medicine, The Lancet, Volume 377, Issue 9768, Page 811, 5 March 2011
 Simone Buitendijk, Daniela Corda, Anders Flodström, Anita Holdcroft, Jackie Hunter, Elizabeth Pollitzer, Teresa Rees, Curt Rice, Londa Schiebinger, Martina Schraudner, Karen Sjørup, Rolf Tarrach

Chapter 2:

Problems faced by research institutions

BOX 2.1

Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering

- Systematic structural constraints built into academic institutions have impeded the careers of women scientists and engineers.
- Well-planned, data-driven efforts to remove institutional constraints on women academics' careers can produce significant results
- Adequate data gathering, planning, implementation, and evaluation of changes require the dedication of sufficient resources to the objective of increasing diversity

Report by National Academy of Sciences (US), National Academy of Engineering (US), and Institute of Medicine (US) Committee

One major reason why progress has been so slow for gender equality in research, despite all the knowledge available on gender to inform policy and actions, is that many universities and research institutions lack the capacity and experience to analyze and transform the rich and often complex gender knowledge into specific gender management applicable to their structures and procedures.

Direct discrimination is relatively straightforward to recognize and address. However, indirect discrimination, which characterizes the policies and processes of many universities, research institutes and companies, is more difficult to identify and put right.¹ While many employers will acknowledge that there is a gender pay gap, few will imagine that they themselves are contributing to it. Collecting and analyzing data seems unnecessary if you are a 'good employer', not one intending to discriminate. The 'problem' is a lack of awareness of how systems and structures, policies, processes and procedures can be discriminatory, even where the employers have the very best of intentions on fairness and equality.

The consequence of this is that women are marginalised in decision-making about science. They do not play a significant role in deciding what research should be funded, how it is evaluated, how excellence should be defined, what use should be made of it, who should be rewarded, promoted, published or funded. There is, then, a democratic deficit in decision-making.

The problems faced by research institutions can therefore be summarised as:

- Opaqueness in decision-making processes
- Institutional practices inhibiting career opportunities
- Unconscious bias in assessing excellence
- Wasted opportunities and cognitive errors² in knowledge, technology and innovation
- Employment policies and practices

2.1 Opaqueness in decision-making processes

In universities, research institutions and granting agencies, the vast majority of crucial decision-making processes were established at a time when the presence and impact of women was limited at best. These processes have been evolving over the years, thus often slowly losing whatever rational and transparent regulatory basis they might have had when they were established. While some the decision-making processes may have been adapted according to gender mainstreaming principles, the majority of them remain in a state of an unsatisfactory lack of transparency.

This lack of transparency in systems creates myths and confusion. Evidence shows women are more likely to succeed in recruitment and promotion when there is clarity about what is required, information about the opportunities freely available and clear criteria used in decision-making. These approaches also benefit men, making clear how organizations function and what their values are.

BOX 2.2

Women less likely to be promoted to professor (Spain)

During this period a national system was in place (*habilitación nacional*) which provides a unique random natural experiment, with 35 000 candidates, 7000 evaluators in committees of seven, all fields of knowledge. The result of this study is that for every male member of a committee of seven, a woman candidate has 14% less chance of being promoted than a male candidate. In other words, with an all male committee, the probability for a woman candidate to become a full professor comes close to zero.

Spanish study on promotions to the highest rank of the academic ladder, full professorships (*cátedras*) for the period 2002-06, Natalia Zinovyeva, Fedea 2010

However, in many institutions both structures and processes lack the necessary clarity. With many committees or advisory bodies it remains unclear how they function or how they are constituted. Very often membership in such bodies is established through existing members bringing in acquaintances (co-optation). Vacancies are not known to a wider public, and there is insufficient information available on how interested persons could apply if there is an opening. 'Old boys' networks and patronage for allocating opportunities prevail.

Further, the service periods on such bodies and committees are not limited which prevents the influx of fresh ideas and new perspectives. Thus many bodies and committees represent strongholds of traditional values and out-dated concepts regarding the needs and the potential of today's research and education, and thereby tend to even lag behind the overall development of an institution. It is hardly surprising that such bodies and committees do not adequately include women or that their processes and decision-making mostly fail to be gender-sensitive.

While it is true that women are undoubtedly underrepresented in the governing boards of research and higher education institutions, this can be comparatively easily fixed with upcoming vacancies. The situation is much more impenetrable with committees and bodies that advise or prepare decisions for the institutions' governing boards, such as hiring, tenure and promotions committees, strategy boards, budget commissions or nomination committees for prizes, and boards of private foundations that distribute research funds – most likely without supervision from neutral instances.³

Very often institutions try to improve the situation by establishing detailed regulations. As in many other aspects, compliance is often unsatisfactory. Cultural factors will also have a much greater (negative) impact – such as the lack of awareness that the missing transparency and consistency of procedures and decision-making prevent women from having a fair chance to participate, as well as preventing institutions from fully profiting from the competence and creativity of their diverse workforce.

2.2 Institutional practices inhibiting career opportunities

The commitment to excellence and to objectivity that is a hallmark of academic life can make it particularly difficult for research institutions to recognize the ways in which standard practices may give advantage to some and disadvantage others. As demands increase on faculty and researchers, the amount of time available to pay careful

attention to effective recruitment practices or to mentoring junior colleagues or even to thorough review of evaluation materials for tenure and promotion decreases, leaving decision making subject to distortion by cognitive errors (see footnote 2) and bias.

Advances in research in the cognitive sciences reveal the difficulties of evaluating performance, suitability for leadership, and scientific merit objectively. From gender schemas to evaluation bias to stereotype threat, science makes clear that bias clouds judgment, often unconsciously. These tendencies are reflected in organizational practices and culture and inadvertently result in indirect discrimination. Using age bars on fellowships for example is likely to prevent more women than men from making applications because women are more likely to have had career breaks and therefore their chronological age is older than their 'academic' age. Institutionalised sexism does not necessarily mean that individuals are biased or discriminatory, but the outcome of the systems they operate may well be systematically biased.

The now well-established body of research findings demonstrates the manner in which largely unexamined errors in the way of assessing merit create inequitable outcomes for men and women. Research also demonstrates that despite good intentions and a commitment to fairness, both men and women are likely to undervalue women's accomplishments. This tendency is not surprisingly embedded in institutional processes such as recruitment, performance evaluation, and advancement.⁴

While the root causes of women's under-representation in science and technology fields are not yet widely understood, public opinion recognizes the disparate outcomes. A recent global survey by the Pew Research Centre found that 'The view that men get more opportunities than women for jobs that pay well, even when women are as qualified for the job, is widespread in most of the countries surveyed, particularly those that are wealthy or have recently experienced substantial economic growth'.⁵ There is evidence that these assumptions disadvantage women, and disadvantage institutions seeking to create and maintain a productive workplace.⁶ Turnover of faculty (staff), with its ensuing costs, and the institutional failure to capture a return on the investment made in new faculty, are always challenging, but even more so in economically constrained times. The success of academic scientists and engineers can be supported or inhibited by the culture of the academic department level. Administrative leaders such as department chairs are critical in setting the tone within the department,⁷ yet are rarely equipped with the additional professional development

and skills necessary to affect transformation within the department that can bring about positive change.

Without conscious transformation of organizational processes in academic and research settings results, outcomes will be as usual: fewer women, less diversity of experience and outlook, and failure to capture the benefits expected from the enhancement of the potential pool of researchers and innovators reflected in the increasing number of women with doctoral degrees.

2.3 Unconscious bias in assessing excellence

The word 'excellence' appears frequently in the context of science. It is taken for granted that individuals and institutions pursue 'excellence' in all their activities: recruitment, funding, publication, awards, professional and institutional advancement. Peer review systems are designed to ensure that only 'excellent' people and work are supported.

However, what characterizes excellence is generally not itself subjected to scientific evaluation. It is a socially constructed concept, and practices in operationalising the concept in each branch of science can be idiosyncratic. Critical analysis of the 'excellence' concept and of its correspondence with practice is missing. Instead, it is assumed that the scientist in each field somehow acquires from his or her environment a notion of what excellence is, and that their judgments remain objective. This underplays the impact of context (for example, a single-sex interviewing panel) and culture (e.g. implicitly accepted gender normative expectations, such as that a scientist must be 'single-minded' - a characteristic associated with males - rather than 'dedicated', which is perceived as a female attribute).

