WOMEN AND MATHEMATICS

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Introduction

The proportion of women among mathematicians varies considerably from one European country to another. In some countries, the proportion of women among students in mathematics is much higher than among professional mathematicians. The data in Table 1 gives some specifics on these points.

The aim of the round table was to analyse these facts. Of course, in a relatively short text such as this one, some choices had to be made. It appeared that in several European countries, women are seriously underrepresented among mathematicians. Therefore, special attention has been paid to these countries. This is done in some detail in the case of Germany (see Section 3). The next section, dealing with the everyday life of women in the mathematical community, is also mainly concerned with these countries. This is also the case in the final section, which contains some concrete propositions aimed at improving the situation.

Several groups of people played an important role in the preparation of the round table. First of all, the EMS committee on Women and Mathematics (see Section 5), whose work is partially reflected in this round table. The group “European Women in Mathematics” (EWM, see Section 6) was founded in 1986 and has already held 5 congresses. The present text owes very much to the women who are active in this group. Finally, the information in Table 1 could not have been obtained without the help of Mathematical Societies. This text is not only a report on the talks and discussions that took place during the round table, but it also tries to take into account the experience and reflection of the groups of people listed below.

Acknowledgments: I would like to thank the many colleagues who have helped by collecting statistical data, taking part in preliminary discussions, and giving information and ideas for this text. I also thank my colleagues of the Université de Franche-Comté for their interest and support, and Catherine Pagani for the excellent job she did typing this manuscript.

I thank The Commission of the European Communities, Equal Opportunities Unit of DG V, for the support they gave to this round table.

1. The Round Table: Women and Mathematics

Tuesday, July 7, 1992

Organising Committee: Michèle Audin (Strasbourg), Eva Bayer-Fluckiger (Besançon), Bodil Branner (Copenhagen), Capi Corrales (Madrid), Catherine Goldstein (Orsay), Annette Grabosch (Tübingen), Ragni Piene (Oslo), Marie-Françoise Roy (Rennes), Laura Tedeschini Lalli (Rome).
The Round Table consisted of 5 short talks (10–15 minutes each), and a general discussion. The following are abstracts of these talks, with some slight modifications, of those that were distributed during the Round Table.

**Moderator:** Capi Corrales, Universidad Complutense, Madrid (Spain).
International Coordinator of “European Women in Mathematics”.

**Speakers:**

- **Christine Bessenrodt,** Institut für Experimentelle Mathematik, Essen (Germany).
  National Coordinator of “European Women in Mathematics”, Germany.
- **Ina Kersten,** Universität Bielefeld (Germany).
  Member of the EMS-committee “Women and Mathematics”.
  Member of the Praesidium of the German Mathematical Society.

The German situation, compared with other European countries, is quite deplorable. Approximately one third of the students in mathematics are female, which appears not unreasonable. However, only 9% of dissertations and 7% of habitations are written by women, and only 2% of the professors in mathematics are female.

What are the reasons for this discrepancy? One reason might be that, with the absence of female professors, students would think that mathematics cannot be a field for women. There is still a lot of resentment towards intelligent women who think abstractly. In addition, it is difficult for a woman with children to work; school lasts only half a day and kindergartens are rare, particularly in West Germany. Other discouraging factors will be discussed later in the talk.

- **Laura Tedeschini Lalli,** Università “La Sapienza”, Rome (Italy).
  Member of the EMS-committee “Women and Mathematics”.

30% of the permanent faculty of Italian departments of mathematics are women. An even higher percentage have permanent positions in research institutions as mathematicians. Women in Italy feel free to choose mathematics as an elective field of study, a choice not extended to other scientific or technical fields. As a consequence, a lot of them end up “making it” to the upper academic level. This seems not to be the case in Northern Europe. Is this telling us something about mathematics, about Italy, about women? As we all know, it takes a great deal of verbal approximation before sensible variables are defined, and a model can start making sense of scattered numbers. “European Women in Mathematics” proudly undertook this lengthy task, and is drawing people together to name some of the ghosts that lurk behind personal choices and social figures. We think the ongoing work is of interest to all mathematicians.
Mary Gray, American University, Washington (U.S.A.).
First president of “Association for Women in Mathematics”.

American female mathematicians have had a rocky road to travel ever since Johns Hopkins University withheld a Ph.D from Christine Ladd for nearly fifty years. In the twenties and thirties women achieved a certain degree of security with positions in women’s colleges, but even the best had difficulty being accepted in research institutions — witness the fact that only Bryn Mawr welcomed Emmy Noether while her less distinguished colleagues went to more prestigious places. Women were accepted as temporary fill-ins during World War II, but were hustled out of math positions as they were from other traditional male occupations when the emergency was over. In 1964 the percentage of Ph.Ds in math going to women was at the same 6% as thirty years earlier. Since then the percentage has increased to 20% and, due largely to the efforts of the Association for Women in Mathematics, women are highly visible at nearly all conferences and in professional societies. However, only 4 in 303 of the tenured positions in the top ten math departments are filled by women; more depressing is the fact that only 1 of the 88 untenured junior faculty is a woman.

Barbara Roszkowska, Technical University of Warsaw (Poland).
Member of the EMS-committee “Women and Mathematics”.

The situation of women mathematicians in a country cannot be considered separately from the general situation in that country. There are two crucial differences between the situation of women in Eastern and Central European countries and most West European ones. The first is connected with the prosperity of a country and its lifestyle, the second with the general attitude of society towards working women. In the case of Poland, the economic crisis has made women’s lives more difficult. This has influenced the level of professional activities. On the other hand, since the last war, the majority of adult women in Poland have been working. This situation is now considered ordinary and normal by most people in Poland so that many women would not like to give up the possibility of developing their own talents and making their own professional career.

The next congress of “European Women in Mathematics” has already been held in Warsaw (Poland), June 4–7, 1993. It provided a good opportunity to discuss the general situation of women mathematicans in different countries (especially in Eastern and Central Europe). The program of the meeting included expository mathematical lectures, talks and discussions on the theme “creativity” (both in mathematics and other domains) and meetings were held with mathematics students in Warsaw.

Marie-Françoise Roy, Université de Rennes I (France).
First president of Femmes et Mathématiques.

Quantitative information about France can be found in Table 1. No progress
has occurred in the last 15 years regarding the presence of women. There was rapid progress in the 70s, then a regression in the 80s, followed by slow progress in the last years.

From a qualitative point of view, it is now possible to be a woman (a wife, a mother, a lover) and a researcher. In previous generations, women mathematicians had to be single. The presence of women is accepted in the mathematical community (collective responsibilities about teaching...). But there are not many women who have scientific power, as for example, on the committees of journals.

