Status and Prospects of Women in Science in Europe

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At the end of the 20th century, "it is wholly inexcusable that centers of modern academic teaching and excellence . . . should remain bastions of male power and privilege" (*1*). In Europe more effort is needed to identify and to appoint qualified women to top positions in universities, research institutes, and industry. In addition, programs are needed for a limited time at a lower level to increase the pool of qualified female scientists eligible for top positions. European Union (EU) money should be used to correct the gender imbalance in European science while maintaining the emphasis on excellence.

A North-South Divide?

Three rules govern the distribution of women in science. First, the number of women pursuing careers in scientific and technical disciplines is small in relation to the number trained in such disciplines. Second, there is a lateral distinction when individual disciplines are considered; proportionally more women are in biological sciences than in physics or engineering. Third, the higher one goes in any scientific hierarchy the lower is the percentage of women.

In many European countries, 40 to 50% of university students are female. In contrast, in some countries only 2 to 3% of full professors are female (*2*). In addition, the distribution of faculty by gender and rank (Table 1) suggests that there is a north-south divide. Surprisingly, the percentages of women at all levels seem smaller in the more economically developed northern European countries, with the exception of France, than in the southern European countries. In addition, in northern European countries such as England, Germany, and the Netherlands, the numbers have remained static for a decade or more, whereas in the United States the percentage of full professors who are female has increased by 60% in the last 10 years.

Appointment committees, particularly at prestigious institutions, are often all male. Few women are on the top national (*3*) and EU committees that set policy and control funds. Although representation on most EU committees is balanced by country and regional economic differences are often considered in distributing EU funds (for example, through the EU Structural and EU Social Funds), very little emphasis has been placed on gender balance. In 1992, IRDAC had no women and 24 men, and CODEST had one woman from Ireland and 26 men (*4*). On CREST all 24 members were men, but two deputy members were women, one from Spain and one from Portugal (*5*). Many EU advisory committees are all male, and almost all top jobs within the European Commission to do with science and technology are filled by men.

Detailed statistical information is necessary both to assess the status quo and also to monitor whether newly introduced initiatives meet their targets. Neither the Commission nor OECD, UNESCO, or Eurostat seem to have considered gender and professional or academic rank, at least in the context of scientific occupations. Numbers broken down by gender, rank, and scientific field are not available either for universities or for industry. It is difficult to obtain information on gender versus funding from national organizations, and the Commission does not collect information on gender when dispensing contracts. In contrast, in the United States the American Association of University Professors collects faculty and salary data by gender on an annual basis (*6*), and recipients of federal grants are required to supply gender information.

Interest at the National and European Levels

The current lack of opportunities for women in science in Europe has been emphasized in scientific journals (*7–9*), books (*10, 11*), and reports (*1, 12–14*). The government of the United Kingdom states that "women are the country's biggest single most undervalued and therefore underused human resource. The Government believes there is massive scope to attract more women into science and engineering. It has set up a working party to address this important issue . . ." (*12*). The government of Ireland has introduced "gender proofing" to eliminate "indirect discrimination against women and in particular women's exclusion (whether intentional or not) from many aspects of economic and social life" (*15*). Germany admits that "women are disproportionately affected by redundancy and short-term contracts in the restructuring of the scientific landscape in East Berlin" (*16*) and in 1991 instituted a special program to try to increase the number of women in academe (*14*). In many Eastern European countries, women scientists have been disproportionally affected by recent social and political changes.

The low level of representation of women in scientific and technical research in general, and in higher positions in particular, has become a concern of the European Commission and of the European Parliament. This concern is illustrated by the

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Table 1. Percentage of women within professional academic ranks for all disciplines combined. The percentages in southern European countries are higher than those in northern European countries (*33, 34*). Full, full professors; Assoc., associate professors; Asst., assistant professors; Ref., references. Percentages for other countries at the level of full professor include Norway (6% in 1987) (*8*), Australia (7% in 1992), and Canada (8%). France has a higher percentage of females at all levels than other northern European countries (*8*).