Being evaluated or evaluating others, the assessment of excellence is a continually repeated feature of a scientist's job. It shapes the scientist's career trajectory. With the persistently low levels of women in scientific leadership, it would seem that the practice of assessing excellence treats men's accomplishments differently to women's. A variety of opportunities make this possible. Gender bias can occur because excellence is often characterized in abstract terms. For instance researchers are expected to be 'innovative', 'productive', 'coherent'. It can also occur as a result of the criteria lacking in transparency or the kinds of indicators chosen and how they are prioritized, for instance giving weight to explicit indicators such as the number of papers/citations/patents produced, or implicit indicators such as uncommon career pathways (e.g. later start, career breaks). The evaluation criteria may be applied differently to women and men (by both women and men) or certain scientific fields may be preferred over others, for

BOX 2.3

Women scientists discriminated

A study published in 1997 in *Nature* by Wennerås and Wold entitled "Nepotism and sexism in peer-review", demonstrated that women had to have 2.4 more merits than men to achieve the same evaluation, equivalent to 20 articles in peer review journals, in calls of the Swedish Academy of Medicine. Publication of this study prompted the resignation of top decision makers in Sweden as well as the launching of Swedish gender policies in science.

BOX 2.4

The More, the Better? Inclusion of Women in Symphony Orchestras

What happens when members of one identity group enter an elite institution that historically has been dominated by another? The paper examines associations between the gender composition of professional symphony orchestras and several outcomes - the orchestra's functioning, the quality of the relationships among the members, and their motivation and satisfaction (all reported by the players). Outcome measures decline as women's representation increases until the proportion of women approaches 50%. Then, the downward trend flattens or reverses.

<http://www.mendeley.com/research/the-more-the-better-a-foundation-study-of-the-inclusion-of-women-in-symphony-orchestras/>

instance established, single disciplines over emerging cross-disciplinary areas (often favoured by women).

The lack of gender balance among excellence gatekeepers - in interviewing panels, editorial boards, among reviewers - can also differentially influence both the process and outcomes of assessment and selections of women and men. Gender-stereotyped expectations may affect not only how women's work is evaluated, but also what kinds of work women do, compared to similarly placed men. Teaching and professional activities are often undervalued, affecting women who frequently have a systematic overload of these activities as a result of their employment contracts.

Women may find their accomplishments attributed to 'luck' or the support of colleagues and mentors, while their failures are treated as the norm. Letters of recommendation

tend to be shorter for women, and they contain more 'grindstone' adjectives (e.g. 'hardworking') and fewer 'standout' adjectives (e.g. 'brilliant'), even when the applicants' accomplishments are similar.

Peer review is the principal mechanism for judging excellence in science. It is a gatekeeper of excellence and the final arbiter of what is valued in science. The method has been intensely criticized over the last ten years with regard to its reliability and validity, following a number of influential studies showing that men fared much better than women in the assessment process^{8,9}.

Despite the considerable literature, there is surprisingly little sound peer-review research examining the criteria or strategies for improving the process. Over the last ten years, both funding bodies and journal editorial boards have paid greater attention to the application and success rates of women and men. Progress has been made, but still there are significantly fewer grant applications from women than from men, and lower rates of publication submissions.

2.4 Wasted opportunities and cognitive errors in knowledge, technology and innovation

The goal the EU initiative *Innovation Union*¹⁰ is to ensure that innovative ideas can be turned into products and services that create growth and jobs, and tackle societal challenges. It is therefore imperative to find ways for a greater inclusion of the gender perspective in all processes and at all levels leading to productive innovations.

Research shows that gender biases, inequalities and imbalances within the established practices of scientific

BOX 2.5

Gaps in research

- Gender bias in research can be expensive
- Between 1997 and 2000, ten drugs were withdrawn from the United States market because of life-threatening health effects—four of these were more dangerous to women.
- Part of the problem is that preclinical research uses primarily male animals

Wald and Wu 2010; Zucker and Beery 2010; U.S. GAO-01-286R Drugs Withdrawn from Market, Presented to Congress by US General Accounting Office, 17 January 2001)

BOX 2.6

Women and heart disease

- Women are currently still underrepresented in research in many important areas of cardiology
- Men have predominantly systolic failure (pumping) whilst women have predominantly diastolic failure (distensibility).
- Women also have higher early myocardial infarction mortality, a fact that is partly linked to sex, but probably also gender-related.
- Another observation, most likely also connected to gender, is that women are more frequent donors and men recipients in heart transplantation even if women are sicker

Report on the conference organized by DG Research and Innovation, Health Directorate, Medical Research unit in partnership with the European Society of Cardiology, the European Association for the Study of Diabetes and the European Kidney Health Alliance, November 2010

institutions have important implications for the substance of science itself. For example, an underlying assumption of clinical trials conducted until the mid 1990s was that the treatment effects in women would be similar to those in men¹¹. This view has been successfully challenged in medicine, where the significance of gender is gradually starting to become more recognized. The issue is now being addressed and made part of research programmes in centres of scientific excellence across the world, including in university research centres (e.g. Columbia University, US; Karolinska Institute, Sweden; LMU Munich; University of Goettingen, Germany); new scientific societies (e.g. European Society of Gender Medicine, International Society for Gender Medicine); national scientific associations on Gender Medicine; scientific journals and large international Gender Medicine conferences (e.g. *Gender Medicine*).

The implementation of the EU2020 strategy will require full participation of Europe's scientific and innovation talent. However, the practice of not recruiting and promoting women in numbers proportionate to their presence in the available pool of researchers means that the skills and experience of many highly qualified women are not being used. This can mean many opportunities are missed for innovations in research and the identification of new markets.

In the context of the EU2020 strategy, interdisciplinary research has been recommended as a solution to many

BOX 2.7

Gender aspect in transport research

- Public transport is designed to provide for the typically masculine pattern of mobility: commuting from homes to jobs. Public transportation is not designed for the chained, polygonally-shaped and shorter distance trips that women tend to do (resulting from their double workload as employees and family carers). Women, however, are the main users of public transportation.

The *mobility of care* is a new gender aware umbrella concept proposed by Sánchez de Madariaga, 2010, which allows for a better description and visibility of the typically feminine mobility related to care work.

BOX 2.8

Too few women involved in innovation

Greater awareness is needed of the role of gender as a dimension of competitive advantage in innovation and the application of research results:

- Gender equality has been missing from the submissions made to the European Patents Office
- The level of patent applications from women is around 8%, and Germany, which is the source of 50% of EPO's applications, has only 6% submitted by women.

Frietsch, Rainer, Inna Haller, Melanie Vrohings et al. 2008. Gender-specific patterns in patenting and publishing. Fraunhofer ISI Discussion paper Innovation Systems and Policy Analysis, No16.

of today's complex problems¹². With the much-increased participation of women in higher education in all Member States, interdisciplinary research may offer better use of the talent of female scientists in research and innovation, and in more effective translation of ideas to markets.

However, the lack of established interdisciplinary scientific journals, and education systems that are not geared towards producing multidisciplinary graduates and postgraduates, represent a serious career risk for women scientists taking on the interdisciplinary route. Using interdisciplinarity to attract women to science is only practical and ethical if it

BOX 2.9

PAIN

79% of animal studies published in Pain over the preceding 10 years included male subjects only, with a mere 8% of studies on females only, and another 4% explicitly designed to test for sex differences (the rest did not specify)

www.jpain.org

also promotes stable careers. Structural changes are needed because interdisciplinary research cannot be easily embedded within a scientific system that traditionally has been based on one-department, one-discipline structures, in most universities and in most research funding bodies, which tend to exclude women from key decision-making bodies.

Several examples show that the integration of sex and gender analysis increases the quality and excellence of scientific production and improves the acceptance of innovations on the market. Checklists and tools are available now to identify the relevance of sex and gender perspectives in a specific research theme and describe the methods for analysis.

In science, technology and innovation women are perceived by market stakeholders as less credible or less professional¹³. Eurobarometer studies on innovation readiness found for the 25 EU sample interviewed, 49% of Europeans were either 'anti-innovation' or 'reluctant' to embrace innovation and this segment consisted predominantly of women aged 40 years and older¹⁴. Such stereotyping overlooks the fact that women's share in controlling customer spending worldwide is growing rapidly, as more women participate in higher education and in employment: an economic opportunity recognised in series of studies¹⁵. To reach the aims of the EU 2020 agenda it is therefore necessary to find ways of involving more women in innovation processes.