Mathematics may very well be a woman’s love. Mathematics may very well be a woman’s work. The reasons why women or men love mathematics may be partly different. Different approaches to mathematics must be allowed and encouraged. It is a good thing for the whole community to be more open to women.

There is no automatic continuous progress in the proportion of women in the math community or more generally in scientific studies. The underrepresentation of women is a global and complicated problem, very deeply rooted in family, education and the social organization of labour. There is a need for studies in various social sciences to better understand what goes on: sociology, psychology, history... The role of the educational system for reproducing (or changing) the gender roles inside society, the reality of coeducation appears now in our country as an important social issue.

Important sociologists like Baudelot and Establet have studied this problem; *Le Monde de l’Education*, the most important magazine about education in France has published a special issue. In the 60s and 70s, the importance of the educational system for the reproduction of the class structure of the society was discovered; in the 80s and hopefully in the 90s, the importance of the educational system for reproducing gender differences will begin to be understood.

The evolution of the mathematical community is part of this general social process. Internal efforts have to go on and contacts with social science researchers have to be encouraged.

These five talks were followed by a lively discussion. Most of the topics that were mentioned during the round table are developed in some detail in this article.

### 2. Statistical Data

The Committee on Women and Mathematics decided to make an inquiry into the number of women mathematicians in Europe. In February 1991, the committee wrote to all the Mathematical Societies of Europe requesting the following data:

1. **I. The number of mathematicians holding a permanent position in a mathematics department of a university or a research institution in the country in question.**
II. The number of full professors ("full professor" being the highest academic position).

III. The number of Ph.Ds delivered in 1990.

For each of the points I-III, the total number and then the number of women among them was asked.

IV. Percentage of women among the students in mathematics.

The results of this inquiry are represented in Table 1. Almost all the Mathematical Societies did send this data. In a few cases, for a variety of reasons, including lost mail or wrong addresses, no answer came. The group "European Women in Mathematics" was able to obtain the desired information for some of these countries. One of the aims of the Committee on Women and Mathematics is to collect the data from I-IV every four years—in time for every European Congress.

Three Mathematical Societies gave additional information:

**Bulgaria**

Virginia Kiryakova, on behalf of the Bulgarian Mathematical Society, obtained detailed information about mathematicians working in Bulgaria. This is presented in Table 2. In this table, Total 1 gives the numbers concerning the mathematics departments of universities and research institutions.

**Italy**

With the help of the Italian Mathematical Society, Laura Tedeschini Lalli has collected the information presented in Table 3. In Italy, mathematics are subdivided into 4 areas: algebra and geometry, analysis, mathematical physics and numerical analysis. The second part of Table 3 shows the division of women mathematicians in these areas.

**United Kingdom**

Amanda Chetwynd collected, for the London Mathematical Society, data concerning all universities in the United Kingdom (see Table 3).
<table>
<thead>
<tr>
<th>Country</th>
<th>Mathematicians</th>
<th>Full Professors</th>
<th>Ph D. 1990</th>
<th>Students in Maths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>women/total</td>
<td>% of women</td>
<td>women/total</td>
<td>% of women</td>
</tr>
<tr>
<td>Austria (1989)</td>
<td>54/762</td>
<td>7%</td>
<td>0/73</td>
<td>3/21</td>
</tr>
<tr>
<td>Belgium</td>
<td>30/219</td>
<td>14%</td>
<td>8/134</td>
<td>12/32</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>254/855</td>
<td>30%</td>
<td>1/42</td>
<td>4/23</td>
</tr>
<tr>
<td>C.S.F.R.</td>
<td>60/500</td>
<td>12%</td>
<td>2/65</td>
<td>1/10</td>
</tr>
<tr>
<td>Denmark</td>
<td>4/121</td>
<td>3%</td>
<td>1/19</td>
<td>1/5</td>
</tr>
<tr>
<td>Estonia</td>
<td>32/109</td>
<td>29%</td>
<td>0/8</td>
<td>0/4</td>
</tr>
<tr>
<td>Finland</td>
<td>3/127</td>
<td>2%</td>
<td>1/34</td>
<td>8%</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td>20-25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WGermany (1987)</td>
<td>40/1500</td>
<td>3%</td>
<td>4/490</td>
<td>19/208</td>
</tr>
<tr>
<td>Greece</td>
<td>67/283</td>
<td>24%</td>
<td>3/56</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>486/1217</td>
<td>40%</td>
<td>7/72</td>
<td>1/28</td>
</tr>
<tr>
<td>Hungary</td>
<td>32/281</td>
<td>11%</td>
<td>4/103</td>
<td>5/38</td>
</tr>
<tr>
<td>Italy</td>
<td>609/1727</td>
<td>35%</td>
<td>84/646</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>7/135</td>
<td>5%</td>
<td>0/9</td>
<td>2/3</td>
</tr>
<tr>
<td>Iceland</td>
<td>0/10</td>
<td>0%</td>
<td>0/4</td>
<td>0/0</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>1/7</td>
<td>14%</td>
<td>1/5</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>19/437</td>
<td>4%</td>
<td>1/88</td>
<td>2/41</td>
</tr>
<tr>
<td>Norway</td>
<td>9/103</td>
<td>9%</td>
<td>3/45</td>
<td>0/5</td>
</tr>
<tr>
<td>Poland (from 5 univ.)</td>
<td>107/359</td>
<td>30%</td>
<td>7/44</td>
<td>3/16</td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td>40-50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>345/1594</td>
<td>22%</td>
<td>12/177</td>
<td>25/81</td>
</tr>
<tr>
<td>Spain</td>
<td>168/1075</td>
<td>16%</td>
<td>12/279</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>7/150</td>
<td>5%</td>
<td>0/21</td>
<td>1/10</td>
</tr>
<tr>
<td>Switzerland</td>
<td>3/141</td>
<td>2%</td>
<td>0/91</td>
<td>4/42</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>97/1379</td>
<td>7%</td>
<td>3/267</td>
<td>46/266</td>
</tr>
<tr>
<td>Ukraine</td>
<td>31/145</td>
<td>21%</td>
<td>1/33</td>
<td>1/3</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>91/530</td>
<td>17%</td>
<td>12/132</td>
<td>4/24</td>
</tr>
</tbody>
</table>

Statistical data on Women Mathematicians in Europe

Sources: Entries in roman: European Mathematical Societies (Questionnaire from E.M.S.)
### TABLE 2