Country	Year	Full	Assoc.	Asst.	Ref.
	Northern Europe				
Ireland	1992	3	10	20	(*5*)
United Kingdom	1987–1988	3	6	14	(*10*)
	1980	3	8	19	(*10*)
Netherlands	1988	2.1	4.6	14.7	(*10*)
	1980	2.2	8.9	15.0	(*10*)
Federal Republic of Germany	1990	2.6	7.3	24.2	(*5*)
	1980	2.5	6.7	17.6	(*5*)
	Southern Europe				
Spain	1990	7.4	28.2		(*5*)
Portugal	1984–1985	8.2	26.5	36.2	(*5*)
Turkey	1989	20	23	27	(*11*)
United States	1992–1993	14.4	28.9	42.3	(*6*)
	1982–1993	9.1	19.7	33.5	(*6*)

1993 International Workshop on Women in Science sponsored by the Commission (*5*), as well as by hearings held by the Women's Committee and the Energy Committee of the European Parliament. This concern finds further expression in a series of resolutions from the Council, from the Commission, and from the European Parliament (*17*). All three bodies have endorsed positive action for changing the status of women in science.

The current challenge in Europe is how to translate these expressions of good intent into action. Policies on equal opportunity alone are unlikely to be sufficient (*18*) but nevertheless should be implemented. Thus, language used by scientific and technical organizations should be reviewed (*19*), as should statements or actions that reveal unfounded prejudice against women in science (*20*). Better instruction in institutional politics and in the intricacies of raising funds at the national and international levels would be useful, as would requiring a written equal opportunities statement as a part of all applications for national and EU programs. Policies emphasizing gender inclusiveness are also helpful (*21*).

Perhaps the best way to bring about change in Europe would be to discuss and set goals at the institutional, national, and EU levels to increase the participation of women in science and then to use positive action to achieve them (*22–24*). Positive action is a vehicle to be used for a limited time to change an unjustifiable imbalance without infringing on the rights of the existing majority, in this case male scientists. Its justification is that ". . . unless positive action is undertaken to overcome the effects of systemic institutional forms of exclusion and discrimination, a benign neutrality in employment practices will tend to perpetuate the status quo ante indefinitely" (*25*).

In the United States in the 1970s, progress for women in academe was dependent on three factors: a concerted protest by women themselves, appropriate legislation, and use of class action suits to enforce the legislation (*26*). By comparison, in Europe 20 years later women are only beginning to protest about unequal treatment, legislation if it exists lacks teeth and the funds to enforce it (*22*), and class action suits are for the most part not possible. Thus, even more than in the United States, improvement in the status of women in science in Europe will probably depend on pressure from those with power to initiate change. In addition, as in the United States, the press, women's groups in scientific societies, as well as more broadly based organizations (for example, EWISH) can play leading roles.

Possible Initiatives

Initiatives should be directed toward ensuring that women's contributions to science are judged by objective standards and that their access to resources is equivalent to that of their male counterparts at all career stages. In scientific disciplines, access to graduate students, facilities, and research funds are probably the most important factors in terms of productivity.

Current postdoctoral fellowship programs—including those offered by the EU—usually offer support for only 2 years, and this is not enough time to establish an independent reputation in a field, particularly for women who want children. There are not enough longer term positions available, and women may not always be fairly considered on their individual merits for those positions that exist. Thus, many women quit science at this critical stage without having had a chance to use their training. It is at this point that mentoring has a role to play and positive action should be used for a limited time to retain more women in science and thus to increase the pool of qualified women eligible for top-level positions. One possibility would be to finance starting scientist positions for well-qualified young women scientists to be awarded "ad personam" by an international committee (*23, 24*). These would pay an above-average salary, based however on the national scale, provide funds for a technician and students and some money for research, and could be held for 6 years at an institution of the recipient's choice. Contributions to child or dependent care could also be included. One hundred such positions (20 per year for the next 5 years) would cost 6 million European currency units (ECUs) per year for 10 years (*27*). This should be compared to the costs of current EU programs such as COMETT, LINGUA, or TEMPUS, which from 1990 to 1994 each consumed 40 to 50 million ECUs per year, to the 785 million ECUs reserved for the Fourth Activity of the Fourth Framework Program for 1994 to 1998, and to the 10,925 million ECUs for the total cost of this program over the same period (*28*) [see also (*5, 22, 24, 29*)] (1 ECU = $1.12, £0.75, or DM1.94).

At the higher levels, appointment committees have to be forced to consider formally whether there are female candidates who qualify, particularly if jobs are not openly advertised. Further measures might include not paying for scientific conferences unless women are included as speakers [compare with the current policy of the U.S. National Science Foundation biology directorate (*30*)] and requiring when there is a committee vacancy that both a male and a female are considered, leaving the committee free to choose the better candidate (*31*).

Recommendations

National governments and granting agencies, the European Commission, and the European Parliament should:

1) Ensure that qualified women are included on the top EU committees that set policy—that is, IRDAC, CODEST, and CREST—as well as on committees that allocate scientific and technical funds.

2) Collect, monitor, and publicize on a yearly basis statistical data from EU member states and from EU programs relevant to women in scientific and technical research.

