File

ASSOCIATION FOR WOMEN IN MATHEMATICS

NEWSLETTER

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NOW BOYCOTT

The AWM has joined the NOW economic boycott list (against states which have not ratified the ERA). NOW understands our problems with the locations of AMS meetings and will not regard AWM activities at these meetings as a breach of faith. Please support the NOW effort to extend the seven-year deadline on the ratification of the ERA.

AWM PANEL: HELSINKI

The AWM is sponsoring an international panel discussion on women in mathematics at the International Congress of Mathematicians to be held in Helsinki. The discussion will take place August 18, 1978, from 20:00-21:00 in Torthania, Room P III. Judy Green, AWM Vice-President, will represent the United States. The other panelists will be announced in the next issue of the Newsletter.

AWM MEETINGS: OHIO

by Jessie Ann Engle, Associate Professor
Ohio State University, Marion Campus

An AWM Meeting was held at the Ohio State University on March 24, 1978, in conjunction with the 753rd Meeting of the American Mathematical Society. It was billed as the "First Ohio Meeting of the Association for Women in Mathematics," which turned out to be a misnomer, as there have been at least two meetings previously.

There was a panel discussion "On being a woman and a mathematician--some possibilities and responsibilities," moderated by Jessie Ann Engle (The Ohio State University) with Bhama Srinivasan (Clark University) speaking on "Activities of the Boston Area AWM"; Cynthia Yang (Miami University) speaking on "Responsibilities as a Math Educator"; and Suzanne Damarin (The Ohio State University) speaking on "What's Happening at Ohio State". Discussion after the talks centered on the problem of reaching and teaching those, particularly girls and women, who have little mathematical experience, and who avoid mathematics when they can. Several programs for helping students now in college were described. There was general agreement not to use the term "math anxiety" and to support strongly the notion that it is essential to have mathematicians involved in any programs for helping those with mathematics learning problems and mathematics fear problems.

Possible participation in the MAA Women and Mathematics (WAM) secondary school lecturer program was brought up. We were fortunate to have Lenore Blum at the meeting. She described the large network of women mathematicians and scientists who work together in the San Francisco Bay area to encourage 7-12 grade women to stay with mathematics.

A breakfast meeting of the AWM was held April 29 at the University of Akron in conjunction with the MAA Ohio Section spring meeting.

NEW AWM MEMBER-AT-LARGE

Marjorie Stein has resigned her position on the AWM executive committee. Bhama Srinivasan was first runner-up in the recent election and has agreed to fill the position.

SENATOR KENNEDY INTRODUCES WOMEN IN SCIENCE BILL

On February 22, 1978, Senator Edward M. Kennedy (D.-Mass) introduced legislation establishing a ten-year program to encourage the participation of women in scientific and technical careers.

In introducing the Women in Science and Technology Equal Opportunity Act, Senator Kennedy, Chairman of the Senate Subcommittee on Health and Scientific Research, said:

"This legislation is the result of a growing concern that there has been virtually no increase in the number of women in scientific careers over the last fifty years. The percentage of women in the scientific workforce, just 10.4%, has not changed since the 1920's. Moreover, those women who are working as scientists and engineers are earning less than men in every field, at every degree level, at every level of experience and in every employment setting. Further, those women who are trained in scientific and technological fields are experiencing an unemployment rate from three to five times that of men in every field of science.

"Full participation of women in the scientific and technical workforce is not a goal which we can expect to reach in one or two years. Nor is it, however, a goal which we can afford to put off for another fifty years. The Women in Science and Technology Equal Opportunity Act establishes a ten-year program to remove the educational, cultural and institutional barriers which have resulted in the serious underrepresentation of women in science and technology. Rather than focusing on increasing the total scientific and technical workforce, it attaches highest priority to programs which will change the mix of students deciding to pursue higher education in scientific and technical fields.

"It is my conviction that the full implementation of this legislature will enhance this nation's scientific and technical strength, contribute to the standard of excellence which has been the hallmark of our scientific and technical enterprise, and assure that all of our talented students and researchers are given a full opportunity to pursue careers which are among the most challenging and rewarding that our nation has to offer."

Highlights of the Women in Science and Technology Equal Opportunity Act, cosponsored by Senators Williams, Pell, Hathaway and Javits, follows.

TITLE I - - STATEMENT OF FINDINGS, PURPOSE AND POLICY

Findings

The Congress finds that it is in the national interest to promote the full use of human resources in science and technology; that skills in science and mathematics contribute substantially to achievement in a wide range of professional fields; and that men and women have equal potential for excellence in scientific and technical fields.

Declaration of Purpose

It is the purpose of this Act to encourage the full participation of women in scientific, professional and technical fields through programs to improve science education; to promote literacy in science and mathematics and educate and inform the public concerning the importance of the participation of women in science and technology; to increase employment and advancement opportunities for women; and to encourage the participation of minority and handicapped women in science and technology.

Statement of Policy

The Congress declares that it is the policy of the United States to assure equal opportunity for women in education, training and employment in scientific and technical fields and thereby promote the full use of human resources in science and technology.

TITLE II - - EDUCATION

Elementary and Secondary Education Programs

The National Science Foundation is directed to support activities to strengthen elementary and secondary school programs in science and mathematics. The activities supported must demonstrate potential to interest and involve female students and priority is to be given to activities focused on students in grades seven through twelve.

Higher Education Programs

The National Science Foundation is directed to support activities which demonstrate potential to increase the participation of women in courses of study leading to degrees in scientific and technical fields, to encourage women to consider and prepare for careers in science and technology, and to provide traineeship and fellowship opportunities for women in science and technology.

Continuing Education

The National Science Foundation is directed to initiate a program of continuing education and science and engineering, with particular emphasis on the participation and needs of women, to enable persons who (i) have been in the workforce for at least three years, (ii) hold degrees in scientific and technical fields; and (iii) have had careers interrupted for at least three years to acquire new skills and/or strengthen existing skills. The program includes the development of curricula and education techniques in cooperation with industry and academic institutions, as well as fellowships. The fellowships are to be allocated in a manner which attracts highly qualified applicants and encourages the participation of women.

TITLE III -- PUBLIC UNDERSTANDING

Research Program

The National Science Foundation is directed to conduct a comprehensive research program to increase understanding of the potential contribution of women in science and technology and of means to facilitate the participation and advancement of women in scientific and technological careers.