<table>
<thead>
<tr>
<th>Institute, University</th>
<th>Total number Mathematicians</th>
<th>Women number</th>
<th>Asso. prof. Total</th>
<th>Women number</th>
<th>Full professors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst. of Math. Bulg. Acad. Sciences</td>
<td>198</td>
<td>45</td>
<td>64</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Sofia Univ. Depart. Math. and Informatics</td>
<td>185</td>
<td>58</td>
<td>47</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Plovdiv Univ. Depart. Math.</td>
<td>65</td>
<td>20</td>
<td>30</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Technical Univ. Sofia</td>
<td>93</td>
<td>42</td>
<td>38</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Technical Univ. Rousse</td>
<td>35</td>
<td>18</td>
<td>7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Technical Univ. Gabrovo</td>
<td>24</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Plovdiv Polytechnics</td>
<td>15</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Rousse Section of Union Bulg. Mathematicians</td>
<td>240</td>
<td>56</td>
<td>9</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total 1</strong></td>
<td><strong>855</strong></td>
<td><strong>254</strong></td>
<td><strong>203</strong></td>
<td><strong>44</strong></td>
<td><strong>42</strong></td>
</tr>
<tr>
<td>Agrarian Univ. Plovdiv</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>50%</td>
</tr>
<tr>
<td>Higher Institute for Food Industry Plovdiv</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>60%</td>
</tr>
<tr>
<td>Teachers' Section Sofia (6° Section)</td>
<td>72</td>
<td>54</td>
<td>75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers' Section Gabrovo</td>
<td>185</td>
<td>123</td>
<td>66.47%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Center Bulg. Acad. Sciences</td>
<td>42</td>
<td>36</td>
<td>85.71%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Center Gabrovo</td>
<td>68</td>
<td>40</td>
<td>58.82%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total number investigated</strong></td>
<td><strong>1238</strong></td>
<td><strong>517</strong></td>
<td><strong>210</strong></td>
<td><strong>48</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

22,86% incl. 1 woman 2.38%
### TABLE 3

**Academic career**

<table>
<thead>
<tr>
<th>Level</th>
<th>% of women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>70</td>
</tr>
<tr>
<td>Researchers</td>
<td>55</td>
</tr>
<tr>
<td>Associate professors</td>
<td>33</td>
</tr>
<tr>
<td>Full professors</td>
<td>11</td>
</tr>
<tr>
<td>Principal investigators</td>
<td>5</td>
</tr>
</tbody>
</table>

**Women/total by area**

<table>
<thead>
<tr>
<th>Research area/faculty position</th>
<th>Researchers number, %</th>
<th>Associate Prof. number, %</th>
<th>Full Professor number, %</th>
<th>Total number, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonna 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algebra.</td>
<td>120/181</td>
<td>77/107</td>
<td>20/209</td>
<td>217/497</td>
</tr>
<tr>
<td>Geometry</td>
<td>66%</td>
<td>72%</td>
<td>13%</td>
<td>44%</td>
</tr>
<tr>
<td>Analysis</td>
<td>63/138</td>
<td>153/366</td>
<td>37/281</td>
<td>253/785</td>
</tr>
<tr>
<td>Mathematical Physics</td>
<td>26/60</td>
<td>17/101</td>
<td>8/102</td>
<td>52/263</td>
</tr>
<tr>
<td>Numerical</td>
<td>43/77</td>
<td>27/51</td>
<td>11/54</td>
<td>79/182</td>
</tr>
<tr>
<td>Analysis</td>
<td>56%</td>
<td>50%</td>
<td>20%</td>
<td>43%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>252/456</strong></td>
<td><strong>274/625</strong></td>
<td><strong>76/646</strong></td>
<td><strong>602/1727</strong></td>
</tr>
</tbody>
</table>

**ITALY**
### TABLE 4

<table>
<thead>
<tr>
<th>University</th>
<th>Mathematicians</th>
<th>Women</th>
<th>Full professors</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeen</td>
<td>14.3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Aber</td>
<td>16</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Aston</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bangor</td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bath</td>
<td>27</td>
<td>1</td>
<td>5.2</td>
<td>0</td>
</tr>
<tr>
<td>Belf</td>
<td>31</td>
<td>1</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Birkbeck</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Birmingham</td>
<td>28</td>
<td>2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Bradford</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bristol</td>
<td>38</td>
<td>2</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Brunel</td>
<td>21</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Buckingham</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cambridge</td>
<td>72</td>
<td>1</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Cardiff</td>
<td>26</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>City</td>
<td>12</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Cranfield</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Dundee</td>
<td>27</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Durham</td>
<td>24</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>East Anglia</td>
<td>14</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>30</td>
<td>2</td>
<td>4</td>
<td>0</td>
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3. Women Mathematicians in Germany

Anyone who has visited a mathematics department in Germany has realized that professional women mathematicians are very, very rare. The data in Table 1 confirms this.

Christine Bessenrodt started her talk at the round table as follows: “Investigating the status quo and compiling a list of obstacles that women in mathematics have to face in Germany was a very discouraging task; considering all these difficulties, it is very surprising that there are women mathematicians at all in our country!”.

Before giving additional (depressing) details on these difficulties, I would like to point out that there is also reason to hope: more and more German mathematicians think about this question, wish to understand the reasons for the underrepresentation of women among mathematicians, and would like to help improve the situation. The German Mathematical Society organised a panel on women mathematicians at the 1991 annual meeting in Bielefeld ([49]), and a discussion on the same subject was held at the 1992 meeting in Berlin. For the first time in its hundred-year-old existence, the German Mathematical Society has a woman (Ina Kersten) in its Praesidium. Recently, two excellent young women mathematicians became full professors: Hélène Esnault in Essen, Ursula Hamenstädt in Bonn (two nominations may not seem very many, but they represent a 50% increase, from 4 to 6 women full professors!).

Studies and academic positions in Germany

In order to enter a German university, the students have to have an “Abitur” (high school degree). This degree is normally obtained in 13 years, so the students getting an “Abitur” are about 19–20 years old. If a student decides to study mathematics, he (or she) has the choice between “Staatsexamen”, preparing for teaching in a high school, and a “Diplom”, preparing for a job in industry or an academic career. The statistics about the proportion of women among the students in mathematics (Table 1) concern both types of studies.

The highest academic level in Germany is full professor (called C4-Professor). This is a respected and highly-paid position. Usually a full professor has several assistants and a secretary. According to the Table, the number of full professors of mathematics in Germany was 490 in 1987. There are also “associate professors” (C3-Professors). Most permanent positions are either full or associate professors. In addition, there are also some “Akademische Räte”, as well as a few other types of permanent positions. These types of positions are taken into account in Table 1. No evaluation was made on the non-permanent positions. Most of these are post-doctoral positions, limited to 6 years.
Statistics

Whereas the percentage of women among the professors is low in all subjects, there is an important difference between mathematics and other subjects as far as women Ph.D’s are concerned (see [63]). The explanation is probably that in most other subjects, a Ph.D leads to careers other than academic ones.