2.5 Employment policy and practices

Thirty-five years after the first European Community directives on Equal opportunities and equal treatment in employment¹⁶, Member States still have a gender pay gap and statistics that demonstrate that gender continues to play a significant role in determining who gets what jobs¹⁷.

Even though employees in the research field are covered by the Directive on equal opportunities and equal treatment,

the European provisions pertaining directly to research, and more specifically to equality between women and men in research, are in the realm of 'soft law', restricted to recommendations, resolutions, action programmes and road maps. This leads to the conclusion that the EU Treaties' commitment on gender mainstreaming needs more effective legislation and better compliance in the Member States in order for the aspirations on gender equality in the EU to be fulfilled.

The research environment and scientific work continue to be organized in gendered ways that make it difficult for talented women to prosper in their research careers when they have to reconcile work and home responsibilities. In addition, women tend to develop careers later in life, and are more affected than men by inadequate maternity and paternity leave policies¹⁸. In Member States with very long qualification pathways (e.g. Germany), researchers getting their PhD are in their early thirties, and hold their first permanent position generally not before their early forties, which can cause serious problems for women who want to combine a scientific career with having a family.

Sexist behaviour still characterizes the cultures of some research teams, resulting in discouraging women, in particular, from remaining in the field of research. The concentrated power wielded by a professor, for example, is often seen as a problem.¹⁹

Whilst there has been a massive increase in women's participation in higher education across all Member States, this has not been matched by the provision of support structures²⁰ such as child-care services or emergence of flexible work schedules for working parents. Funding that enables women to reconcile their career aspirations and private life at crucial stages of their career path is needed (as graduate students, postdocs, and professors) to ensure that they and society benefit from the investment made in their education.

Discipline based research is essential. However, research has shown that in many institutions and fields of knowledge the guru/acolytes model of power relations appears to dominate, which can lead to the exclusion of new ideas. Interdisciplinary, challenge based research can be more open to team work and innovation.

Endnotes

- 1 Some barriers can be difficult to recognize: the way work is credited, how reputation is constructed and merit attributed (Mathew effect), and how the work of those below (mostly women) is used in the crediting; cases of subtle discrimination, hostile work environments and harassment. There is also persuasive empirical evidence that the collaborative research networks (and strategies) of men and women differ and impact on progress of their careers (special issue of the Interdisciplinary Science Reviews on Gender in Science, The Role of Gender in Team Collaboration and Performance, Julia B Bear and Anita Williams Woolley).
- 2 'cognitive error' or an error in thinking results in acting on only what is immediately visible
- 3 Bias in hiring women: In her article "Orchestrating impartiality" Professor of Harvard University Claudia Golding shows how American great philharmonic orchestras, where there were practically no women musicians before the 1970s – "women do not have talent for music", the argument went, started hiring women when auditions became blind and evaluators could not see the person who was playing the instrument. The number of women hired increased even more significantly when the floors were covered with carpets and women candidates could not be identified through the sound of their high heels.
- 4 See, for example, <http://maxweber.hunter.cuny.edu/psych/faculty/valian/docs/2005BeyondGender.pdf>
- 5 Men get more opportunities for high-paying jobs, says Germany (84%), France (80%), Japan (80%), South Korea (70%), UK (70%), US (68%), Spain (68%) <http://pewglobal.org/files/pdf/Pew-Global-Attitudes-2010-Gender-Report.pdf>
- 6 Polzer, J. T., Milton, L. P., & Swann, W. B. (2002). Capitalizing on diversity: Interpersonal congruence in small work groups. *Administrative Science Quarterly*, 47, 296-327.
- 7 Bensimon, E. M., Ward, K., & Sanders, K. (2000). *The department chair's role in developing new faculty into teachers and scholars*. Bolton, MA: Anker Publishing; Carroll, J. B., & Gmelch, W. H. (1994). Department chairs' perceptions of the relative importance of their duties. *Journal for Higher Education Management*, 10(1), 49-63; Lucas, Ann (1994). *Strengthening Department Leadership: A Team Building Guide for Department Leaders*. San Francisco: Jossey-Bass
- 8 Sexism and Nepotism in Peer-review, Christine Wennerås and Agnes Wold, *Nature* 387:341-343)
- 9 Searching for discrimination, Gannon, Frank et al. 2001, *EMBO Reports*, 21 (8) 655-657; Foschi, Martha (2004) 'Blocking the use of gender-based double standards for competence', in M. Brouns and E. Addis (eds) *Gender and excellence in the making* (EUR 21222 Report), ed., 51-5. Brussels: European Commission, Directorate-General for Research. House of Commons Science and Technology Committee, (2011) *Peer review in scientific publications*, Eighth Report of Session 2010-12 HC 856 London: The Stationery Office Madera, Juan M., Michelle R. Hebl, and Randi C. Martin. (2009) 'Gender and letters of recommendation for academia: Agentive and communal differences' *Journal of Applied Psychology* 94(6): 1591-9.
- Marsh, Herbert, Lutz Bornmann, Rüdiger Mutz, Hans-Dieter Daniel, and Alison O'Mara. (2009) 'Gender effects in peer review of grant proposals: A comprehensive meta-analysis comparing traditional and multi-level approaches. *Review of Educational Research* 79(3): 1290-326.
- Rees, T. (2011) 'The Gendered Construction of Scientific Excellence' *Interdisciplinary Science Reviews, Special Issue on Gender in Science*, Vol. 36, No. 2, pp. 133-45
- Trix, Frances, and Carolyn Psenka. (2003) 'Exploring the color of glass: Letters of recommendation for female and male medical faculty' *Discourse and Society* 14(2): 191-220
- 10 Flagship of EU Agenda 2020: Europe to drive innovation in products, services, business and social processes and models, especially at a time of public budget constraints, major demographic changes and increasing global competition. It also seeks to re-focus R&I so that it becomes more relevant to today's world.
- 11 Holdcroft, A., Snidvongs, S., & Berkley K.J., Incorporating gender and sex dimension in medical research, *Interdisciplinary Science Reviews* (36(2): 180-192
- 12 EURAB 04.009-FINAL
- 13 Evaluation on Policy: Promotion of Women Innovators and Entrepreneurship, EC DG Enterprise and Industry, 2008
- 14 Special Eurobarometer 236 "Population Innovation Readiness", 2005
- 15 Womenomics 3.0. The time is now, Goldman Sachs, October 2010, <http://www2.goldmansachs.com/ideas/demographic-change/womenomics-2011/right-column/womenomics3.pdf>)
- 16 Directives 75/117/EEC, 76/207/EEC – now replaced by Directive 2006/54/EC
- 17 She Figures 2009, p. 74: Analysis shows that the gender pay gap is the widest in those occupations that are most open to high-level female researchers. However, the gender pay gap is large everywhere, even more so in public enterprise. It also widens as the age of researchers increases. This illustrates the workings of a Glass Ceiling that women hit during their ascent in the academic hierarchy. It is important to highlight that there is no spontaneous reduction of the gender pay gap over time.
- 18 ETAN, 2000; EC, *Women and Science*, 2005; EC, *Women in Science & Technology*, 2006
- 19 A professor should not be allowed to have complete and total control over a student's research, future employment prospects, and overall career success. *Sexual harassment, misconduct, and the atmosphere of the laboratory: The legal and professional challenges faced by women physical science researchers at educational institutions*. Ellen Sekreta, Duke Journal of Gender Law and Policy, Spring 2006
- 20 Sjoberg, Ola. 2010. Ambivalent Attitudes, Contradictory Institutions: Ambivalence in Gender-Role Attitudes in Comparative Perspective. *International Journal of Comparative Sociology*. 5 (1-2), 33-57.

Chapter 3:

Essential elements of structural change

In order to overcome the barriers to effective practice that are created unwittingly within organizations over time, certain basic conditions must exist. There must be a statistical base, to provide accurate sex-disaggregated data which can be assessed. There must be a willingness at the top to open up discussion and to support the process of self-study. There must also be acknowledgement of the importance of the multifaceted role of department chairs and unit heads, who oversee the key processes of recruitment, retention, promotion and pay. Fortunately, establishing these basic conditions is quite feasible and ultimately beneficial to the organization in the long run.