Community Outreach

The National Science Foundation is directed to support community outreach activities designed to attract substantial numbers of young women and girls, to emphasize the importance of equal opportunity in scientific and technical fields, to stimulate the interest of girls and young women in science and mathematics and to encourage girls and young women to continue in and complete courses of study in science and mathematics.

Visiting Women Scientists Program

Each year the Director of the National Science Foundation is to name at least thrity women scientists who will visit secondary schools and institutions of higher education.

TITLE IV -- EQUAL EMPLOYMENT OPPORTUNITY

Agency Responsibility

The head of each Federal agency, national laboratory and federally funded research and development center which supports or conducts research and development is to take action to: (1) prevent discrimination against women in science and technology, (2) increase opportunities for the employment and advancement of women in science, and (3) encourage the participation of minority and physically handicapped women in science. In meeting these requirements action is to be taken designed to increase the number of qualified women in permanent scientific and technical positions, realizing opportunities for promotion, serving on peer review and advisory panels, and serving as principal investigators.

Data Collection Program

The Director of the National Science Foundation is to make an accurate accounting of the participation and status of women in all disciplines and job categories of scientific and technological fields in the public sector, private enterprise and academic institutions.

Demonstrating Projects

The National Science Foundation is to support demonstration projects to encourage the employment and advancement of women in science and technology through: (1) flexible work schedules and job-sharing arrangements, (2) eligibility for fringe benefits and tenure for parttime employees, (3) removal of antinepotism employment conditions and (4) other similar arrangements, including day care, which show promise of encouraging the employment and advancement of women in science.

TITLE V -- GENERAL PROVISIONS

Authorization of Appropriations

For fiscal year 1980 and for each of the succeeding nine fiscal years $25 million is authorized to carry out the provisions for this Act.

July, 1978

DATA ON WOMEN IN SCIENTIFIC RESEARCH: part two

by Betty M. Vetter, Executive Director, Scientific Manpower Commission

TABLE 1: SCIENTISTS AND ENGINEERS IN THE NATIONAL SAMPLE WHO WERE WORKING IN RESEARCH 1974

Source: Characteristics of the National Sample of Scientists and Engineers-1974, Part 2, Employment, NSF 76-323

	TOTAL SCIENTISTS & ENGINEERS				RESEARCH AND DEVELOPMENT				
	Men	% T	Women	% T	Total	Men	% M	Women	% W
All Fields	969,674	95.7	43,412	4.3	302,776	291,931	30.1	10,845	25.0
Phys. Sci.	104,954	93.6	7,125	6.4	49,448	45,603	43.5	3,845	54.0
Math Sci.	22,717	88.0	3,099	12.0	3,284	2,948	13.0	336	10.8
Computer Sci.	47,501	89.5	5,581	10.5	3,136	2,883	6.1	253	4.5
Environ. Sci.	27,111	97.1	815	2.9	7,407	6,893	25.4	514	63.1
Engineers	645,168	99.6	2,599	0.4	211,758	210,636	32.6	1,122	43.2
Life Sci.	62,008	88.6	7,950	11.4	19,427	16,433	26.5	2,994	37.7
Psych.	24,354	74.2	8,465	25.8	2,964	2,279	9.4	685	8.1
Social Sci.	35,861	82.2	7,778	17.8	5,352	4,256	11.9	1,096	14.1

	RESEARCH AND DEVELOPMENT								TYPE OF EMPLOYER			
	In Basic Research				In Applied Research				Federal Government		Other Government	
	Men	% M	Women	% W	Men	% M	Women	% W				
All Fields	35,325	3.6	5,904	13.6	50,677	5.2	3,249	7.5	31,302	10.3	18,655	6.1
Phys. Sci.	16,562	15.8	2,266	31.8	15,423	14.7	1,162	16.3	6,572	13.3	1,807	5.6
Math. Sci.	1,427	6.3	225	7.3	1,089	4.8	93	3.0	738	23.8	231	7.0
Computer Sci.	169	0.4	75	1.3	374	0.8	32	0.6	116	3.7	290	9.2
Environ. Sci.	2,492	9.2	314	38.5	3,577	13.2	184	22.6	1,946	26.3	811	10.9
Engineers	3,843	0.6	36	1.4	19,890	3.1	286	11.0	16,413	7.8	12,813	6.1
Life Sci.	8,133	13.1	2,152	27.1	6,936	11.2	731	9.2	3,807	19.6	1,714	8.8
Psych.	921	3.8	357	4.2	1,010	4.1	224	2.6	417	14.1	183	6.2
Social Sci.	1,656	4.6	479	6.2	2,378	6.6	537	6.9	1,293	24.2	814	15.2

	TYPE OF EMPLOYER											
			Educational Institutions									
	Business, Industry		Total		Univ. & Colleges		Other		Hospitals & Clinics		Non-Profit Orgs.	
All Fields	185,669	61.3	27,286	9.0	26,604	8.8	682	0.2	1,743	0.6	10,785	3.6
Phys. Sci.	20,841	42.1	9,154	18.5	9,019	18.2	135	0.3	618	1.2	2,910	5.9
Math. Sci.	342	10.4	1,284	39.1	1,284	39.1	–	–	–	–	203	6.2
Computer Sci.	2,234	71.2	206	6.6	206	6.6	–	–	–	–	48	1.5
Environ. Sci.	2,386	32.2	1,487	20.1	1,387	18.7	100	1.4	–	–	105	1.4
Engineers	157,186	74.2	3,565	1.7	3,381	1.6	184	–	–	–	5,238	2.5
Life Sci.	2,014	10.4	8,644	44.5	8,489	43.7	155	0.8	835	4.3	957	4.9
Psych.	313	10.6	1,051	35.5	1,012	34.1	39	1.3	290	9.8	573	19.3
Social Sci.	353	6.6	1,895	35.4	1,826	34.1	69	1.3	–	–	751	14.0

WOMEN IN RESEARCH

Overview

The number of women scientists and engineers employed in research and development is only a small fraction (less than 6%) of the total 542,000 scientists and engineers so employed in 1977.[1] Very little information exists on women employed in research below the doctorate level, although the available data indicate that the proportion of all women scientists and engineers who list their principal work activity as research is generally comparable to the proportion of men who make that indication.