All the statistical data concerns the former West Germany. Since reunification, many changes have occurred in the eastern part of the country. It appears that women mathematicians who had jobs before reunification are losing them at a higher rate than their male colleagues; this is also very alarming.

Why are there so few women mathematicians in Germany?

In her talk at the Round Table, Christine Bessenrodt gave a list of about 12 obstacles that prevent women from becoming mathematicians. As she points out, these can be separated into two groups: those coming from the general public, and those coming from the university. I would just like to present here the difficulties that seem to be the most important, and those that are most specific to Germany. As in many other countries, there is a preconception in the general public that mathematics is not a feminine subject. This seems to be especially strong in Germany: the fact that until quite recently the textbooks of mathematics and physics were different for boys and girls seems to indicate this.

In spite of this, a large number of females are interested in mathematics. Among students in mathematics, about 33% are girls. However during their years of study, females find that whereas they can complete their studies and then become high school teachers or perhaps find a job in industry, they have almost no chance of becoming professional mathematicians at a university. Very often, they have the impression that nobody expects them to pursue such a career.

In a 1960 poll of professors, 64% were against female students at the universities, and 79% were against female university teachers [5]. Hopefully the situation is better now—but I doubt that the present figures would be 0%! There are few female professors in any domain, but the situation is especially bad in mathematics (see [63]). It is also rare to see a woman invited to speak at seminars and colloquia. Girls don’t find any role models, and more often than not, they give up the idea of having an academic career.

Some women persist in spite of all these difficulties, and get a Ph.D and a habilitation. In spite of international recognition of their work, many do not find permanent positions for many years (if ever). The only possibilities open to them are temporary jobs or emigration. When I discuss this with German colleagues, and point out that this or that excellent woman mathematician does not have a job in Germany, invariably the reply is to the effect that men have the same difficulties. However, it is truly questionable as to whether the examples given of such men awaiting jobs were in any way “better mathematicians” than
the women I listed. It seems that in the minds of some colleagues women should
wait until all men of comparable level have jobs, and only afterwards could they
be considered. Obviously, with such a policy, it is no wonder that there are few
women mathematicians in Germany. Unfortunately, it is not to be expected that
the situation will change spontaneously in the near future. This indicates the need
to introduce affirmative action to increase the proportion of women among the
mathematicians in Germany.

**Affirmative action: facts and suggestions**

Many German universities have some sort of affirmative action aimed at in­
creasing the number of women on the scientific staff. These programs are recent
and often of a tentative nature: first versions are publicised and then later different
versions are put into effect. Therefore it is difficult to give a precise picture of the
situation. However, the following aspects seem to be important:

1. **Scholarships for completing a habilitation.** In order to become a professor in
   Germany, one has to have a habilitation. Therefore it is natural to want to increase
   the number of women holding such a degree. The problem with scholarships is that
   they are low-paid and (even more importantly) they are very limited in time: one or
two years at most. This is too short to finish an habilitation, especially if the scholar
is just getting back to research (these programs mainly seem to be intended for
women who interrupted an academic career in order to take care of their children).
I have also heard complaints that the women holding such scholarships are not
well integrated into the universities where they work. This starts with very basic
things like having a library card and an office.

   **Suggestions.** Maintain this type of scholarship, but extend it with some sort of
   “career plan”: for instance, give a scholarship for two years with possibility of
   renewal for two more periods of two years, if the work of the scholar is successful.
   Make sure that the scholars are integrated and respected in the institutions where
   they work; this involves office space, access to the library, the possibility of working
   with advanced students in a seminar. It may also involve increased financial
   support. Moreover, it would be a good thing not to reserve these scholarships
   for women. Ideally, a young mathematician preparing a habilitation should have
   the option of a research scholarship or a job as an assistant, paying slightly more
   but involving more teaching. Of course, one should pay attention to ensure that a
   sufficient percentage of these young mathematicians are women!

2. **Women commissioners.** Many universities have recently elected a “woman
   commissioner”. This is usually a woman professor in the university. She tries
to make sure that women get equal treatment when they apply for a position and
when working at the university.
Taking over the task of a woman commissioner means a significant extra burden for the few women at the universities, in particular if this comes with hardly any reduction of other duties and with hardly any support (like office staff). Moreover, it appears that often the male colleagues are not helpful, and on the contrary they make jokes about the whole issue and try to ridicule anybody involved, making it very explicit that this is only some sort of gimmick and not to be taken seriously.

Suggestions. An obvious suggestion is to give more support to the women commissioners: office staff, and a reduction of her other duties. This is mainly a financial question. It is more difficult, but even more important, to get a more constructive attitude from the colleagues in the department.

3. Equal treatment for women candidates. Some universities even advertise positions with an accompanying text saying something to the effect that “in the case of equal qualifications, women candidates should be preferred”—as long as women are underrepresented. I have heard that, in the case of more junior positions such as assistantships, this can play a positive role for women. As long as “qualifications” means having a diploma, having good grades or having a Ph.D, it is something that can be checked and compared easily. In the case of applicants for a professorship, “equal qualifications” does not seem to have any meaning, as there is no uncontestably objective way to compare the candidates at this level. The woman commissioner can make sure that the women candidates for a professorship are invited to give a talk. However, this seems to be totally useless: if the professors are not interested in hiring the woman in question, they will just not come to the talk. This is usually what happens. The woman commissioner can recommend changing the order of the candidates on the list. But this has a very negative effect, in fact it decreases the number of women who appear on lists of candidates at all.

Suggestions. For junior positions, the strategy of preferring women in the case of “equal qualifications” seems to have good results, so it is a good idea to maintain it.

It is much more difficult to suggest an efficient course of action to ensure equal treatment for women candidates for professorships. The heart of the problem is in the attitude of the professors in the mathematics departments. If they are really open to the idea of hiring women, one can make some suggestions. If not, then I really do not know what measure could help, except imposing quotas for women. So, here are some suggestions: when a position is advertised, usually the area of mathematical expertise is specified. It is not at all clear that there will be women candidates in just that subject. However, highly qualified women candidates may be interested in the position. The department should consider them as well, even if they work in a different area. Another suggestion is to think ahead, and encourage young women mathematicians with a Ph.D to work on a
habilitation in the department.

4. **Visiting professorships for women.** The Sofia Kovalevskaia guest professorship in applied mathematics at the University of Kaiserslautern has existed since 1991/92. It is internationally advertised and awarded.

5. **Permanent professorships for women.** It has been suggested to start a program similar to the “Fiebiger-program”: professorships for women in those fields where they are seriously underrepresented (this of course includes mathematics).