3.1 Knowing the institution

The subtlety of indirect forms of gender discrimination means that institutions often fail to recognize what is happening. In the first instance, then, it is necessary to gather data. This can include statistical data on recruitment, retention and promotion and pay. Gender audit of committees, especially those making important decisions about the allocation of resources can reveal much about an institution. Getting to know one's own institutions can also include an analysis of documents, for example a gender count of photographs in prospectuses and in marketing materials and who appears in portraits of esteemed colleagues hanging on walls. It can include the views of women and men in the organization about whether they are working in a positive environment, free of harassment and bullying, where talent is encouraged and supported.

Statistics can be developed into equality indicators, which allow the measurement of change as policies are introduced. Progress needs to be measured and benchmarked against other institutions. It is essential that such data are published, and so available to students, staff and potential new recruits, funders and partners. Ideally, some of this data should be available in a published form at a national level for comparison.

New policies need to have a gender impact assessment to assess whether they will have an effect on men and women in different ways, and if so, whether they are justifiable. Such gender impact assessments are needed at both department and institution level.

Morale or climate surveys of staff are useful devices for establishing whether women (or men) in particular feel disadvantaged in some part of the institution. They can also highlight cultures of bullying and harassment that may need to be addressed.

The tools of gender mainstreaming, which include statistical analysis, developing equality indicators, gender

audits, gender proofing and gender impact assessments all require expertise. It is essential to ensure that there is sufficient expertise, from awareness-raising to training to hiring experts in order to conduct this work. Much of it is technical. Just as health and safety and doing the accounts require professional expertise, so does gender mainstreaming. 'Knowing the institution', from a gender perspective, is the first stage in bringing about cultural change.

3.2 Securing top-level support

Both the ADVANCE programme in the US and the Position Paper of the EU Helsinki Group on Women and Science have emphasized the importance of top-level support for gender policy in research institutions. They further stressed that gender policy should be formulated in a unit which is both closely as well as permanently related to the governing body of research and higher education institutions (university president/rector/vice-chancellor).

It is absolutely crucial that the persons in management a) are personally involved in the formulation of the institution's gender policy and b) fully support the introduction, sustainable effect and the monitoring of the gender policy. Only an observable full commitment of an institution's governing body will guarantee the long-lasting effect of a gender policy since this proximity to 'power' prevents a gender policy from becoming just another policy paper, guaranteeing that the policy is actually carried out, is continuously tested against 'reality' and adapted to changing needs and challenges by implementing new measures. In addition, the effects of the policy beyond an institution's walls should not be underestimated since the successful and visible positioning of a research or higher education institution as an attractive workplace for both men and women will strongly contribute to the institution's future development and competitiveness on an international level.

It is important that administrative units, such as those involved in faculty hiring, actively and visibly pursue gender policy measures. The gender policy unit heads should also have a title which fully expresses their proximity to the governing body, and they should preferably be chosen from amongst the faculty or be prominent leaders of research groups who continue their main activities in teaching and research on par with their peers. Therefore it goes without saying that adequate and permanent resources should be made available to them, both regarding staff who are experts in gender issues as well as a budget which will allow for activities both internally (mentoring programs, gender awareness courses, data gathering, monitoring, close interaction with other administrative units as well as the

teaching and research units) and externally (networking with similar units elsewhere, national and international workshops and congresses, media relations, wider public actions).

3.3 Generating effective management practices

Engaging and equipping leaders to understand the elements of a supportive climate for faculty and the process of organizational change that can improve and enhance academic climate can be a powerful tool for structural change, for the better.

Understanding how processes critical to recruitment and advancement may disadvantage women, from letters of recommendation to assessment of women in leadership roles is often catalytic, equipping men and women with an intellectual framework for thinking about how what had been assumed to be purely merit-based processes were affected by unconscious bias. Experience suggests that once faculty are introduced to the scholarship and data on the status of women in science and engineering, they understand how academic and research cultures perpetuate the status quo. Some may become champions for changing practices to encourage more equitable evaluation and greater opportunities for women.

Changing workplace culture is not a simple matter, and for individuals such as department chairs, having access to well-designed opportunities for professional development that equip them with management expertise on critical issues of human resource management, for example, can be very effective in creating greater transparency and accountability for outcomes that are fair for both men and women. Supporting the development of opportunities for peer-learning, particularly among department chairs, is often a welcome and effective approach.

The practical work of improving the outcomes of standard processes such as recruitment and advancement by mitigating the impact of evaluation bias is not easy to do in isolation. Each effort benefits from building on lessons learned, effective practices, and tools and strategies for addressing particular problems. Support provided to bring people engaged in this work together is critical, to allow the development of a community of practice that can synthesize knowledge and experience to engender the development of informed and effective management approaches.

Chapter 4:

Solutions: Bringing about structural change

BOX 4.1

ADVANCE Programme (Increasing the Participation and Advancement of Women in Academic Science and Engineering careers)

- National Science Foundation, USA
- 10 million USD per year for new projects, 2001 – present
- Goal to develop systemic approaches to increase the representation and advancement of women in academic science, technology, engineering and mathematics (STEM) careers, thereby contributing to the development of a more diverse science and engineering workforce
- Extensive resource base for structural change

<http://www.portal.advance.vt.edu>

The five problems facing research institutions that are described in Chapter 2 can be turned around into five solutions:

- Making decision-making transparent
- Removing unconscious bias from institutional practices
- Promoting excellence through diversity
- Improving research by integrating a gender perspective
- Modernising human resources management and the working environment

The underlying aim is to dismantle no longer justifiable gendered hierarchies and to establish more democracy in research and higher education institutions. The voices of the teams that are directly affected by the results of the procedures and hiring decisions should be taken into account in an adequate manner, by balancing the dignity and integrity of the individuals involved against the need for transparency and the confidentiality of information and (hiring) procedures.

Men and women will profit equally from these solutions in their quest for a successful, individually fulfilling career. At the same time, the procedures and the decision making will be both more efficient as well as focused on real and sustainable results instead of power play, maximized individual influence or the perseverance of long established (old boys) networks. Further it has been clearly shown that gender bias can be effectively reduced through a balanced representation of men and women in committees.

4.1 Making decision-making transparent

Invitations to join committees and boards could be extended to external female researchers and experts. Additional administrative support for committees and boards in general would not only reduce the workload of internal female experts, but would also lead to more professionalism and thereby transparency since the stability and consistency of procedures and decision making processes can be guaranteed to a higher degree.

Suggested measures:

a) Making in-house women more visible

All public relations activities from scientific institutions should be gender-proofed (represent women appropriately), while avoiding tokenism. This could be done by including women in all promotional campaigns for scientific careers, by leaders nominating women for prizes, and by recognizing women's achievements appropriately. Deciding what to highlight should be informed by data from gender-mainstreaming tools such as sex-disaggregated data, information on resource allocation by gender and other gender budgeting applications, achievement records, etc. Making women more visible allows for students and staff to see a number of possibilities in achievement and to choose from a variety of role models. Making women's work visible also encourages women already present in scientific institutions to reach higher positions.¹

b) Gender-balancing committees

Balancing the gender composition of committees improves the quality of committee work and symbolically changes institutional cultures.

A good representation of women is especially important in committees which set the research agenda, are involved in the shaping of the future of their institution by hiring new researchers and teachers, serve as tutors for Master's and PhD students or have a high visibility, such as: strategy committees of national science foundations, national academies, academic and research institutions or advisory boards of research and/or education ministries or the European Commission; hiring committees for faculty and research positions, but more especially also committees who make decisions and/or recommendations on leading research positions; tenure and promotion committees; PhD committees; committees for (re) designing curricula; review boards for research proposals, review boards of journals; prize committees; programme committees which decide on whom to invite as (key note) speakers.

BOX 4.2

EU project genSET (gender in SET)

- A panel of science leaders has developed 13 evidence-based recommendations for institutional action, to best take advantage of the benefits in recognizing the gender dimension in scientific research
- Compiled in cooperation with gender experts and institutional stakeholders, and based on extensive personal experience as members and leaders of scientific institutions
- Recognition that gender equality contributes to better science is fundamental to the genSET recommendations
- The genSET project was the subject of the editorial in *The Lancet* (5 March 2011) titled 'Promoting Women in Science and Medicine'

Recommendations:

1. Leaders need to 'buy into' the importance of the gender dimension in research
2. Scientists (and managers) should be trained in methods of sex and gender analysis
3. The use of methods for sex and gender analysis must be considered in all assessments
4. Research teams should be gender diverse
5. All committees, panels should be gender balanced
6. Diversity in leadership style should be encouraged
7. Women already in scientific institutions should be made more visible
8. Research quality rather than quantity should be assessed
9. Researchers with heavy committee burdens should be provided with additional support
10. Policies on e.g. working conditions should be reviewed
11. Special strategies developed to attract women to research positions
12. Explicit public targets to improve gender balance
13. Gender issues must be part of evaluations and strategies

http://www.genderinscience.org/downloads/genSET_Leaflet_with_recommendations.pdf

BOX 4.3

UK Athena-SWAN initiative: Charter for women in science

55 universities, research institutes have committed themselves to 'the advancement and promotion of the careers of women in science', disseminating and awarding good practice
<http://www.athenaswan.org.uk/html/athena-swan/about-the-charter/history/>

"In a letter to the Medical Schools Council on 29 July 2011, the Chief Medical Officer, Professor Dame Sally C Davies outlined her intention that all medical schools who wish to apply for NIHR Biomedical Research Centres and Units funding need to have achieved an Athena SWAN Charter for women in science Silver Award."