3) Take the initiative in developing positive action programs for women in science. Possible initiatives have been discussed above. Longer term "ad personam" positions should be favored over shorter term fellowships.

4) Use EU Structural and Social Funds to increase the entry of women in scientific and technical fields and to train women in technical positions.

5) Encourage the Task Force for Human Resources (i) to fund EU-wide women's networks and (ii) to support women's studies in science and technology designed to study factors that affect science education and the tendency of girls to self-select out on scientific and technical subjects and that influence the entry and reentry of women in scientific and technical research.

6) Use future EU programs, as well as the Fourth Framework Program, to promote equal opportunities for women in scientific and technical research (*32*).

7) If sufficient progress cannot be made using persuasion and the measures suggested above, consider further legal measures or financial pressure to enforce the process. A very effective measure would be to require that all industrial firms and academic institutions set up and document programs to increase the representation of women in scientific and technical research at all levels as a condition for receiving EU funds.

These recommendations reflect the consensus reached at the 1993 EU international workshop on women in science (*5*). This meeting focused on the current lack of access to decision-making bodies, lack of access to top scientific and technical jobs, lack of access to research funds, and lack of access in terms of entry into scientific and technical research. Other problems, such as conscious or unconscious prejudice against women in scientific and technical research, inflexibility in career structures, and difficulty in finding child care, should not be underestimated [see (*5*)].

In conclusion, achieving equity for women in science is a problem that should

no longer be ignored either at the national or the EU levels. In one sense, it is a problem that some member states seem unable or unwilling to solve by themselves, yet one where pressure to improve the situation could be applied at the EU level given determination on the part of the European Parliament, the Commissioner for Research, and the head of the Directorate General for Science, Technology and Development (DGXII). The costs of training large numbers of women in science and technology at the undergraduate and Ph.D. levels, as well as in the wide variety of EU programs, are a poor investment if women are not encouraged to pursue professional careers in these fields. Alternatively, initiating measures to increase both the total number and the pool of female scientists eligible for top jobs would not only compensate for a possible decline in the number of male researchers by the year 2000 (*31*) but would increase the diversity of the scientific workforce and, most importantly, raise European competitiveness in science and technology.