**Conclusions**

Women are very strongly underrepresented among the mathematicians in Germany. This situation will not change spontaneously. The affirmative actions attempted so far have not accomplished much, but they provide some women with the opportunity to work towards a habilitation. The Sofia Kovalevskaia visiting professorship is certainly a very good initiative as well. It would be important to:

1. introduce a control of effectiveness in the affirmative action programs;
2. find an effective way of increasing the number of women professors, with and without special programs. The latter is possible if the basic attitude towards women in mathematics becomes more positive. There is certainly room to believe that there is hope for such a change!

This section is essentially based on Christine Bessenrodt’s talk, and on the preliminary work of several women mathematicians working in Germany (Annette Grabosch, Sandra Hayes, Ina Kersten, Roswitha März). The article of Irene Pieper-Seier [63] was also an important source of information and ideas. As Christine said in her talk: “we were all very glad to meet so many good women mathematicians in Germany, and also several male colleagues who wish to see the number of women mathematicians increase.”

**4. Women Mathematicians in France**

It would be very interesting to have a detailed analysis of the situation of women mathematicians in France. Because of lack of time and space, it was not possible to do this here. I hope that a detailed text on France will appear in the Proceedings of the next European Congress.

I would like to make some preliminary observations. First of all, some estimations concerning the proportion of women among mathematicians in France (communicated by Femmes et Mathématiques and by the Société Mathématique de France):

- 30 % in scientific classes at the end of secondary school (Terminale C)
- 15 % in “Classes préparatoires” (2 years of preparation for the scientific Grandes Ecoles)
30% in “Premier cycle scientifique” (first two years of the University)
20% in Engineering schools
50% in “licence et maîtrise de mathématiques” (third and fourth year of the University)
25% of Ph.Ds
50% of secondary school teachers (much less than in other subjects)
25% of “maîtres de conférence”
8% of University professors.

Some comments:

It is clear that women mathematicians are no exceptions in France. This is shown by the statistical data, which is also reflected in the everyday experience. As Marie-Françoise Roy said in her round table presentation: “It is now possible to be a woman (a wife, a mother, a lover) and a researcher. In former generations, women mathematicians had to be single. The presence of women is accepted in the mathematical community”. Women are present at every academic level. They are also increasingly present in the administrative experiences of academic life in France: in the various decision-making committees in mathematical departments, as well as in the Council of the SMF (Société Mathématique de France) and the SMAI (Société des Mathématiques Appliquées et Industrielles), in the Committee of the CNRS, and so on. The work of women mathematicians is also occasionally recognised by prizes. For instance, Claire Voisin received several French prizes, as well as one of the European prizes of the Congress.

Still, the proportion of women is very low among editors of mathematical journals, main speakers of important congresses or seminars. For instance, it is hard to understand why there are so few talks by women at the Bourbaki seminars (about 1,5%).

It would be a dangerous mistake to think that the proportion of women mathematicians in France will increase spontaneously. The evolution of the situation in the last 25 years was the following: fast increase in the 70s, then a slight decrease in the 80s and again a slight increase in the early 90s. The merging of the two Ecoles Normales Supérieures will certainly have a negative effect on the proportion of women mathematicians in the near future. These problems are currently studied by sociologists, for instance Baudelot and Establet.

5. Women Mathematicians in Switzerland

The highest political power in Switzerland is held by the Federal Council. The composition of this 7 member council follows the “magic formula”: a quota system regulating the representation of political parties and of regions.
In Switzerland, there are very few women holding positions of responsibility or power. In particular, there are very few women university professors. This is true in any subject, and is especially striking in mathematics. More and more people would now like to change this situation. Most universities express the desire to increase the number of women professors.

One way to obtain this would be to use a quota system. This has been suggested, but most university professors are very much against it. If one thinks about it, this is really surprising. Why not do in Universities what works so well in the Federal Council?

For the time being, only very mild measures are taken. They are similar to those introduced in Germany. For instance, when a position is available, the announcement contains a sentence saying, “the University wishes to encourage women to apply”, or something similar. But even this irritates many professors.

Most Swiss Universities and Polytechnic Schools now have a “woman commissioner” whose role is to see that women are not discriminated against. This is a very good thing, but of limited efficiency since the woman commissioner only has a consultative role.

6. Women in the Mathematical Community

6.1. Opinions of colleagues

The reactions of men (and women) to their women colleagues and students are quite varied. They depend a great deal on the country and of course on the personality of the colleague.

(1) Colleagues who think that women can be as good as men in mathematics: More and more colleagues do think so, not only in the countries where there is a high percentage of women mathematicians but even in those where there are hardly any. In the second case, they also realise that the underrepresentation of women among the mathematicians in their country is not natural. Many of them are ready to help in one way or another. They join associations like AWM or femmes et Mathématiques, or take part in round table discussions on this issue. More importantly, they are encouraging their women colleagues and women students.

(2) Colleagues who think that some women can be mathematicians, but not too many: Some men think that some women can be good mathematicians, and have great respect for the work of some of their women colleagues. However, the majority think that this happens only very rarely and that women are gifted for mathematics much less frequently than men.

(3) Encounter with colleagues who don’t think that women should be mathematicians.: As already pointed out, there are many types of reactions. I
will give a non-exhaustive list here, and try to understand the reasons for each of them.

**The weight of tradition**

Some people, even mathematicians, find it very strange and unusual that women are mathematicians, or that mathematicians can be women. In many countries, this combination is very rare. As a result, many people rarely meet any women mathematicians. It is a frequent reaction to feel uneasy in the presence of unusual phenomena. Perhaps surprisingly, it is even more difficult to accept things or beings that resemble closely known ones (for instance, mathematicians) but are different in one important aspect (they are women). This is because two types of reactions are involved: one tends to have a certain type of behaviour towards mathematicians, and another (quite different) towards women. To a mathematician, one would talk about theorems, conferences, job openings. One would open the door for a woman, and ask her about the children. Being in presence of somebody who is both a mathematician and a woman may cause problems. People (usually) prefer to avoid problems, and this one can be easily avoided by not having women colleagues in the department, not inviting women to conferences, and so on.

*Illustrations:*

1. This is a story from the special issue on women and mathematics in the *Notices of the AMS* [3], p. 732. “A graduate student at Warwick gave a ride to a visiting star in her field. She started to talk to him about his lecture and saw him chuckling to himself. She asked him what was funny and he bent over double, laughing, “A women, talking mathematics, and foliations, it’s too much!””

2. This story has nothing to do with women; it just illustrates the difficulty of relating to someone having two attributes that are traditionally incompatible. A young German mathematician was nominated “assistant professor” (a new type of temporary position) in a German university. He took the elevator with a full professor. The full professor said to him: “These new positions are really confusing; I really think that they should not have been created. This situation is embarrassing, you are not really an equal, but still a professor somehow, so how am I to relate to you now?”

This is to show that in communities with strong hierarchical structures the relation-question is really very serious: if it is hard to figure out how to relate to an assistant professor, it is much harder to figure out how to relate to a woman professor!