<http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=417209>

BOX 4.4

University of Tromsø (Norway)

- Board of Directors adopted the genSET recommendations in full as the guiding principles for their gender equality work in all faculties
- Focus on increasing the number of women professors (from current 23% to 30% by 2014)

http://www2.uit.no/ikbViewer/page/nyheter/artikkel?p_document_id=207829

However, persons with disproportionate committee and administrative duties should be provided with additional research and support staff or reduced teaching assignments to ensure that their research does not suffer.

c) Making nomination and election to committees and boards more transparent

Whenever possible vacancies should be made public in the community, and the conditions regarding applying for vacant positions should be commonly known. It is advisable that the terms for membership on committees and boards be limited to an appropriate duration in order to avoid stagnation. The working conditions of such committees

BOX 4.5

Good practice from ETH Zürich (Technical University)

- All hiring committees must include at least two women
- Hiring committees always include external experts
- In order to alleviate the administrative workload of ETH's female scientists, external female experts are also invited to join the committees

http://www.equal.ethz.ch/publications/Gendermonitoring/index_EN

BOX 4.6

Australian university assists women researchers back into research

The University of Queensland Postdoctoral Research Fellowships for Women have been developed in accordance with the University's research strategy to introduce special initiatives to advance women in research. The purpose of the Fellowships is to assist eligible women to re-establish their academic research careers following a career break or interruption.

<http://www.uq.edu.au/research/rid/fellowships-women>

and boards should be published and the criteria of how procedures are structured and how decisions are reached should be transparent and objective: there should be no doubts as to how and where decisions are reached. A regular review of processes and gender audits of such bodies ensures accountability and leads to increased transparency.

4.2 Removing unconscious bias from institutional practices

Institutional processes need to be examined periodically to ensure that they are producing the best outcomes for the organization. Research demonstrates that despite good intentions and a commitment to fairness, both men and women are likely to undervalue women's accomplishments. Therefore, reviews of organizational processes such as recruitment, performance evaluation, and advancement are likely to identify ways in which structural change would result in achieving organizational goals.²

The 2006 Communication from the European Commission '*Delivering on the Modernization Agenda for Universities: Education, Research and Innovation*' notes that professional management of human resources is necessary for universities to achieve important strategic priorities.³ Ensuring the highest quality faculty, the diversity of perspective necessary for robust discourse and innovation, and the availability of role models who encourage students to pursue science and engineering careers requires examination of how human resource management processes can address the cognitive errors (see footnote 35) built into standard operating procedures. There are substantial resources available to help with this effort, including past data, theory and innovative practices. Above all, accountability matters. Institutional processes must be transparent and that includes accountability at each level in order to mitigate

BOX 4.7

Swedish Research Council (Decision, 4 May 2010)

Goals for achieving gender equality at the Swedish Research Council

- Achieve and maintain equal gender distribution in evaluation panels
- Ensure that the percentages of female and male applicants for grants ... correspond to the percentages of women and men among the potential group of applicants for research grants
- Ensure that women and men have the same success rates and receive the same average size of grants, taking into account the nature of the research and the type of grant

BOX 4.8

Examine your own hidden biases: Implicit Project (Harvard University)

- Research shows that implicit stereotypes could influence gender equity in science and mathematics engagement and performance
- Study's results suggest that implicit stereotypes may also have a hand in ensuring that women and girls steer clear of science as opposed to their male peers

<http://projectimplicit.net/generalinfo.php>

BOX 4.9

Virginia Valian's Tutorials for Change

- Examines the moment-by-moment perceptions and judgments that disadvantage women
- The gender schemas that we all share result in our overrating men and underrating women in professional settings, only in small, barely visible ways: those small disparities accumulate...

<http://www.hunter.cuny.edu/gendertutorial/> (Gender Schemas and Science Careers)

BOX 4.10

Transforming the culture and climate (Virginia Polytechnic Institute, US)

- One department, as a group, defined its core values (including open communication and collaborative decision making, a focus on quality and achievement, and valuing diversity) to foster a more positive climate in the workplace.
- This approach cost very little (using an ADVANCE Institutional Transformation grant from the National Science Foundation) but had positive results, improving the overall climate and raising dormant cultural issues such as fairness, respect, and equity

<http://www.advance.vt.edu/> (VT's NSF ADVANCE activities)

http://www.advance.vt.edu/Climate_Compodium/Introduction.html (VT's Dept Climate Compendium)

the individual tendency toward gender bias.

Extensive resources are available to assist with this process through the tools generated by the US National Science Foundation's Advance programme (see Box 4.1). Suggested approaches include:

a) **Training** (up-skilling) the decision makers

Examples: professional development programmes (looking at evaluation bias and mitigating impact) for university administrators, including department chairs (University of Washington ADVANCE Department

BOX 4.11

Prizes (US): recognize effective mentoring/career development

- Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring
- AAAS Mentor Awards, honouring individuals who have demonstrated leadership to increase the participation of underrepresented groups in the science and engineering Ph.D. workforce. These groups include: women of all racial or ethnic groups; African American, Native American, and Hispanic men; and people with disabilities.

<http://www.whitehouse.gov/the-press-office/2011/01/21/president-honors-outstanding-science-math-engineering-mentors>
<http://www.aaas.org/aboutaaas/awards/mentor/>

BOX 4.12

Harvard Business Review: Impact of having more women on teams

- There's little correlation between a group's collective intelligence and the IQs of its individual members. But if a group includes more women, its collective intelligence rises.

<http://hbr.org/2011/06/defend-your-research-what-makes-a-team-smarter-more-women/ar/1>

Chair Programme); effective hiring practices training for search committees (STRIDE, University of Michigan: see Box 4.13); on-line training modules on gender equity that are required for reviewers and evaluators (Virginia Valian's Tutorials on Gender, see Box 4.9; Georgia Tech ADEPT programme⁴)

b) **Funding** comprehensive structural change efforts designed to create models for effective practice

c) **Rewarding** effective practices and providing recognition, such as awards for research institutions that demonstrate effective leadership on gender equity e.g. ATHENA.

d) Creating **accountability** measures such as periodic reporting on key indicators (e.g. ADVANCE toolkit on Virginia Tech ADVANCE portal), from institutions receiving Commission research support.

4.3 Promoting excellence through diversity

The European Commission's Green Paper⁵ highlighted the need to improve EU's R&I strategy for tackling societal challenges. Until now this strategy focused on promoting a thematic technology push, facilitated by bringing researchers from across Europe together in collaborative networks, primarily through the mechanisms of FP7, CIP and EIT⁶. Lessons from current approaches show that much greater flexibility, creativity and cross-disciplinary research will be needed in the future if Europe is to achieve sufficient capacity to tackle the challenges ahead, and achieve Horizon2020 goals. Within the complex array of capacity variables to shape the quality of the scientific system and the scientific knowledge production, gender equality and diversity represent a key and well understood – but much underutilized – tool to promote excellence and enable sustainable success. The key areas where impact can be made are:

a) Enhanced cognitive **creativity** and more effective **capacity** in collaborative working and problem-solving in research teams and project consortia

If there is any activity that requires creativity, surely it is R&I. Enhancing gender balance in research teams promotes creativity. Observations of how postdoc researchers work in labs show that women and men deploy different cognitive strategies when faced with unexpected findings. A connection between gender balance in a group and its creativity has been established through a number of studies. In a recent report, the London Business School (LBS) concludes that innovation is fed when we “actively construct teams with equal proportions of men and women”.⁷ One of the key concepts of innovation, for example, is the ability to construct experimental approaches to solving problems. The teams studied in the LBS report peaked in their experimental capacity exactly at the point of parity in gender distribution in the team. Analyses have revealed that the most important scientific innovations are increasingly produced through collaborating groups⁸ and that group intelligence is positively influenced by the presence of women in the group. “Teams containing more women demonstrated greater social sensitivity and in turn greater collective intelligence (capability of a collective to perform across a variety of domains) compared to teams containing fewer women”.⁹

b) Enhanced scientific **human capital** for knowledge production and utilization

Scientists do not exist in a social vacuum, they are members of institutions, participate in collaborative networks, engage

BOX 4.13

STRIDE (Science and Technology Recruiting to Improve Diversity and Excellence Committee) University of Michigan

There were a number of factors that inhibited the University's success at recruiting, largely a result of inattention and of ignorance about the effect of unconscious bias on the outcome of the process.

