

Remarks to the Mathematics and Physical Sciences Breakout Groups

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Let me begin by suggesting that, as a framework for discussion in the breakout groups, we consider three arenas which affect the development of scientists and that we identify progress, barriers, and concerns in each of these arenas, namely, society at large, the educational system, and the community of scientists. Of course, these areas are not mutually exclusive; educational background certainly affects career paths. If society discourages some girls from playing with computers or mechanical toys, then it becomes the responsibility of the schools to provide additional training when needed. My choice of the word "community" to describe the third arena was deliberate. Those of us who choose to study science are not entering "enemy territory" but joining a true community of people, most of whom are neither perfect nor hostile. Within that community I have found far more friends and supporters than adversaries. So I would like to encourage the breakout groups to not only identify problems and barriers, but also strategies for dealing with them in a supportive community.

I'd now like to present some rather detailed data about the distribution of women students and mathematics faculty at different types of institutions. Although this data is only for mathematicians, I think it is of interest to those in all fields because of the many questions it raises.

Although women now receive almost 50% of bachelor's degrees in mathematics, they are not uniformly distributed. On the contrary, as you can see from Table 1, 43% of the men attended research universities while 34% went to 4-year colleges. For women, these figures are reversed; 31% attended research universities while 42% went to 4-year colleges. At those institutions which offer separate bachelor's degrees in mathematics education, 64% of the recipients are female.

Given this difference in undergraduate education, it is not surprising that women receive only 20-25% of of the PhD degrees in mathematics. However, Table 2 shows that the apparent doubling from 11% (of degrees to US citizens) in 1975 to 22% in 1990 is somewhat deceptive, as the actual number of women receiving doctorates in mathematics went only from 83 to 89. Most of the percentage increase came from the substantial *decrease* in the number of male doctoral recipients among US citizens. Not until 1993, did both the number and per cent of women PhD's increase significantly.

If we now examine the tenured doctoral faculty, we do not see the 20% of women who received PhD's in mathematics since 1980 reflected in the faculty of doctoral institutions. The AMS (American Mathematical Society) breaks doctoral mathematics departments into groups I (top 39), II (next 43), and III corresponding to rank in the 1982 NRC survey; groups IV and V designate departments of statistics and applied mathematics respectively. While

much attention has been given to the paucity of women at top mathematics departments, the record of groups II and III is not better. Indeed, there is little change across Table 3 until one reaches the Master's departments where the percentage of women more than doubles. Discussion of the presence or absence of women at top institutions often becomes a debate on whether or not a particular woman is good enough for department X. Therefore, I feel strongly that it is more productive to focus on the many group II and III departments who have no women, one woman, no tenured women, etc. etc. even though they can not reasonably claim there are none good enough.

It is widely believed that both the low percentages and skewed distribution of women faculty are historical artifacts. However, even for first positions of recent PhD's, disparities persist. It is true that women are significantly more likely to get degrees in statistics and slightly more likely to receive PhD's from group II or III departments than group I. However, in the 4-year period 1988-91 (the first for which data is available) women did not get their first position *at* doctoral institutions at the rate at which they received them *from* group I departments. Thus, the low percentage of women at groups II and III is not simply a result of many male faculty having been hired in the 50's and 60's; it is also a consequence of the fact that most of the large pool of women from the 80's did not receive a first position conducive to research development.

From 1992-95 women do seem to have achieved parity for "first positions" at doctoral departments. However, this was accompanied by widespread assertions of preferential treatment and "women getting all the jobs" although the data definitely do not support such claims. Moreover, women continue to be much more likely than men to go directly from graduate school to a 4-year college.

Let me conclude by examining the question of recognition of women's achievements later in their careers. There is considerable evidence that women are much more likely to be invited speakers at major conferences if there are women on the organizing committee. During the last 10-15 years, the AMS has been successful at ensuring that women are well-represented among the major hour speakers at its meetings. However, these meetings also include topical "special sessions" of 20 minute talks at which one expects. In 1992 I discovered that male organizers of these special sessions were inviting women at the same 7-8% rate that women were represented among plenary speakers, but that sessions with one or more women organizers had 15-16% women speakers. One might conjecture a number of reasons for this; however, examination of meeting programs and anecdotal information has convinced me that most men were invited only the few obvious "big name" women who could also be hour speakers, while the women organizers included more junior women and lesser luminaries. As chair of the JCW (AMS-ASA-AWM-IMS-NCTM-MAA-SIAM Joint Committee on Women in the Mathematical Sciences) I began to make a fuss and publicize this data. Although the AMS leadership rejected all the proposals of the JCW, they did get the message. In 1994 the percentage of women speakers in special sessions organized by men increased to 11%.

The AMS data did raise nagging questions as to whether women were using lower standards or men deliberately discriminating, although I was convinced that neither was

true. Therefore, I was pleased to receive some data gathered by Juliet Schafer about the elections to Fellow in the ASA (American Statistical Association) in the past 5 years. In short, women fellow were more likely to nominate other women; however, once nominated, women were more likely to be elected. While one should be cautious about drawing sweeping conclusions from such small samples, this data does suggest that men do often overlook good women, but that, if reminded, they also do readily recognize their accomplishments. This is both reassuring and frustrating; for it is often easier to deal with blatant discrimination than with the subtle biases still held by men of good will.