**Fear of loss of status**

Professors at prestigious mathematics departments are usually very proud of this. They want to preserve the prestige of the status of professor, and of the department. Many of them think that this is incompatible with hiring women. Women just cannot be prestigious mathematicians. When they think of the fac-
ulty members they would like to hire, they have a profile in mind, usually of a young mathematician having a strong research record in a fashionable topic, and an excellent reputation on the international level—and a man. Consciously or unconsciously, this condition is added.

**Fear of competition**

In the very same countries where there are very few women mathematicians, it is currently also hard for men to get jobs as mathematicians. Therefore it is understandable that many of them don’t welcome the arrival of new competition. Simple arithmetic shows that if a new category of people arrive on a job market, the competition will be harder. Moreover, they sometimes fear that this will be unfair competition. Some people think that pretty young women have an extra advantage. In the countries having affirmative action programs, being a woman is actually an advantage—that’s the whole point of the program. Most European countries do not have such programs; some are just starting to have them. But in the U.S., some young mathematicians seem to be very bitter about this, and tend to say very negative things about the programs and also about women mathematicians, individually or collectively. I have frequently heard the comment, “It is no longer possible to get a job in mathematics for a white male”. The data about new appointments in the U.S. ([4]) shows that this is not true, but the comments are still there.

**Women should be happy**

Some people (even mathematicians) think that real happiness for a woman is getting married and having children. And they also think that this is incompatible with a career as a mathematician. This is really a variant of the “weight of tradition” reaction, but a specially nice and unselfish form—they only want the happiness of the women, in particular women graduate students or women candidates. They feel that these women make a big mistake by wanting a thesis, or wanting a job.

**Conclusion**

These reactions are unpleasant, but natural. Most stem from traditions and stereotypes. I think that the most effective way of dealing with this problem is to talk about it. Talk about it to colleagues or fellow students, organise panels about it. Another very efficient method is to make women mathematicians more visible by inviting them to give talks more frequently.

**6.2. Attitudes of women**

Girls and boys are educated differently, and this has some consequences in their attitudes towards professional activities. Girls are brought up to have “feminine qualities”: they should be nice, not too independent, always ready to help others. Boys are brought up to be independent, competitive. Girls aim to be
liked, boys aim to be respected. Of course, society is changing and the patterns of education will also change, but perhaps not very rapidly.

This issue is discussed in many books and articles. I would like to recommend two popular psychology books: [26] and [83]. They are both pleasant to read and can be very useful in analysing our attitudes in professional life, in particular as mathematicians. I would like to point out some attitudes that many of us have in common, often without realizing it, and that such attitudes can have a negative effect in our work as mathematicians.

1. Lack of confidence

Many sociological studies show that girls tend to have much less confidence in their capacities and scholarly performance than do boys. When questioned after a test, boys usually think that they performed better than they actually did, and girls usually think that they performed not as well.

One often sees the same attitude in professional women mathematicians. They do not dare to submit their papers to very good journals, but think that any recognition of their work is due to good luck.

Of course, such an attitude is rather nice and also effective in reducing stress; if one does not expect much, one is less often disappointed. However, this is clearly not the attitude that will lead to the greatest professional success. It may even lead to not studying mathematics at all, even if one has good grades and is interested in the subject. At all levels, a lack of confidences makes women give up their professional expectations.

2. Fear of success

This issue is closely related to the first one. Many women seem to think that having too much professional success is not “nice”, that they will be less popular, that they will have less chance to find a boyfriend or a husband. For men, exactly the opposite is true. A very striking illustration of this is given in [26]: A test was conducted with American students. They were given the beginning of a story and they had to complete it. The story began as follows: a student, John (for the boys) or Anne (for the girls) finds out that he has the best results of the whole university at an exam. Most of the boys predicted a highly successful professional career and a happy life for John. Most of the girls were afraid that Anne would be lonely and nobody would like her.

3. Competition?

Most girls (women) don’t like competition. Some do, to a certain extent, but there is a significant difference in boys (men). This can cause problems, for instance, when taking a competitive exam in order to enter an institution (such as the “Grandes Ecoles” in France), and in many other professional situations.

4. Finite energy?

I would like to point out a “mistake” that I have seen several women students or
graduate students make. They marry early, and expect to complete their studies or Ph.D while also doing almost all the housework, making a living, and perhaps even taking on an administrative duty such as being a student delegate. In all the cases I know, this situation ended with a divorce and the woman became a professional mathematician living alone or with someone who did a reasonable share of the household duties (I probably did not meet those who gave up mathematics instead).

The same attitude also exists among professional mathematicians. We seem to think that we have to take on “community duties”, for instance, administrative work. Laura Tedeschini Lalli explained this attitude very well during the round table discussion. She said: “We think that we can think about mathematics at night, take care of our children in the morning and run the department in the afternoon. Let me remind you—we only have finite energy!”

**Conclusion**

I would like to conclude with three remarks. First of all, not all women have these attitudes. Moreover, some men do have them. But statistically, they are more common in women then in men.

The second remark is: I do not want to say that these attitudes are wrong and that all women mathematicians are invited to think this over and change. All I am saying is that they seem to be incompatible with the highest performances in mathematics. So we have to make a choice, and it is just as well if we know about it.

Thirdly, some women mathematicians outgrow these attitudes and they tend to “overreact”; moreover, they are perceived by their colleagues as extremely aggressive. It is not easy to give up the behaviour we were brought up with, and to find a balanced attitude of non aggressive, modest self-confidence. Moreover, some people tend to find every successful woman too aggressive—the mere fact of being successful is often perceived as unfeminine. This brings us back to point (2).

**6.3. The only one**

In some countries, women mathematicians are so rare that when there is a woman in the mathematics department, she is the only one. The situation is nearly as bad at the graduate student level, as well as in conferences and mathematical research institutes. With some luck, there may be one or two other women, but usually not more. To live with this situation year after year, conference after conference, is really depressing. One starts to wonder, especially on the days when one did not prove any major theorem, whether one is really in the right place and whether the popular wisdom according to which “mathematics are not for women” is not correct.

There are now groups of women mathematicians, email networks that can help (see Section 6).
Possibly, there may be women mathematicians who enjoy being exceptions—but I have not met any so far.

6.4. Role models

Role models (professors, thesis advisors, and so on) play an important role in the development of every mathematician. It seems that gender plays a role in this process: women can find it difficult to identify with men, and vice versa. This poses a serious problem to the women students in the countries where there are almost no women mathematicians.