- Through a process of introducing senior faculty, both men and women, to the academic theory and data on evaluation bias and on aspects of academic climate that may feel unwelcoming or hostile, the University was able to engage a group of senior faculty in creating an approach to recruitment that resulted in wider pools of excellent candidates.
- Department chairs were able to request surveys of climate in their departments, and to get assistance addressing climate problems within the department.
- The university reports significant progress regarding recruitment of women in science and engineering fields, from 13% of all new hires to 28% (pre- and post-ADVANCE).
- The engagement and leadership of opinion leaders among the faculty, including senior and highly respected men, was reported as a critical element in the success of STRIDE.

in a discourse between science and society. Therefore the production of scientific knowledge is by definition social. It relies not only on cognitive skills but also many other skills of more social or political nature. Two consistent themes emerge in literature on group diversity – the importance of context in evaluating the effects of diversity on performance and the positive effects of gender diversity on group processes. Both of these themes are extremely relevant to scientific work. First, scientific research is conducted within teams of individuals with varying levels of expertise, in varying career phases, and with a variety of demographic differences such as gender, age, ethnicity and national origin, as well as different cultural backgrounds. How these teams are organized and managed will have an impact on the scientific and technical capacity of the individuals and institutions involved. One can argue that an investment in gender equality is an investment in better R&I because it improves conditions for research (e.g. through more effective management and leadership of resources) and

maximizes opportunities for gains in scientific and technical capital by tapping into the intellectual capital and social capital of women and men.

c) Improved scientific cultures (by diversifying the values of the participants in scientific discourse and diluting prevailing implicit stereotypes)

Changing implicit stereotypes is not just a matter of influencing intentions; it also requires consideration of the social realities that shape minds without intention through the influence of persisting cultural realities. Historically, scientific cultures have accepted gender imbalances and inequalities but research shows that in male-dominated professions there is an increased categorization of under-represented women, whereas in gender-balanced professions, negative stereotyping and categorization by gender are less likely to occur. Specifically, studies of occupations dominated by male or white employees, such as teams of engineers, team-gender-diversity had strong, negative effects on performance, whereas in gender-balanced occupations, team-gender-diversity had significantly positive effects¹⁰. Investment in gender equality will therefore help get rid of negative gender stereotypes.

4.4 Improving research by integrating a gender perspective

The challenge to ensure that innovative ideas can be turned into products and services that create growth and jobs, and tackle societal challenges, could be met by a greater inclusion of the gender perspective:

a) Developing, communicating and implementing standards for the incorporation of sex and gender analysis into basic and applied sciences

All applicants for EU R&I funding should be required to specify whether, and in what sense sex and gender are relevant in the objectives and methodology of their project. Research projects that fulfil this criterion should achieve a higher score for funding. Researchers can also achieve this score by demonstrating where sex or gender are not relevant to the work proposed in a particular project. It is important, however, that gender/sex issues are addressed and explained in the context of design, investigation and interpretation of results.

Articles proposing that the declaration of sex and gender analysis should become a requirement when selecting papers for publication have been published in *Nature* and

BOX 4.14

ERC (European Research Council)

ERC Scientific Council adopted a Gender Equality Plan 2007-2013, with the following included amongst the objectives:

- Raise awareness about ERC gender policy among potential applicants and improve gender balance among researchers submitting ERC proposals in all research fields
- Identify and challenge any potential gender bias in ERC evaluation procedure
- Achieve gender balance among ERC peer reviewers, and other decision making bodies (minimum 40% participation of the under-represented sex)

BOX 4.15

CERN

CERN Tripartite Employment Conditions Forum (TREF), 2010:

- Reaffirm the principles of non-discrimination and equality of treatment
- Strengthen diversity policy through management commitment, specific training, examination and adaption of all procedures, practices and composition of boards at all levels, and carry out awareness-raising
- Investigate factors responsible for the low number of women in top management, including the 'glass ceiling' effect and the 'leaky pipeline'
- Establish a career mentoring programme

"...Factors responsible for a low number of women in top management, the "glass ceiling" effect and the 'leaky pipe', should be investigated. Active support should be provided for example to establish a career mentoring programme and to participate in a European women's network. Participation in studies at the European level to strengthen the career chances for women scientists should be envisaged..."

Tripartite Employment Conditions Forum (TREF), 73rd Meeting, Geneva, May 2010

in *The Lancet*. Funding bodies, journal editors and agencies responsible for curricula accreditation should be responsible for incorporating these methods into their assessment procedures.

BOX 4.16

Spanish legislation

Aim: to promote the inclusion of gender as a cross-cutting category in science, technology and innovation, and as well to promote a balanced participation of women and men in all areas of Spanish Science and Technology

- Balanced gender composition of all bodies, councils and committees
- Gender relevance to be considered in all aspects of the research process, including the definition of the priorities of scientific and technological research, research problems, theoretical and explanatory frameworks, methods, collection and interpretation of data, findings, applications and technological developments, and proposals for future studies
- Promote gender and women studies, and as well as concrete measures to encourage and give recognition to the presence of women in research teams
- Information system to collect, process and disseminate gender-disaggregated data and include indicators of the presence and productivity of women researchers
- Research institutions and universities are required to adopt a gender equality plan
- CVs required to be blinded when possible
- Universities required to integrate gender into the curricula
- Universities required to create gender equality units

BOX 4.17

Research Council Norway

- Essential that gender perspectives are given adequate consideration in research projects where this is relevant
- Good research must take into account biological and social differences between women and men, and the gender dimension should be one of the main pillars of the development of new knowledge
- In research projects this dimension may be manifested through the research questions addressed, the theoretical approaches chosen, the methodology applied, and in the efforts to assess whether the research results will have different implications for women and men

BOX 4.18

Interdisciplinary Science Reviews

- Sex and gender analysis should be taught throughout the curriculum, including basic science, medicine, and engineering courses. It is important that research institutions support programmes in gender research where experts develop new knowledge concerning gender, science, medicine, and technology
- Yet at the same time, gender analysis must also be taught to future scientists and engineers. In this way, students in technical fields learn methods of sex and gender analysis continuously throughout their studies. Textbooks should be revised to integrate sex and gender results and methods

<http://www.isr-journal.org/> (v36(2), p164)

b) Integrating gender into the whole process of knowledge transfer, thereby introducing different perspectives for more innovation potential

Different perspectives are necessary in the decision making processes that bring research results to the market. Diversity management, which should be the main tool in a globalized economy, means that the whole spectrum of clients is mirrored within the decision processes. This is not yet the case in public funded research. A broader spectrum of perspectives can be reached by setting gender-balanced targets for all decision making bodies, especially for research agenda setting and knowledge transfer processes. Different perspectives, because of sex, gender, discipline, age, educational and working background need to be included in research

much more intensively in order to create greater innovation potential. In the perspective of a knowledge-based, but aging Europe, more flexible models of working in research should be possible and supported through relevant policy initiatives.

c) Supporting specific research on gender and women to feed into all disciplines and research subjects

To make use of the innovation opportunities in the growing “women’s market”, actions are needed to overcome the lack of knowledge about the needs and interests of this segment

of research users from a gender perspective. Establishing such understanding should be in place before starting research projects.

BOX 4.19

Gender Toolkit: Learning how to integrate gender in research

To further promote gender equality in research, the European Commission has developed a gender toolkit with training activities. These provide the research community with practical guidance on how to integrate gender into research:

- Help researchers to understand the “gender and science” issue and make them more sensitive towards the gender dimension of/in science
- Help researchers include the gender dimension throughout a research project
- Help to eliminate gender bias in research projects
- Show why it is important to create a gender-balanced research team
- Help make research results more relevant for society

http://www.yellowwindow.be/genderinresearch/downloads/YW2009_GenderToolKit_Module1.pdf

BOX 4.20

Gender audit at DFG (German Research Foundation)

This study provides information on the participation of women in the DFG's research funding activities, thereby ensuring transparency and openness “at a glance”.