Within the National Sample of Scientists and Engineers surveyed in 1974, only 5% are women.[2] This sample is derived from the 1970 Census and therefore includes only persons who were already employed before 1970. It includes scientists and engineers at all degree levels, and no cross tabulations by sex and degree level are available.

Among scientists and engineers in this sample whose primary work activity was basic or applied research, 9.6% were women,[3] a higher proportion than their proportion in the National Sample (Table 1). However, 30% of men and only 25% of women scientists and engineers were engaged in R & D, with the proportions highest in the physical and environmental sciences and lowest in the social sciences, psychology and computer sciences. The proportion varied from less than one percent of all researchers in engineering to 23.1% in psychology.

We cannot distinguish the degree level of women working in research from this National Sample, nor can we distinguish differences between men and women working in research by type of employer. (Table 1)

The National Sample is one of three parts of the National Science Foundation's Manpower Characteristics System (MCS), where data are pulled together in even-numbered years from a combination of the National Sample, a survey of New Entrants since 1970, and some input of new doctorates from the Doctorate Roster. Table 1 shows the number of men and women scientists and engineers in the National Sample in 1974 and the number of each who were working in research. Table 2 shows the number of men and women scientists and engineers in the Manpower Characteristics System and the number who were working in research in 1974.[4] The proportion of women among employed scientists and engineers is higher in the MCS (5.8%) than in the National Sample (4.3%) and the proportion of basic and applied researchers who are women also is higher (13.7% and 8.3%). Both of these data sets include persons at all degree levels, and both sets indicate that women are proportionately more likely than men to be working in basic or applied research and less likely to be in development, with some exceptions by field, as in the life sciences.

TABLE 2: SCIENTISTS AND ENGINEERS IN THE MANPOWER CHARACTERISTICS SYSTEM WHO WERE WORKING IN RESEARCH IN 1974

Source: U.S. Scientists and Engineers, 1974, NSF 76-329

	TOTAL SCIENTISTS & ENGINEERS				RESEARCH AND DEVELOPMENT			
	Men	% T	Women	% T	Men	% M	Women	% W
All Fields	1,556,100	94.2	96,000	5.8	447,200	30.7	23,500	24.5
Phys. Sci.	141,200	90.7	14,400	9.3	59,200	41.9	6,400	44.3
Math. Sci.	37,900	84.6	6,900	15.4	5,900	15.6	900	13.0
Comp. Spec.	100,800	82.7	21,100	17.3	8,700	8.6	1,000	4.7
Environ. Sci.	42,300	95.9	1,800	4.1	11,100	26.2	800	44.4
Engineers	993,500	99.5	5,200	0.5	333,200	33.5	1,800	34.6
Life Sci.	117,600	86.5	18,300	13.5	33,600	28.6	7,600	41.5
Psych.	46,400	75.6	15,000	24.4	6,700	14.4	2,500	16.7
Social Sci.	86,600	86.8	13,200	13.2	18,800	21.7	2,600	19.7

RESEARCH AND DEVELOPMENT

	In Basic Research				In Applied Research			
	Men	% M	Women	% W	Men	% M	Women	% W
All Fields	49,800	3.2	7,900	8.2	83,300	5.3	7,500	7.8
Phys. Sci.	19,000	13.5	2,800	19.4	19,800	14.0	1,700	11.8
Math. Sci.	2,200	5.8	300	4.3	1,900	5.0	300	4.3
Comp. Spec.	1,200	1.2	200	0.9	1,900	1.9	200	0.9
Environ Sci.	4,000	9.5	500	27.8	5,600	13.2	300	16.7
Engineers	5,200	0.5	100	1.9	31,700	3.2	400	7.7
Life Sci.	11,900	10.2	2,800	15.3	13,400	11.4	2,500	13.7
Psych.	2,100	4.5	600	4.0	2,200	4.7	800	5.3
Social Sci.	4,300	5.0	600	4.5	6,800	7.8	1,300	9.8

TABLE 3: PROPORTION OF ALL DOCTORAL SCIENTISTS AND ENGINEERS AND OF WOMEN DOCTORAL SCIENTISTS AND ENGINEERS IN VARIOUS EMPLOYMENT SETTINGS, 1975
Source: National Science Foundation, NSF 77-309

Number	All 262,062	Women 22,386
Business & Industry	25.1%	9.7%
Educational Institutions	58.5	70.3
Colleges & Universities	(56.3)	(64.4)
Two-year Colleges	(1.4)	(3.2)
Elem./Sec. Schools	(0.7)	(2.7)
Hospitals & Clinics	2.9	7.9
Non-profit Organizations	3.2	4.1
Federal Government	8.3	4.7
Other Government	2.0	1.8

As shown in Table 3, women doctoral scientists and engineers are more likely than men to work in educational institutions, hospitals and clinics, and non-profit organizations; and less likely to be employed in business and industry or in government.[8]

We have no data to tell us what proportion of women were working in research within each of these various employment settings or whether the proportions for women are different than for men. We can see that the employment setting of men and women doctorates is significantly different.

There is no substantial difference by field in employer categories of women except in psychology, where only 58% work in educational institutions, and 20% are employed in hospitals and clinics.

Among employed doctoral scientists and engineers in 1975, 26.7% of women and 28.6 of men list basic or applied research as their primary work activity, down slightly from 27.0% and 29% in 1973. (Table 4). An additional 14.3% (15.1% of employed men and 6.1% of employed women) report that they are primarily administrators of research and development.[9] As can be seen in Table 4, doctoral women appear somewhat more likely than men to be working in basic research and somewhat less likely than men to be working in applied research. This is true when all fields are combined, and holds true in the physical sciences, computer sciences, environmental sciences, the life sciences, and the social sciences. In psychology, approximately equal proportions of men and of women are working in both basic and applied research and in the mathematical sciences, a higher proportion of men than of women are engaged in both basic and applied research. There are few women engineers, and statistics on their research participation probably are not as significant as in other fields where they make up a higher proportion of the total.

The National Sample does not include any women who entered the labor force after 1970, and the Manpower Characteristics System has added mostly women at the baccalaureate level who graduated after that date. Because the proportion of women receiving advanced degrees in science and engineering has climbed rapidly during the decade of the seventies, neither the data from the National Sample or from the Manpower Characteristics System in 1974 are as likely to show the picture in 1977 as are studies of doctorate scientists and engineers in 1975.