Table 1

See 1990-91 CBMS Survey (MAA Notes #23) p. 36, Table E.6

Table 2

See AMS Notices (Dec. 1995, Vol. 42) p. 1511, Table 6

Classifications Used in Tables 3-6

- I Top 39 PhD Math Depts. from 1982 NRC Survey
- II Next 43 PhD Math Depts. from 1982 NRC Survey
- III Other PhD Math Depts in US
- IV Statistics Departments
- V Applied Math/Operations Research Depts.
- RI Research Institute
- M Master's Granting Math Depts
- B Bachelor's Granting Math Depts

Table 3

% Women among Tenured Doctoral Faculty

	I	II	III	I-III	IV	V	M	B
% F 1991	4.2	5.2	5.5	5	7	3	11	14
% F 1992	3.8	5.3	5.5	5	6	6	12	15
% F 1993	4.9	5.9	6.5	6	6	5	11	15
% F 1994	3.6	6.0	7.6	6	7	5	13	15
# of Depts	39	43	88	170			250	1000
Approx # Faculty	1450	1300	1700		700	250	3000	4000

Table 4
Doctoral Degrees in Math and Statistics in USA
% of Women among those receiving degrees FROM

Year	Math Depts				Stat		US Cit	ALL
	I	II	III	I-III	IV	V		
81-90	15	18	21	17			25	20
F 1991	16	21	21	18	29	21	24	20
F 1992	17	20	29	20	27	21	24	21
F 1993	22	22	24	22	28	26	28	24
F 1994	18	25	22	21	33	13	26	22
F 1995	19	28	23	22	24	26	25	23

Table 5
First Position of New Doctorates by Type of Department
% of Women among those receiving first position AT

	I	II	III	RI	I-III+RI	M	B
1988	13	26	7.5	17	15	18	20
1989	8	21	13	12	12	24	35
1990	12	16	19	9	14	19	18
1991	13	24	17	15	17	21	30
1992	21	17.5	12	16	18	18	30
1993	26	25	26	33	27	24	25
1994	14	17	32	24	21	34	33
1995	20	21	31	18	20	30	34
88-91	11	22	15	13	14	21	26
91-95	21	21	26	22	22	26	31

Table 6: Side-by-Side comparisons from Tables 4 & 5

A. % Female Among Those With

	I	II	III	RI	I-III+RI	M	B
88-91: Degree From	15-16	19-20	21		17-18		
First Position AT	11	22	15	13	14	21	26
92-95: Degree From	19	24	24		21		
First Position AT	21	21	26	22	22	26	31

B. % Female Among Those With

Year	Degree FROM		First Position AT	
	I	I-III	I	I-II+RI
81-90	15	17		
1988			13	15
1989			8	12
1990			12	14
1991	16	18	13	17
1992	17	20	21	18
1993	22	22	26	27
1994	18	21	14	21
1995	19	22	20	20

Table 8
American Statistical Association Election of Fellows 1991-95
 reported by Juliet P. Shaffer

Nominator	Nominee			
	<u>Male-elected</u>	<u>Male-not</u>	<u>Female-elected</u>	<u>Female-not</u>
Male-Fellow	143	200	25	15
Male-Nonfellow	7	18	1	3
Female-Fellow	10	11	13	3
Female-Nonfellow	4	2	1	0

Among those nominated, the % of women elected was higher

<u>Nominees</u>	<u># Elected</u>	<u># Not</u>	<u>% Elected</u>
Male	164	231	42
Female	40	21	66

Women were more successful as nominators

<u>Nominators</u>	<u>Elected</u>	<u>Not elected</u>	<u>% Elected</u>
Male	176	236	43
Female	28	16	64

Women nominators were more likely to nominate women

<u>Nominator gender</u>	<u>Nominee</u>		
	Male	Female	%Female
Male	368	44	11
Female	27	17	39

Table 7: AMS Special Sessions (Math Research)

<u>Meeting</u>	<u>Organizer</u>	<u># of Speakers</u>		<u>% Women</u>
		<u>Women</u>	<u>Total</u>	
Jan. 91, San Francisco		22	244	9%
6 sessions	Wom CoOrg.	12	100	12%
8 sessions	MenOnly	10	144	7%
Jan. 92, Baltimore		18	206	9%
none	Wom CoOrg.	<i>omitted — teaching & history only</i>		
12 sessions	MenOnly	18	206	9%
1992 section meetings		69	812	9%
11 sessions	Wom CoOrg.	28	193	14%
41 sessions	MenOnly	41	619	7%
Jan. 93, SanAntonio		40	404	10%
4 sessions	WomCoOrg.	16	73	22%
17 sessions	MenOnly	24	331	8%
92 & 93 joint summer meetings	25	340	8%	
3 sessions	Wom CoOrg.	8	44	18%
21 sessions	MenOnly	17	296	6%
Jan. 94 Cincinnati		18	287	6%
3 sessions	Women CoOrg.	8	68	12%
12 sessions	Men Only	10	219	5%
Total of all Above		192	2293	8%
27 sessions	Women CoOrg.	72	478	15%
111 sessions	Men Only	120	1815	7%
1994 — All Meetings		171	1478	11.5%
	Women CoOrg	43	280	15%
	Men Only	128	1198	11%