Gender Equality in DFG Research Funding - Facts and Assessment

Selected findings from a study of the funding proposal submissions by female scientists, women's chances of receiving funding and the functions they perform in the Deutsche Forschungsgemeinschaft's statutory bodies

Jürgen Güdler, Anke Reinhardt, 1/2007, DFG infobrief

DFG's Research Oriented gender equality Standards: http://www.dfg.de/en/research_funding/principles_funding/equal_opportunities/research_oriented/index.html

Research should be funded to create specific knowledge on gender issues and women in the context of innovation, and research results transferred into all other disciplines and research subjects, as well as integrated into the funding process. New ways for the presentation of research results should be made available especially for small and medium sized enterprises.

4.5 Modernising human resources management and the working environment

Since EU law covers the field of employment, it should be possible on the EU level to take more substantial steps towards addressing the gender pay gap and the working conditions in research. Specifically in the area of research, however, EU competence is limited to funding programmes, coordinating national R&I activities (e.g. guidelines, monitoring, evaluation), and encouraging development in universities and research institutions (e.g. to adopt common standards).

Notwithstanding these limitations, cooperation between the EU and Member States should lead to the implementation of the following:

Pay gap: legislation should be adopted to carry out pay-gap audits in all research institutions, providing a precise definition of ‘pay gap’ as well as methods for implementation of the audit. European institutions and companies should be encouraged to greater transparency: publishing data would allow a comparative review by country, put pressure on companies and governments, and encourage the development of relevant solutions to eradicate the pay gap

Parental leave: legislation should be encouraged in Member States, with an assumption of the co-responsibility of mother and father in parenting. The European Parliament proposes a maternity leave of 20 weeks fully paid and a parental leave on the Swedish model that is better balanced between the mother and father, “which would transfer a part of the professional ‘risk’ caused by the maternity onto the men.”

Further measures for the **reconciliation of work and family life** include putting in place strategies for dual career couples. Although women have advanced in terms of participation in higher education and the labour market, this has not been matched by the provision of appropriate support structures¹¹ such as child-care services or the emergence of suitable flexible work schedules for working parents¹².

BOX 4.21

Ifremer (French research institute): Agreement with trade unions on gender equality

- Equal representation of men and women on all committees dealing with career patterns
- Creating committee to monitor implementation of agreement
- Compliance with gender proportionality in procedures: e.g. hiring, promotion, training, mobility
- Setting up measures on linkage between life balance and parenthood which should not hinder career progression: e.g. service vouchers for child care and help with school homework (2/3 paid by institution), flexibility in working hours

Annual Report 2008: <http://asp.zone-secure.net/v2/index.jsp?id=421/499/5889&startPage=64>

BOX 4.22

Stanford University training on harassment

- Compulsory online training course on harassment that all employees have to take every year
- The two-hour training is very effective, reaches everyone, ensures high quality and consistency, allows for flexibility
- Also because all employees are required to take the course every year, the institution is better protected in case of legal challenges

processes, identifying current successes and failures). The visibility of deployed efforts and their effects is important. The progress must subsequently be regularly monitored and be made public and visible (e.g. the Gender Equality Award in Norway).

Enabling **mobility**: The availability of scientific talent in the EU requires greater mobility of researchers, as well as greater movement between academia and industry. Actions contributing to women's mobility in the scientific system should include: wider availability of inter-sector mobility for both early stage and established researchers; gender sensitive advertising of vacancy positions and providing access to researchers' industry relevant expertise online; putting in place adequate evaluation criteria, and a fair and transparent career evaluation process; as well as gender aware, trained evaluators and researchers from both sectors in the evaluation committees.

By underlining the importance of gender equality and making it visible in both European policy and externally, the EU can become an example of best practice in R&I.

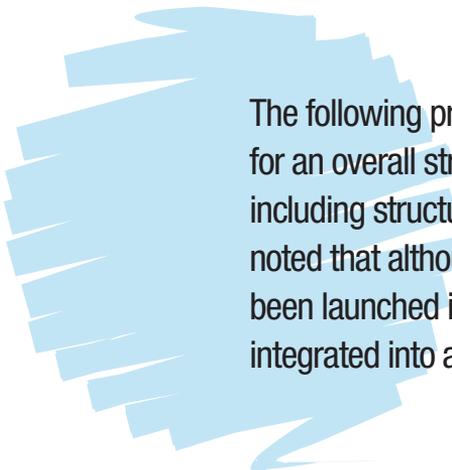
National action plans/strategies consider positive action measures to speed up the slow process in changing the societal structures of inequality. Experiences from Norway, Sweden, Belgium, Switzerland, etc demonstrate that it is possible to increase professional efficiency through equality – with a strong will and deliberate policies.

Monitoring: Systematic follow-up is essential. The role of 'observatories' or 'independent committees' should be strengthened since these provide recommendations regarding the mainstreaming of the gender equality efforts in research institutions. Gender issues must be an integral part of the internal and external evaluation of institutions (including a critical review of gender mainstreaming



Endnotes

- ¹ Women's choices of careers in science seem heavily influenced by role model relationships and both genders have been shown to benefit from identifying with successful examples in various fields (Bonetta, 2010; Carrell et al., 2009; Lubinski & Benbow, 2006). Because there are a variety of attitudes toward careers and work balance within gender groups, female role models are not always best matched to other females, thus they must be shown in a wider context of institutional success (Chen, 1998; Desrochers & Sargent, 2004).
- ² See, for example, <http://maxweber.hunter.cuny.edu/psych/faculty/valian/docs/2005BeyondGender.pdf>
- ³ See also *Inventing Equal Opportunity*, Frank Dobbin. Princeton, NJ: Princeton University Press, 2009
- ⁴ <http://www.adept.gatech.edu/activities.htm>
- ⁵ GREEN PAPER. From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation funding, Brussels, 9.2.2011, COM(2011) 48
- ⁶ FP7: 7th Framework Programme; CIP: Competitiveness and Innovation Framework Programme; EIT: European Institute of Innovation and Technology
- ⁷ London Business School. 2007. *Innovative Potential: Men and Women in Teams*. http://www.london.edu/assets/documents/facultyandresearch/Innovative_Potential_NOV_2007.pdf (21/3/2011)
- ⁸ Wuchty, S., B.F. Jones, B. Uzzi. 2007. The increasing dominance of teams in production of knowledge. *Science*, 316(5827) 1036-1039.
- ⁹ Massachusetts Institute of Technology. 2010. Collective intelligence: Number of women in group linked to effectiveness in solving difficult problems. *Science Daily* October 2. <http://www.sciencedaily.com/releases/2010/09/100930143339.htm> (21/3/2011)
- ¹⁰ Joshi, A., & Roh, H. (2009). The role of context in work team diversity research: A meta-analytic review. *Academy of Management Journal*, 52(3): 599-627
- ¹¹ Sjoberg, Ola. 2010. Ambivalent Attitudes, Contradictory Institutions: Ambivalence in Gender-Role Attitudes in Comparative Perspective. *International Journal of Comparative Sociology*. 5 (1-2), 33-57.
- ¹² Flexible working time arrangement and gender equality. 2009. EC KE-31-10-378



The following provides a comprehensive list of recommendations for an overall strategy for gender mainstreaming in research, including structural change in research institutions. It should be noted that although some of the initiatives listed have already been launched in some form, they nevertheless need to be integrated into a more consistent and inclusive strategy.