**Role models in action**

I have always been impressed by Pilar Bàyer (no relation to me). She has been a professor in Barcelona since 1981, and has built up a number theory group there. She has had 9 Ph.D students so far, 5 of whom are women. Of course there are many women mathematicians in Spain, but still, none of her male colleagues have such a high percentage of women Ph.Ds. In September 1991, at the “Journées Arithmétiques” in Geneva, 17 participants came from Spain, and 10 of them were women!

I could give several similar examples of women mathematicians in France and in the U.S. who have had many women graduate students. This seems to happen in every country with a reasonable proportion of women mathematicians (15% at least). In these countries, most women mathematicians who have Ph.D students at all, seem to have a large percentage of women students. In the countries where there are very few women mathematicians, one can observe a different but related phenomenon. There are often several women Ph.D students working with the same advisor, or with different advisors but in relatively close subjects. They talk a lot to each other, and they partially function as role models.

**Psychological analysis of role models of women mathematicians**

This is entirely outside the scope of this article. However, I would like to point out that a start has been made on this subject by Claudine Blanchard-Laville. She took part in the 1991 EWM congress in Luminy, and wrote a very interesting article which appeared in [39]. At the same conference, a discussion about personal experiences of role models took place. A short report on this, written by Laura Fainsilber, appeared in [39].

6.5. Family and career

Having a professional career as well as children is often difficult. The degree of difficulty depends on the country: whether or not there are easily accessible kindergartens, how long a maternity leave women can take, and so on. They also depend on the partner: how large a share he takes in the housework and the education of the children.
None of the above questions are specific to mathematicians. This is certainly not the place to start a detailed general study on the subject of family and career. The only thing that I can do here is to present in a certain number of concrete examples of how some women mathematicians deal with this problem.

1. **First child just before a Ph.D:** Many women mathematicians had their first child just before, or just after, defending their thesis. I know several of these, who now have 2 or 3 children, and are successful in research as well. In all of these cases, the father does about half of the housework.

2. **Career first, children afterwards:** Some women wait until they are very well established mathematicians before they have their first child. In the cases I know, this also works very well and the women have been able to continue their research at the same level after the birth of their child. Some of them even say that the break of a few months was an opportunity to change their mathematical subject.

3. **Children first, career afterwards:** This may be difficult to realise, and depends very much on the conditions. However, I know some excellent women mathematicians who had 2 or 3 children first, and only started to work towards a thesis afterwards. In general, they say that they have been lucky. There are now affirmative action programs that give scholarships to women with children to start research, or come back to research.

### 6.6. Women participants in conferences

Women at mathematical conferences are frequently mistaken for "wives" (which they perhaps are), that is, "accompanying persons". Women participants at mathematical conferences are still rare. This is especially true for those conferences where the number of participants is limited, so the mathematicians must be invited.

Typical examples of such conferences are those that take place every week in Oberwolfach (Germany) and Luminy (France). The number of participants is limited to 42 in both cases (with a possible extension to about 50, under favourable circumstances). The number of women at the Oberwolfach meetings usually varies between 0 and 3. In Luminy, this number is much higher: it usually varies between 4 and 8. This is certainly due to the fact that the number of women mathematicians is so much higher in France (even though the conferences are international, a large proportion of the participants comes from the host country).

**Signs that times are changing:** In May, there was a conference in Oberwolfach that is part of a series existing since 1978. There are usually 2 women mathematicians at these meetings. This time not only were there 5 women, but two of them came with their husbands and children. The husbands came as accompanying persons, and they looked after the children during the conference!

In September, there was a meeting in Luminy with 10 women participants, and 7 of them gave talks. Even more impressive: I just saw an announcement for
an international conference of combinatorics, where half of the invited speakers were women.

6.7. “Dear Sir” postcards

Many mathematical departments have printed postcards to be used for reprint requests. They contain a text that runs about as follows:

“Dear Sir,
Please send me a reprint of your article... that appeared in...
Many thanks in advance. Sincerely,”

A card that I received recently actually had this in three languages, namely:

“Lieber Herr Professor,
Monsieur le Professeur,
Dear Sir”.

So that there is no ambiguity about it... Of course, the person who is requesting a reprint does not necessarily know whether the author is a man or a woman. But actually *printing* postcards with such a text implies that only men can be authors of papers that people want to read — and this is clearly false and insulting.

6.8. What would be different if there were more women in mathematics departments?

(1) Different atmosphere in the department: The best source for this is to ask the colleagues who work in departments with a high percentage of women mathematicians. They think that this gives a more natural atmosphere to the department, that everyday work is more pleasant. A German colleague told me that he would like to have more women in his department because there would then be less tension at the department meetings. I think that he is right to expect this.

(2) Equal opportunities: It appears, for instance from the statistical data, that in certain countries, many women would like to be professional mathematicians and cannot (because they are discouraged, or not hired). This is not fair — men and women should have equal opportunities.

(3) More gifted students and colleagues, more qualified people in scientific and technical professions: If women have equal access to the mathematical profession, there will be a new arrival of gifted students in the universities — more confident, because they will have role models and will not feel isolated. This will be a gain for the mathematical community. At a more general level, this evolution will also contribute to encourage girls to choose scientific and technical professions, and this will be a gain to society.
7. Committee on Women and Mathematics

The EMS committee on women and mathematics was founded in January 1991. At present, the committee members are: Eva Bayer-Fluckiger (France), Ina Kersten (Germany), Ragni Piene (Norway), Stewart Robertson (U.K.), Barbara Roszkowska (Poland), Laura Tedeschini Lalli (Italy), Vera Trnkova (C.S.F.R.). At the time of this exposition, the committee has done the following:

(1) **Collection of statistical data:** With the help of the mathematical societies, data concerning the situation of women mathematicians in Europe was gathered. This is presented in Section 2.

(2) **Analysis of the situation in Germany:** It became evident that Germany is one of the European countries with the lowest proportion of women mathematicians. This made us decide to start a more detailed analysis of the situation of women mathematicians in Germany. This work was mainly done by the women working in Germany: Christine Bessenrodt, Annette Grabosch, Sandra Hayes, Ina Kersten, Roswitha März, Irene Pieper-Seier and others. The results of this analysis are presented in Section 3.

We plan to continue to work on these two points:

(1) **More statistical data:** The information gathered so far is very interesting. It is important to collect similar data every 4 years, so that we can have an idea on the evolution of the situation. Moreover, we also want to do our best so that the statistical data coming from different countries can be really comparable. It is not always clear whom to count as a "mathematician". We think that the decision, within certain limits, should be taken by the Mathematical Societies. However, we can help to obtain greater consistency.

(2) **Further analysis of the situation in Germany, possibly extended to other countries:** We would also like to continue analysing the German situation, especially in order to understand how effective the encouragement programs are and how the situation develops in the coming years. This project should be continued as long as there is such severe underrepresentation of women among the mathematicians in this country. It would be very interesting to extend this project to other countries, for instance the Netherlands, Switzerland, Scandinavian countries and the U.K.