Doctoral Scientists and Engineers

Although persons holding a doctorate degree make up only one-fifth of the total research manpower, both better and later data are available on doctoral women scientists and engineers than on all women scientists and engineers.

Among all working scientists and engineers in 1974, 7% of men and 15% of women list teaching as their primary activity, while 8.6% of men and 16% of women indicate that their primary activity is in the area of basic or applied research.[5]

Among all doctoral scientists and engineers, about 39,100 where employed in basic research, 33,780 in applied research, 11,600 in development, and 36,815 in the management of R & D in 1975.[6] Only 2.5% of those in the management level are women. The

TABLE 4: NUMBER AND PERCENT OF EMPLOYED DOCTORATES REPORTING WORK ACTIVITY WHO ARE WORKING IN RESEARCH AND DEVELOPMENT, 1973& 1975, BY SEX

Source: Characteristics of Doctoral Scientists and Engineers in the U.S., 1975, NSF 77-309 and Characteristics of Doctoral Scientists and Engineers in the U.S., 1973, Detailed Statistical Tables, NSF 75-312A

	TOTAL NUMBER				RESEARCH AND DEVELOPMENT Total			
	Men	% T	Women	% T	Men	% M	Women	% W
All Fields 1973	194,660	92.3	16,150	7.7	64,992	33.4	4,517	27.9
1975	234,375	91.5	21,808	8.5	78,468	33.5	6,042	27.7
Phys. Sci. 1973	44,579	96.2	1,770	3.8	19,145	42.9	594	33.6
1975	51,969	95.5	2,448	4.5	22,180	42.7	978	40.0
Math. Sci. 1973	11,122	93.5	778	6.5	2,349	21.1	69	8.9
1975	12,805	93.5	894	6.5	2,673	20.9	93	10.4
Computer Sci. 1973	2,727	97.1	80	2.9	1,003	36.8	40	50.0
1975	3,472	96.2	136	3.8	1,404	40.4	72	52.9
Environ Sci. 1973	9,538	97.4	253	2.6	3,393	35.6	118	46.6
1975	11,783	97.2	343	2.8	4,563	38.7	122	35.6
Engineers 1973	34,181	99.6	133	0.4	13,129	38.4	55	41.3
1975	42,403	99.4	239	0.6	16,715	39.4	118	49.4
Life Sci. 1973	48,262	89.5	5,687	10.5	20,144	41.7	2,751	48.4
1975	57,736	88.6	7,399	11.4	23,860	41.3	3,415	46.2
Psych. 1973	19,076	80.5	4,622	19.5	2,555	13.1	491	10.6
1975	23,382	78.8	6,279	21.2	2,811	12.0	675	10.8
Social Sci. 1973	25,073	89.8	2,850	10.2	3,324	13.3	397	13.9
1975	30,762	88.3	4,067	11.7	2,811	9.1	675	16.6

	In basic research				In applied research			
	Men	% M	Women	% W	Men	% M	Women	% W
All Fields 1973	28,872	14.8	3,403	21.0	27,683	14.2	971	6.0
1975	34,624	14.8	4,497	20.6	32,458	13.8	1,321	6.1
Phys. Sci. 1973	9,083	20.4	328	18.5	8,334	18.7	193	10.9
1975	10,485	20.2	659	26.9	9,591	18.5	265	10.8
Math. Sci. 1973	1,372	12.3	41	5.3	813	7.3	23	3.0
1975	1,526	11.9	67	7.5	819	6.4	21	2.3
Computer Sci. 1973	191	7.0	3	3.8	276	10.1	14	17.5
1975	225	6.5	11	8.1	360	10.4	17	12.5
Environ. Sci. 1973	1,844	19.3	95	37.6	1,388	14.6	23	9.1
1975	2,229	18.9	89	25.9	2,155	18.3	28	8.2
Engineers 1973	1,053	3.1	9	6.8	7,020	20.5	30	22.6
1975	1,634	3.9	27	11.3	8,141	19.2	48	20.1
Life Sci. 1973	12,603	26.1	2,367	41.6	7,080	14.7	365	6.4
1975	15,079	26.1	2,932	39.6	8,124	14.1	449	6.1
Psych. 1973	1,365	7.2	295	6.4	994	5.2	162	3.5
1975	1,496	6.4	397	6.3	1,108	4.7	247	3.9
Social Sci. 1973	1,415	5.6	211	7.4	1,778	7.1	159	5.6
1975	1,496	4.9	397	9.8	1,108	3.6	247	6.1

doctorate group makes up about one-fifth of all scientists and engineers employed in research and development and R & D engaged the services of about two-fifths of the total 278,000 doctorate scientists and engineers in 1975.

Among all doctoral scientists and engineers employed in research and development, about 40% are employed in private industry, 37% in academic institutions and 14% in the federal government.[7]

The number of doctoral women scientists and engineers as well as the number and the proportion of women among those working in the areas of research is shown by field in Table 5 for 1973 and 1975. Their proportion of the total climbed from 8.7% to 9.4% in those two years and their proportion of doctorate researchers also increased from 7.2% to 8.0%, although it remains below their proportion in the total doctoral population. This is largely accounted for by the

TABLE 5: DOCTORAL SCIENTISTS AND ENGINEERS IN RESEARCH, BY SEX AND FIELD, 1973 AND 1975
Source: National Science Foundation, NSF 77-309 and NSF 76-312-A