To the European Commission

1. **Attach gender requirements to all funding programmes:**
 - a) Set requirements for research organizations (at an early stage of the eligibility process), including:
 - adapted gender equality plans with clear targets
 - implementation of gender audits which include data published in the annual reports on pay gaps, and participation statistics
 - b) Ensure systematic integration of gender and sex analysis in all proposals (requiring that all applicants specify whether, and in what sense, sex and gender are relevant in the objectives and the methodology of their projects) – e.g. Norwegian Research Council, Spanish legislation
 - c) Ensure gender balance in research teams as a criterion for evaluation
 - d) Provide briefings to all evaluation panels on the evidence of bias occurring in the assessment and selection of people and work
2. **Create a well-funded, dedicated programme to promote the structural change in research institutions (on the model of the ADVANCE programme in the US)**
 - a) Funding to institutions implementing a programme for structural change
 - b) Support for cooperation between national gender and research focus centres
 - c) Fund specific research on women and gender
 - d) Fund exploratory actions, e.g. international cooperation with US organizations, including ADVANCE institutions
 - e) Fund up-skilling and train-the-trainers programmes
3. **Gender mainstream all EC activities in R&I (in order to become an example of good practice at the worldwide level)**
 - a) Gender-proof relevant EC policy documents
 - b) Introduce gender measures throughout
 - c) Ensure gender balance in committees, expert groups, high-ranking positions, speakers at important conferences, senior advisory committees
4. **Re-establish the Women and Gender Unit in the EC Research and Innovation Directorate-General, ensure that it has sufficient expertise, personnel, financial resources, stability, and create an advisory position on women and gender in the Cabinet**
5. **Create a well-funded, high-quality leadership development (up-skilling) programme, targeting officials, experts (with training to ensure there is in-house capacity to lead worldwide with this agenda)**
6. **Ensure that researcher mobility measures incorporate the gender dimension (e.g. taking into account dual careers, work-life balance issues)**

To European-wide organizations¹

1. Demonstrate leadership
 - a) show senior level commitment to gender equality
 - b) promote opportunities for new blood to circulate in institutions – e.g. transparency in criteria and appointment to committees and bodies, set time limits on membership of committees, promote gender balanced committees
2. Identify, publicize and promote gender equality best practices – e.g. create special programmes, promote specific initiatives
3. Establish an award for well performing institutions, as appropriate – e.g. Athena Swan (UK) (see Box 4.3)
4. Establish an award for best research which integrates a gender analysis in frontier research, as appropriate
5. For those with funding programs, attach gender analysis requirement to calls (see also recommendations for the European Commission)
6. Create a panel of experts, higher level group of high status men and women to advise, monitor gender in research

calls for research, and attach requirements to funding programmes

4. Create a dedicated programme to finance actions on women, gender and science (similar to ADVANCE, and structural change in EC) e.g. gender analysis, training, support to universities and research / funding organizations, fund gender programmes at Master's and PhD level
5. Ensure decision makers, evaluators, etc are trained in gender awareness and how to avoid gender bias in evaluations, and researchers are trained in gender analysis
6. Disseminate information on all the scholarship available (particularly on bias, stereotypes, diversity)
7. Ensure that all measures dealing with mobility within countries and in Europe properly consider gender differences

To gatekeepers of scientific excellence²

1. Gender in research (research projects that specify the relevance– or lack of relevance – of sex and gender should achieve a higher score for funding)

- a) include requirement in calls for inclusion of sex and gender analysis
- b) provide up-skilling, guidelines, examples³
- c) fund specific programmes on women and gender

2. Eradicate institutionalized bias (i.e. practices that favour one sex)

- a) carry out gender impact assessment including audits of procedures and practices to identify potential gender bias; identify and support mechanisms to eradicate bias
- b) make decision-making transparent – define criteria that are publicly available and actually implemented, publish the data online
- c) sign up to a set of good practices (e.g. genSET recommendations): re-advertising positions if there are no women in the applicant pool, assessing research quality rather than quantity

3. Address evaluation bias (improve peer review)

- a) carry out up-skilling (e.g. specific leadership training)
- b) provide guidelines, examples of good and bad practice, tutorials

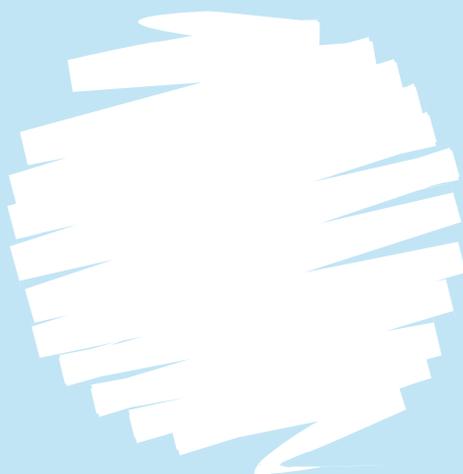
To Member States

1. Enact legislation requiring:
 - a) integration of gender dimension into university curricula
 - b) integration of sex and gender analysis in publicly funded research programmes, at all stages of research (refers to content of research)
 - c) universities and science institutions to:
 - adopt gender equality plans
 - create gender equality units
 - develop programmes to suppress bias and barriers to women's careers in science
 - d) public funding bodies to develop research programmes on women and gender
 - e) provisions for ensuring compliance with existing and new legislation
2. Create organizational structures on gender and science at the highest possible governmental level, with good resource of personnel, expertise, funding
3. Integrate gender requirements into all action plans and

- c) disseminate existing research on evaluation and organizational bias
- d) provide online training, and a certification process with basic minimum knowledge for evaluators and referees (e.g. Implicit project at Harvard University)

To universities and scientific institutions

1. Ensure gender dimension is integrated into the undergraduate and postgraduate curricula, across the university (particularly in engineering and science – e.g. Stanford University)
2. Adopt an Equality Plan, and include audit results (gender disaggregated statistics) in annual reports. These should include gender pay gap, staff statistics and senior committee membership
3. Sign up to and follow a set of good practices (e.g. genSET recommendations)
 - a) gender proofing of important policy documents
 - b) gender impact assessment of policies and practices
 - c) train staff on gender dimension in research and introduce regular staff assessment (e.g. see Box 4.4 on University of Tromsø)
 - d) mentoring, networking, role models
 - e) Code of Conduct for developing early researcher standards
 - f) set up gender equality unit (on a high hierarchical level); centre of expertise for women and science
 - g) gender balance in committees, and train men to understand the issue; leadership development in implementing gender awareness (e.g. see Box 4.13 on STRIDE)
 - h) work-life balance for both women and men
 - i) positive work environment: dignity for all, no harassment or bullying, ombudsman, training (e.g. see Box 4.22 on compulsory online training on harassment at Stanford University)
 - j) fair and transparent workload balance; ensure women are not allocated all the teaching and administrative work and taking care of students
 - k) fair recognition of work; ensure fair signature, giving credit where credit is due
 - l) mobility and contract funding conditions
 - m) at a minimum: data and indicators, carry out climate surveys in departments (diagnosis)
4. Provide up-skilling – for careers, and on the content of research



Endnotes

- ¹ European Research Council, European Institute of Innovation and Technology – EIIT, Joint Research Centre – JRC, European Patents Office, European Science Foundation, European Cooperation in Science and Technology – COST, European Molecular Biology Organization – EMBO, European Organizations for Heads of Research Councils – EUROHORCC, European Universities Association – EUA, European Association of Research Managers and Administrators – EARMA, European Industrial Research Management Association – EIRMA, European Association of Science Editors – EASE, League of European Research Universities – LERU
- ² research and innovation funding bodies, journal editorial boards, learned societies, scientific prize committees
- ³ Rees, T (2011) ‘The Gendered Construction of Scientific Excellence’ *Interdisciplinary Science Reviews, Special Issue on Gender in Science*, Vol. 36, No. 2, pp. 133–45

European Commission

EUR 24905 — Structural change in research institutions: Enhancing excellence, gender equality and efficiency in research and innovation

Luxembourg: Publications Office of the European Union

2012 — 45 pp. — 17.6 x 25.0 cm

ISBN 978-92-79-22394-5

doi 10.2777/37288

How to obtain EU publications

Free publications:

- via EU Bookshop (<http://bookshop.europa.eu>);
- at the European Commission's representations or delegations. You can obtain their contact details on the Internet (<http://ec.europa.eu>) or by sending a fax to +352 2929-42758.

Priced publications:

- via EU Bookshop (<http://bookshop.europa.eu>);

Priced subscriptions (e.g. annual series of the Official Journal of the European Union and reports of cases before the Court of Justice of the European Union):

- via one of the sales agents of the Publications Office of the European Union (http://publications.europa.eu/others/agents/index_en.htm).

The feminisation of the student population is one of the most striking aspects of the last 30 years. But women are still struggling to progress in their scientific careers. At the leadership level, women account for only 18% of full professors and 13% of heads of institutions in the higher education sector. Based on recent scientific findings and research practices, this expert report provides the analysis needed to take action, and points to good practices in those research institutions that succeed in attracting and promoting women in research and innovation.

Research & Innovation policy



Publications Office

ISBN 978-92-79-22394-5



9 789279 223945