REFERENCES AND NOTES

1. *Women at the Top* (The Hansard Society for Parliamentary Government, London, 1990).
2. The percentage of women who are full professors in the Federal Republic of Germany is less than the percentage of female students in 1910 [N. Wermuth, Bundesminister für Bildung und Wissenschaft **105**, (Bonn, 1992)].
3. For example, 0 out of 11 members of the Technology Foresight Steering Committee and 1 out of 11 members of the Council of Science and Technology recently announced by the Office of Science and Technology in the United Kingdom is female. Only 4 out of 116 members of the committee charged with reviewing and restructuring the universities in the former East Germany were female (Landeshochschulstrukturkommissionen) [*Frankfurt Rund.* (29 September 1992)].
4. Acronyms used: IRDAC, Industrial Research and Development Advisory Committee; CODEST, Committee for European Development of Science and Technology; CREST, Scientific and Technical Research Committee; OECD, Organization for Economic Cooperation and Development; UNESCO, United Nations Educational, Scientific and Cultural Organization; EWISH, European Women in Science and Humanities; COMETT, Community Action Program in Education and Training in Technology; LINGUA, EU program concerned with promoting skills in foreign languages; and TEMPUS, Trans European Mobility Scheme for University Students.
5. Women in Science International Workshop, 15 and 16 February 1993, H. A. Logue and L. M. Talapessy, Eds. (European Commission, Directorate General XII for Science, Research, and Development, Brussels, 1993), p. 146.
6. Annual Report on the Economic Status of the Profession, *Academe* **79**, 8 (1993).
7. *Lancet* **337**, 1007 (1991); D. E. Koshland Jr., *Science* **260**, 275 (1993); M. Holloway, *Sci. Am.* **269**, 68 (1993).
8. B. Healy, *Science* **255**, 1333 (1992).
9. Unsigned editorial, *Nature* **359**, 92 (1992).
10. S. S. Lie and V. O'Leary, Eds., *Storming the Tower* (Kogan Page, London, 1990).
11. V. Stolte-Heiskanen, Ed., *Women in Science* (Berg, Oxford, 1991).
12. *Realizing Our Potential* (*Cm 2250*, Her Majesty's Stationery Office, London, 1993). The working party will report in March 1994.
13. A. Sperling, *Report of the Women in Higher Education Research Project 1988–1990* (Kings College, Cambridge, 1990).
14. The Hochschulsonderprogram II in the former West Germany started in mid-1991 aims to distribute 700 million DM over 10 years to try to increase the number of women in universities and research institutes. In the first year, the percentage of recipients of Federal Republic of Germany habilitation stipends who were female increased fivefold. Thus far, the program has been more successful at the stipend level than at higher levels. See Bund-Länder Kommission **19** (1989), **34** (1992), and data in press, Bonn, or (*24*).
15. National Development Plan 1994 to 1999, submitted to EU Structural Funds.
16. Regional Development Plan 1994 to 1999, submitted to EU Social Funds.
17. See the Council Recommendation on the Promotion of Positive Action for Women (13 December 1984) and the Council Resolution of 21 May 1991. Also see the European Parliament Resolution on Women and Research (16 September 1988), which "calls on Member states to promote positive measures to further the presence of women at the highest levels in universities and research institutes." See also the Third Community Action Program for Equal Opportunities for Women and Men (6 November 1990), which stated that "the Commission will ensure more systematic use of positive action measures within the framework of the Council Recommendation of 13 December 1984 on the promotion of positive action for women and produce an updated report on Member States Actions." Finally, the resolution on the single market and its implications for women in the EU (25 January 1991) "calls on the Commission to present a directive on positive action and an action program to promote equal opportunities for women in employment and to promote positive measures in the field of employment" and "asks the Commission to take account of . . . the gender domain . . . in the production of statistics."
18. Compare the situation at Oxford University, where in spite of equal opportunity policies only 3 of 87 readers and professors appointed in the last 3 years have been female [Editorial, *Times* (London), 10 May 1993]. Although Harvard University has had an equal opportunities policy since 1970, the number of women on the faculty has not increased [*Nature* **363**, 288 (1993); *Report on Women in Science at Harvard*, part 1 (Harvard University, Cambridge, MA, 1991)].
19. For example, European Science Foundation, *Background Information on the Programme of the European Research Conferences* (1992) states that "the Chairman of each meeting has full responsibility for its scientific programme. A small organizing committee assists him."
20. For example, the winner of the Nobel Prize, cited by Parliament member M. van Hemeldonck in the European Parliament on 12 December 1993 as saying in an interview, "Women disturb the working group."
21. F. C. Kafatos, *EMBO J.* **12**, 257 (1993).
22. J. Mason, *Nature* **353**, 205 (1991).
23. M. Osborn, *ibid.* **360**, 101 (1992).
24. ———, in (*5*), p. 51.
25. 1972 Higher Education Guidelines, U.S. Department of Health, Education, and Welfare, as cited in (*26*).
26. M. K. Chamberlain, Ed., *Women in Academe: Progress and Prospects* (Russell Sage Foundation, New York, 1988).
27. This assumes an average grant of 100,000 ECUs per recipient per year.
28. Figures for EU programs are from *DGXII:EC Research Funding: A Guide for Applicants* (Office for Official EU Publications, Luxembourg, ed. 3, 1992), and, for the Fourth Framework Program, from the proposal dated 16 June 1993. (COM (93) 276). See (*32*).
29. Compare with the proposals for the 1993 white paper (*12*) from the UK Women in Science and Technology Committee, 8 January 1993.
30. B. Hogan, *Nature* **360**, 204 (1992).
31. Compare with the Bundesgremiumgesetz, a law proposed but not yet passed in the Federal Republic of Germany.
32. The Framework Program is the foundation of EU research and technology policy. It sets aims and priorities and outlines the budget for research over a 5-year period. The Fourth Framework proposal dated 16 June 1993 for the years 1994–1998 submitted to national governments and the European Parliament contained no reference to equal opportunities. However, the Council Common Position of 14 January 1994 now includes the statement that ". . . it is essential to ensure equal opportunities for male and female researchers" in the opening passage to the Fourth Activity relating to training and mobility in research. Alterations 102 and 104 of the European Parliament (18 December 1993), which recommend measures to support a stronger participation of women in the areas of science and technology, and not least on the advisory boards, will also be incorporated in modified form.
33. These figures show the current difficulties in comparing data on a European-wide basis. In the few cases where figures are available for individual scientific disciplines, great variation between individual disciplines is seen [for example, (*5, 22*)]. For comparative structures of university staffs in different countries, see Council of Europe documents DECS HE 91/20, 92/17, 92/18.
34. Women are more likely to have short-term contracts rather than institute positions; for example, in the United Kingdom in 1987 and 1988 women formed 32% of contract researchers but only 14% of lecturers (*29*).