	TOTAL			RESEARCH AND DEVELOPMENT: Total			Basic			Applied		
	All	Women	% T	All	Women	% T	All	Women	% T	All	Women	% T
All Fields 73	244,921	21,261	8.7	69,509	4,517	6.5	32,275	3,403	10.5	26,654	971	3.4
75	277,517	26,118	9.4	84,510	6,042	7.1	39,121	4,497	11.5	33,779	1,321	3.9
Physical Sci. 73	53,425	2,486	4.7	19,739	594	3.0	9,411	382	4.1	8,527	193	2.3
75	59,267	3,097	5.2	23,158	978	4.2	11,144	659	6.0	9,856	265	2.7
Chemists 73	33,881	1,950	5.8	11,434	431	3.8	4,647	262	5.6	5,563	154	2.8
75	38,784	2,502	6.5	14,003	775	5.5	6,158	514	8.3	6,359	218	3.4
Physicists 73	19,544	536	2.7	8,305	163	2.0	4,763	120	2.5	2,964	39	1.3
75	20,483	595	2.9	9,155	203	2.2	4,986	145	2.9	3,497	47	1.3
Math. Sci. 73	13,515	992	7.3	2,418	69	2.9	1,413	41	2.9	836	23	2.8
75	14,542	1,047	7.2	2,766	93	3.4	1,593	67	4.2	840	21	2.5
Math. 73	11,984	915	7.6	2,122	51	2.4	1,310	32	2.4	671	15	2.2
75	12,729	955	7.5	2,383	79	3.3	1,468	59	4.0	633	15	2.4
Stat. 73	1,531	77	5.0	296	18	2.1	103	9	8.7	165	8	4.8
75	1,813	92	5.1	383	14	3.6	125	8	6.4	207	6	2.9
Computer Sci. 73	2,943	90	3.1	1,043	40	3.8	194	3	1.5	290	14	4.8
75	3,662	147	4.0	1,476	72	4.9	236	11	4.7	377	17	4.5
Environ. Sci. 73	11,074	307	2.8	3,511	118	3.4	1,939	95	4.9	1,411	23	1.6
75	12,783	379	3.0	4,685	122	2.6	2,318	89	3.8	2,183	28	1.3
Earth Sci. 73	9,142	236	2.6	2,697	81	3.0	1,379	70	5.1	1,175	11	0.9
75	10,076	279	2.8	3,138	69	2.2	1,352	49	3.6	1,669	18	1.1
Ocean. 73	1,227	54	4.4	502	25	5.0	381	18	4.7	113	7	6.2
75	1,353	67	5.0	640	28	4.4	516	26	5.0	120	2	1.7
Atmos. Sci. 73	705	17	2.4	312	12	3.8	179	7	3.9	123	5	4.1
75	1,354	33	2.4	907	25	2.7	450	14	3.1	394	8	2.0
Engineers 73	37,569	165	0.4	13,184	55	0.4	1,062	9	0.8	7,050	30	0.4
75	44,425	288	0.6	16,833	118	0.7	1,661	27	1.6	8,189	48	0.6
Life. Sci. 73	64,540	7,697	11.9	22,895	2,751	12.0	14,970	2,367	15.8	7,445	365	4.9
75	72,316	9,176	12.7	27,275	3,415	12.5	18,011	2,932	16.3	8,573	449	5.2
Biologists 73	41,035	6,214	15.1	15,439	2,295	14.9	12,066	2,059	17.1	3,195	223	7.0
75	43,754	7,225	16.5	17,352	2,827	16.3	14,074	2,540	18.0	3,022	265	8.8
Agri. Sci. 73	11,893	175	1.5	4,451	63	1.4	983	22	2.2	3,326	38	1.1
75	14,277	214	1.5	5,865	79	1.3	1,323	24	1.8	4,312	48	1.1
Medical Sci. 73	11,612	1,308	11.3	3,005	393	13.1	1,921	286	14.9	924	104	11.3
75	14,285	1,737	12.2	4,058	509	12.6	2,614	368	14.1	1,239	136	11.0
Psychologists 73	28,286	5,777	20.4	2,996	491	16.4	1,660	295	17.8	1,156	162	14.0
75	31,613	7,043	22.3	3,486	675	19.4	1,893	397	21.0	1,355	247	18.2
Social Sci. 73	32,773	3,582	10.9	3,721	397	10.7	1,626	211	13.0	1,937	159	8.2
75	38,251	4,762	12.5	4,827	567	11.7	2,263	313	13.8	2,406	246	10.2
Economists 73	9,678	610	6.3	1,445	97	6.7	352	36	10.2	1,059	58	5.5
75	11,049	720	6.5	1,740	139	8.0	530	34	6.4	1,194	103	8.6
Soc./Anthro. 73	7,455	1,444	19.4	969	174	18.0	608	111	18.3	310	55	17.7
75	8,775	1,960	22.3	1,201	247	20.6	721	151	20.9	480	96	20.0
Other 73	15,640	1,528	10.1	1,307	126	9.6	666	64	9.6	568	46	8.1
75	18,427	2,082	11.3	1,886	181	10.0	1,012	128	12.6	732	47	6.4
No Report 73	796	165	20.7	2	2	100	-	-	-	2	2	100
75	658	179	27.2	4	2	50.0	2	2	100	-	-	-

slightly larger proportion of women than men who were out of the labor force in each of these years. Table 4 deals with similar data but includes only employed scientists and engineers in the totals, and indicates the proportionate segment of each sex engaged in research.

According to the 1975 survey of a sample of all U.S. doctorates, newer graduates are more likely than those from earlier years to be working in research. For the survey in 1975, 30% of all doctoral recipients from 1974 compared to only 25% of those from all earlier years were principally doing research in 1975.[10] This may result from the higher proportion holding postdoctorate appointments a year after receipt of the doctorate.

Footnotes

1. NSF, "R&D Spending Reaches Nearly $41 Billion in 1977," NSF 77-306, p.1
2. NSF, Characteristics of the National Sample of Scientists and Engineers 1974, Part 1, Demographic and Educational, NSF 75-333, p. 7
3. NSF, Characteristics of the National Sample of Scientists and Engineers 1974, Part 2, Employment, NSF 76-323, pp. 53,144
4. NSF, U.S. Scientists and Engineers, 1974, NSF 76-329, pp. 27-28
5. ibid., p. 27
6. NSF, "Largest Increase of Employment of Doctoral Scientists and Engineers is in Industrial Sectors: 1973 to 1975," NSF 76-326, October 28, 1976, p.2
7. NSF, Characteristics of Doctoral Scientists and Engineers in the United States, 1975, NSF 77-309, pp. 50-53
8. ibid., p. 115
9. ibid., p. 62, 115
10. National Research Council, Doctoral Scientists and Engineers in the United States, 1975 Profile, 1976, p. 17

CORRECTIONS TO AMERICAN WOMEN IN MATHEMATICS - THE FIRST PH.D'S

by Judy Green

Another name should be added to the list of women receiving doctorates in mathematics between 1886 and 1911 - - 1893 - Ida Martha Metcalf-Cornell. She did not marry and should be grouped among the women who had non-academic careers as she was a statistician for the City of New York.