(3) **Study of encouragement programs, concrete propositions:** We will give special attention to the affirmative action which exists, or is planned, in the above countries. We will try to evaluate the results of these programs and make some concrete recommendations. A start on this is made in Sections 3 and 7.
8. Groups of Women Mathematicians

Since 1986, several groups of women mathematicians have been formed in Europe. Some of them are associations, others just informal groups. For most of the women taking part in these groups, the main motivation is to meet other women mathematicians. It is really pleasant and encouraging to see that there are so many excellent women mathematicians. This is of course especially important for the women working in the countries where there are hardly any women mathematicians. It helps them to fight the feeling of isolation and the impression of being “strange” that often arises when they work for a long time with male colleagues only. Another motivation is to talk about mathematics in a non-competitive context.

I would like to present here two such groups: European Women in Mathematics, and the French association Femmes et Mathématiques.

8.1. European Women in Mathematics (EWM)

At the ICM in Berkeley in 1986, a panel discussion was held about women mathematicians. It was organised by the “Association for Women in Mathematics” (AWM), an association founded more than 20 years ago in the U.S. (see for instance [3]). Several European women took part in this panel. They decided to create a European association of women mathematicians, and that is how EWM was born.

Since then, several EWM congresses have been held (in Paris, Copenhagen, Warwick, Lisbon and Luminy). At each of these congresses, there were expository mathematical talks, and discussions about subjects of interest for women mathematicians (for instance: family and career, role models, etc).

The longest EWM-congress so far (5 days) was the fifth one, held in Luminy (France) in December 1991. It was attended by 49 participants from 19 countries. For the first time, two “satellite meetings” took place after this EWM congress: in Besançon (March 1992) and Schwerte (Germany, May 1992). A report on the congress and its satellites is available [39]. It also contains an article by Caroline Series about the history of EWM.

The communications network for EWM is through coordinators (international and regional). There is also an EWM email net. All those interested are invited to contact one of the coordinators (see Appendix).

8.2. Femmes et Mathématiques

The association Femmes et Mathématiques was founded in Paris, in March 1987. It has more than 100 members. In addition to giving women mathematicians the opportunity to meet each other, the association very actively cooperates with other professional associations of mathematicians or teachers of mathematics: for instance, Femmes et Mathématiques organised a round table at the congress “Mathématiques à venir” in 1987 (see [23]). This Association is now one of
five participating in the common framework of “Mathématiques à venir” for the promotion of mathematics in France through public debates, articles in newspapers, brochures, etc... One result has been that brochures (for students and for policy makers) on mathematical careers in France includes quotations from, results by, and portraits of women mathematicians. On the other hand, Femmes et Mathématiques also collaborates in activities aimed at secondary schools: constructing and testing teacher programs promoting equality in schools (the European program TENET for example and units in the new Institutes of Teacher Training) and organizing conferences and workshops at various meetings of the Association of Teachers in Mathematics. The Association has also given funds for girls permitting them to participate in mathematical summer schools. Members of the association often give talks at schools, and take part in conferences about mathematics education.

9. Concrete Propositions

During and after the round table discussion, several people made interesting suggestions as to how to improve the situation of women mathematicians in Europe. On the other hand, it also became clear that there is a need for concrete propositions in this direction. This demand comes from Mathematical Societies as well as from individual colleagues who would like to help.

1. Information about positions: Many people, women and men, pointed out that they did not always get the information they needed concerning available positions. This probably does not concern all countries, but has been observed (at least) in Germany, Spain, Switzerland and the United Kingdom. Particularly in the countries where there have been very few job openings in mathematical departments in the last 10 or 15 years, it would be profitable for everybody to have an efficient network for such information. The national Mathematical Societies could help very efficiently in this issue. They could collect information about the job openings at all universities. They could establish an email net to distribute this information to all the interested members of the Society. This would also make membership more attractive to young mathematicians. A similar network could also be created for scholarships and fellowships, if there is a need for it.

2. Gender related information in statistical data: In all sociological studies about mathematicians, it would be important to take gender into account. This is also an issue in which Mathematical Societies can help.

3. Encouragement: It has been observed that women are less often encouraged than men to do postgraduate work, and that the teachers are often surprised to see how well some women students do. This is natural enough, considering that mathematics have been regarded as an unfeminine subject for such a long time. It is important to know that many of us tend to react in this way, and make the
necessary adjustments.

4. Relax or suppress age limits for women: It has been pointed out that in many countries, fellowships are limited to candidates below a given age. If a woman has children, she will be disqualified on age alone from all these fellowships. But even women without children often start late because it takes them on the average longer than men to feel confident enough to consider a career in mathematical research. One solution to this problem would be to relax or suppress age limits when women are concerned, as long as women are underrepresented among mathematicians.

5. Doctoral or postdoctoral scholarships for women: Some countries (Denmark, Germany, Norway) have such scholarships. One can make the following remarks:

a) Such scholarships are useful, even if it appears that the women who get them are also eligible for other scholarships (this is for instance the case in Denmark: all the girls who got a doctoral scholarship in a special program for women were also qualified for non-specific scholarships). It was often pointed out that girls tend to have less self-confidence than boys, especially concerning subjects that were traditionally considered as reserved to men. Therefore it is very good if they can think that they have a reasonable chance of success.

b) It is important that such scholarships do not appear to be “second best”, less considered or less highly-paid than others. It is also important to ensure that the women who hold such scholarships are welcome in the mathematics departments where they work, that they have access to the library, some office space and (if they wish) opportunity to work in seminars with advanced students. This way they can act as role models, and at the same time be better integrated in the department.

c) It is not enough to give a scholarship for one or two years: in the case of successful work, it should be possible to obtain further scholarships or extensions.

d) There should be monitoring of effectiveness for these scholarships, so that one can see how to modify them to make them better.

6. Change of attitude in making appointments: In the countries where the proportion of women among the mathematicians is very low, it is very important to find a way to increase this number fairly rapidly. Scholarships for women students are not enough, if they have no role models among the professors. Therefore, the first step would be to increase significantly the number of women professors. It is not difficult to find good women candidates. Hiring women mathematicians does not involve lowering standards! But it may involve some change of policy. If the department wants to hire someone in a specific subject, and perhaps insist
on giving promotions to those who “have been around for a long time”, then this may be incompatible with hiring women. The real change of attitude would be to change the order of priorities. That is, hiring a woman who is perhaps in a different field. The department may need a professor in a given field, but it needs a woman professor even more!

One More Suggestion: As Marie-Françoise Roy pointed out in her talk, it would be good to encourage sociologists and psychologists to work on the subject of “women and mathematics”.

Bibliography


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