Although Gottingen is in Hanover it was referred to as a Prussian university since in 1893 it was in the Prussian Empire and therefore consent for the admission of women to the university had to come from Berlin.

Finally, Grace Chisholm's name was incorrectly spelled.

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RELATED TO REQUIRED MATHEMATICS FOR WOMEN STUDENTS

by Emilie N. Martin, Mount Holyoke College
reprinted from American Mathematical
Monthly 23(1977), pp. 394-398

Thanks to Judy Green for uncovering this article.

In recent months I have been present at many informal discussions in regard to the required work of a college course. The background of such discussions has been the woman's college, and the aim of all the participants has been to find the best method of training the woman student for her part in the work of the world.

Some argue that with the large amount of required work in college a student has too little time in which to sample new courses or to devote herself to a subject for which she shows an aptitude. Their demand is: "Lessen the required work." Others argue that the required work of a college course is seldom more than sufficient to give the solid foundation of general culture upon which the structure of specialized subjects may be safely and permanently reared.

Some of the arguments of the opponents of required mathematics have a curiously familiar sound. To be sure they are not put as crudely as in the world outside the college. There no one hesitates to ask: "What is the use of mathematics for a girl? She will never need more than the elements of arithmetic." The opponents of the subject in a woman's college, especially if they are themselves women, are somewhat wary of asking that time-honored question. They know that they are supposed to claim the same stiff intellectual training for women as for men, so they avoid stating the question in bald terms of sex. Instead they say: "Every student who enters our college has already had several years of mathematics. She has enough for all practical purposes. [This is nothing but the old query revised.] She has already found out whether or not she has an aptitude for the subject. If she cares for it, by all means let her elect it, but if she has no aptitude for the subject, let her take something that is really worth her while instead of wasting her time on a subject she will never use."

My belief is that in spite of her school training, however thorough, the student needs some college mathematics if she is to have an education that will send her out into life with the best general equipment. Mathematics as taught in college is viewed from an angle different from that used in the school-room. This statement does not apply to solid geometry which is only an extension of the plane geometry of the school, and which we hope some day to see put back in its proper place in connection with plane geometry. Take, however, college algebra and trigonometry. Both of these subjects make use of material in the way of ideas and methods that the student has already worked with in school, but this material is handled in a very different way. In her algebra the schoolgirl is concerned almost entirely with processes. She needs but little theory. This little is sometimes explained to her, sometimes she has to remember and reproduce it; but even in the latter case the average student seems to have acquired little grasp of the underlying principles. The consequence is that almost every college freshman has a definite idea of logical reasoning as connected with the subject of geometry, but has little idea of it in connection with any other part of mathematics.

In college the freshman, while once more dealing with symbols and processes that were familiar in school, is now concerned with them from the standpoint of logical combinations. She is applying to them the methods that she had thought confined to geometry, deducing the laws that rule in the subject of her study, and expressing these laws in exact mathematical language. Unless much emphasis is laid upon this side of mathematics in the freshman classes, the claims of its enemies would seem to me to have some foundation. The application of the theory to special problems is necessary as making the subject more vivid and as preparing the student for the application of abstract reasoning to all manner of problems stated in advance; but the true value of the course lies in the training it gives in applying logical processes to the mathematical concepts already familiar from school days.

The average student may not like to find that the mechanical work of her school algebra is replaced in college by this demand upon her reasoning powers, yet she is ordinarily able to master the required amount of freshman mathematics in spite of the extra difficulty. On the other hand there are always a few students to whom such a treatment of mathematics offers an insuperable difficulty, — students who seem to have no idea of logical sequence. In their statement of a geometrical construction no attention is paid to the logical order in which the lines must be drawn, in their statement of a proof the effect precedes the cause, and their minds are so constructed that it seems impossible to convince them of error—one order seems to them as good as another.

This latter class of students is always cited by our opponents as the strongest argument for dispensing with a general requirement of mathematics. "Why torture such a student," they say, "with a subject for which she has no fitness? Why should she not take the subjects for which she shows some aptitude, and let mathematics severely alone?" They usually omit to name the college subjects that do not require at least some modicum of reasoning ability. My feeling, on the contrary, is that no matter what other subjects such a student has to omit, mathematics is one subject absolutely essential to her training. Such a student needs to develop her reasoning powers, and freshman mathematics gives her the best field for practice. Other subjects also require logical ability, but often the logical framework is so obscured by the newness of the material, the unfamiliarity of the nomenclature, and the large number of strange concepts, that the value of the subject from the standpoint of logical training is quite lost.

As for the examples that the opposers of required mathematics quote from time to time of women brilliant in other lines of college work who found themselves totally unable to do even enough work in freshman mathematics to gain a passing grade, I cannot deny that such women may exist, but I wish to record my deep conviction that the majority of these cases have been diagnosed incorrectly. I have seen so many students of mediocre abilities fight their way through the difficulties of required mathematics by sheer common-sense and will power, that I am sure that most of the cases cited so solemnly are cases of "I will not" and not of "I cannot." Because they did not want to master a difficult subject, they were willing to profess incompetence in order to get their own way.

Here the question of sex enters in. Parents and guardians who would suffer keen mortification if the boy for whose education they are responsible were in danger of being rejected by his college because of his failure in required mathematics will condone any shortcomings of the girl in that line with a deprecating, "You know that one does not think so much of a failure in mathematics for a girl." But if sex must be considered in this matter, why not consider it from this other standpoint, namely that the woman is prone to look at everything from the personal side? Her own feelings and her background, or lack of background, color the medium through which she views such subjects as history and literature, and affect her judgments of the facts. The personality of her instructor is a factor in inclining her either to believe or disbelieve his interpretations of the theories of economics or philosophy. Of course there are fundamental laws in all these subjects so well established that the personal element cannot enter into their consideration, but there is also a large body of conclusions from these laws, and it is these conclusions from laws that are sometimes only partially understood that are now in question. Herein lies a great advantage of mathematics; it furnishes the woman student with a subject in which the validity of the conclusions drawn from its laws can easily be tested, and in which the personality of the instructor and the bias of the student can play no part.

The foes of the mathematics requirement then say: "Suppose we grant that our students need training in reasoning, and that as women they need especially training in reasoning upon an impersonal subject. Why not then require a course in a science that shall be the equivalent of the mathematics course in these two respects? Any science gives a student the opportunity to acquire the habit of assembling data, rejecting the extraneous elements, and forming the fitting conclusion. No one can bring any personal prejudice into the interpretation of the phenomena that would be discussed in a required course in any established science." Such a suggestion seems quite to overlook the fact that the only sciences that furnish a training at all equivalent to that of mathematics are those that have mathematics as their foundation. Without a preliminary training in mathematics that almost necessitates the inclusion of trigonometry the most rigorous of sciences can only be treated from the more or less popular point of view. The training so acquired is no doubt valuable, but it cannot satisfactorily replace the required work in mathematics.

Another argument that is often brought against this college requirement is that it gives a subject in which the students have already had several years' experience an unfair advantage over others that are not begun until after college is entered, for each year of required work in a familiar subject postpones the opportunity for them to become acquainted with new subjects in which they may later desire to specialize. This argument does not take into account the fact of which I have already spoken, that even in freshman mathematics the methods are used that must be used in any further study of the subject, so making a break between the character of the work in school and that of the work in college. There are sometimes freshmen whose work in all school studies has been so good that no one subject seems to stand out as more particularly suited to them than another, who first realize that mathematics is the subject that they want for special work when they become acquainted with it afresh in their required work. Without this requirement these students will probably be lost to the subject. They may of course elect mathematics, but, under the false impression that the rather mechanical methods of mathematical work already familiar to them are to be continued in college, they usually prefer entering upon some new subject. Given the recognized attractions of the new and untried, mathematics, if not required, will be at a disadvantage as compared with other subjects.

In addition to this unfortunate effect upon the department of mathematics there are other deleterious effects upon both school and college that seem to me bound to follow the dropping of mathematics from our required work. With the best of intentions on the part of the high-school teachers the grade of work is lower in a subject that is necessary for entrance to college but that is not to be tested in the college class room than it is in a subject that will be so tested. In this I speak from experience. I once saw the effect upon the preparation in algebra, when the college with which I was connected eliminated college algebra from the required work, retaining solid geometry and trigonometry. The school work in geometry was kept up to the standard, for that work was expected to have its class-room test. The college work in trigonometry, however, revealed very clearly the fact that, while the required subjects of algebra had been nominally studied in school, the work had been done very superficially. Furthermore there will be a disastrous change in the quality of the teaching, in so far as it is done by women, if more and more women go out to teach in the schools who have had no mathematics beyond that of their high school course. The lack of background is at least as serious a fault in the teaching of mathematics as in the teaching of any other subject.

In the college itself there will probably be a marked effect upon the science departments. If the student is permitted an unfettered choice of her required science —and no one seems to hesitate a moment as to the necessity of such a requirement — the non-mathematical sciences (if such sciences truly exist) will be overrun with more students than can be handled easily, while the sciences known as mathematical will have only the few students who have brought from their school days a love of mathematics and no dread of its symbols. If the curriculum committee meets this situation by requiring the choice of one of the mathematical sciences, even then there will be a difficulty because of the poor equipment in mathematics possessed by the students. Under such circumstances the science requiring the least amount of mathematical knowledge will naturally be given the preference, and the instructors in even the most mathematical of the sciences will have to confine themselves to a rather popular treatment, if they wish to have a fair proportion of the students elect their subject. In any case much of the value of these sciences as aids to exact thinking will be lost. Of course, for any further work in the selected science some mathematics is necessary, and under the supposed arrangement the student must take in her maturer years in college the fundamental work that she now acquires in her freshman year.

With the two apparently contradictory tendencies at present noticeable—one, to minimize for women even in the science courses in college the necessity of any mathematical training beyond that of the high school course; the other, to encourage these same students to place more and more emphasis upon their work in science, especially in the line of laboratory research,—it is evident that the majority of women workers in science will soon be forced to limit themselves to those fields in science that can be cultivated by means of the very simplest mathematical tools. These fields may be wide and they may be fertile, but by permitting this limitation women are denying to themselves the equality of opportunity with men that has been won for them at such a cost by the pioneers in the struggle for the right of women to share in the higher education.

RUTH MOUFANG, 1905-1977

by Bhama Srinivasan

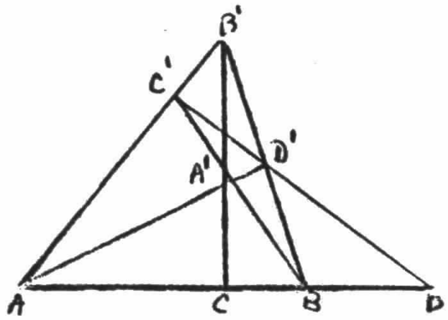
Ruth Moufang was born at Darmstadt on January 10, 1905. Her father was an industrial scientific consultant and he and his wife had two daughters Erica and Ruth, Ruth being the younger child. Ruth had a high school teacher named Schwan who seems to have been one of her early mathematical influences, for she and her sister made the drawings for a monograph of his on the foundations of geometry. In fact, Erica went on to become an artist, and the artistic skills of Ruth are very much in evidence in her drawings in her papers on geometry.

The two sisters appear to have been encouraged in their intellectual interests and pursuits by their family, as was common among the educated German middle class of that period. Moufang studied at the University of Frankfurt from 1925 to 1930 and obtained her Ph.D. under Max Dehn in 1930. She had a Fellowship at Rome in 1931-32 and a Lehrauftrag (Lectureship) at Königsberg in 1932-33. At Königsberg she was encouraged by K. Reidemeister, who was very impressed by her work. In 1934 she returned to Frankfurt and held a Lehrauftrag there until 1936, when she finished her Habilitation thesis. The logical course of events would have been, of course, that she would have become a Privatdozent at this time. However, in March 1938 she received a letter from the Minister of Education of the Third Reich informing her that she could not be appointed to a university teaching position since she was a woman. She was told that the policies of the Third Reich required a professor to be a "leader" of the students in more than just the academic sphere, and since the student body was almost exclusively male, they did not think it feasible to appoint women professors. They did not, however, have any objection to her holding a job which involved only research. Since there were no permanent positions in universities which consisted of research alone and no teaching, Moufang left academic life at this point and joined the Krupps Research Institute in Essen where she remained until 1946. (A few years earlier, Emmy Noether had been dismissed from her position at Göttingen.)

After the war the University of Frankfurt was looking for first-rate mathematicians who had not joined any Nazi organization under Hitler. In 1946 Moufang was given a position as Privatdozent, which she had deserved ten years earlier. Wolfgang Franz was instrumental in getting her the promotions that were her due in succeeding years, and she became a full professor in 1957. She remained at the University of Frankfurt until she retired. She died in Frankfurt on November 26, 1977 after a brief illness, and is survived by her sister Erica.

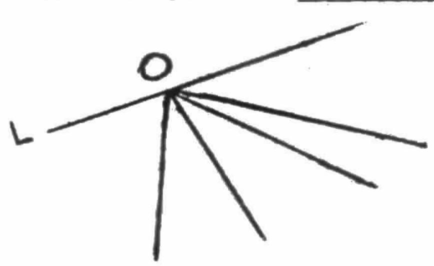
The work that Moufang is best known for was done in the period 1931-37, before she went into industry. During the period that she was with Krupps and soon after returning to Frankfurt she wrote some papers [9], [10], [11], [12] in theoretical physics which were apparently influenced by and arose out of the requirements of her job in industry. Although she did not publish much in later years she had many Ph.D. students who were influenced by her. One can only speculate on what her mathematical output might have been if she had not had to spend ten years in industry at a productive stage in her career.

Moufang's early work consists of a series of papers on the projective plane. Max Dehn had proposed the problem of considering the relationship between various "theorems of configuration" in a projective plane. Assume the axioms of projective geometry as given by Hilbert in his famous work "Grundlagen der Geometrie". A theorem of configuration is a theorem which gives a set of points and lines and relations of the sort that certain points are incident with certain lines and certain points are not incident with certain lines, and then concludes that there are some further incidence relations between some points and lines. For example, the Theorem of Desargues (Theorem D) and the Theorem of Pappus (Theorem P) are theorems of configuration and Theorem D follows from Theorem P. Furthermore, Theorem D is equivalent to coordinatizing the projective plane by a division ring and Theorem P to coordinatizing by a (commutative) field. A further theorem of this type is the Theorem of the Complete Quadrilateral (Theorem CQ) on the uniqueness of the harmonic conjugate, which can be stated as follows. Suppose A, B, C are collinear points. Let A'B'C'D' be a quadrangle (i.e. no 3 of these 4 points are collinear) such that none of these points lies on AB, and such that B'C', A'D' intersect in A, C'A', B'D' in B and A'B', AB in C. Let C'D' meet AB in D. Then (i) D is independent of the choice of A'B'C'D', (ii) D≠C.



A projective plane is said to be generated by a set S of points and lines if we can obtain all the points and lines in the plane out of S by the process of constructing lines joining points and taking intersections of lines. In her first paper [1] Moufang considers a projective plane generated by four points (no 3 of which are on a line) and in which a theorem of configuration (which she calls Satz I) holds, this theorem being equivalent to a special case of Theorem D, where the vertices of one triangle lie on the sides of the other triangle. She shows that the plane can be coordinatized by the rational numbers. A Möbius Net (see [21]) is a Desarguesian plane which can be generated by four points (no 3 of which are on a line); such a plane can be coordinatized by a prime field. Thus, Moufang showed that all configuration theorems of a Möbius Net are consequences of one simple configuration theorem. In two further papers ([3], [4]) she considers projective planes generated by (i) five points 1,2,3,4,5 such that 5 is not on the plane generated by 1 through 4 and 3,4,5 are collinear, (ii) five points, no three of which are on a line, and proves similar results. In this work she uses Hilbert's Axioms of Connection and Order. In the next two papers of the series ([6], [7]) which represent her major work and exhibit a delicate interplay of geometry and algebra, she shows that the validity of Theorem CQ in a projective plane is equivalent to coordinatizing by means of an alternative division ring (of characteristic not 2). Furthermore, she shows that Theorem CQ, or an equivalent theorem which she calls D_9 (yet another special case of Theorem D, where two vertices of a one triangle lie on sides of the other triangle) is definitely weaker than Theorem D (not assuming the Axioms of Order).

A projective plane which can be coordinatized by an alternative division ring is nowadays called a Moufang plane (see [18], [21]). It can be characterized as a projective plane in which a certain transitivity condition holds, which is the following. A perspective collineation of a projective plane is an isomorphism of the plane which fixes every point on an axis L and every line through a center O. If O lies on L we say the collineation is an elation. The transitivity condition is that for each pair (O,L) with O on L the group fixing every point on L and every line through O is transitive on each line through O. J. Tits has recently introduced the concept of a <u>Moufang building</u> in his theory of buildings [22]; this is a building on which some groups act with certain transitivity conditions. Every simple algebraic group gives rise to a building in a natural way; for example, the group SL_3 gives rise to a projective plane. We might ask whether all buildings arise in this way; in rank 2 this is a difficult problem and so it makes sense to look at rank 2 buildings satisfying the Moufang condition. Tits has shown that if a generalized n-gon is Moufang and n≠4 then it arises from an algebraic group.



In her paper [7] Moufang studies the structure of alternative division rings. The definitive theorem on alternative division rings was proved by Bruck and Kleinfeld [15] who showed that any alternative division ring of characteristic not 2 is either associative or a Cayley-Dickson algebra over its center. The non-zero elements of an alternative division ring form a loop in which the identity $(xy)(zx) = [x(yz)]x$ holds. Bruck [14] has called such a loop a Moufang loop. Moufang proved that if 3 elements a,b,c in this loop satisfy $a(bc) = (ab)c$ then they generate a group. Bruck has given another proof of this theorem. As regards more recent work on Moufang loops we might mention the work of Glauberman [16] who studied finite Moufang loops and proved certain theorems which are analogues of theorems in finite group theory.

Manin [19] has introduced Moufang loops in another context. He shows that if V is a cubic hypersurface in some projective space, the set of points of V can be divided into equivalence classes such that the set E of classes can be given the structure of a commutative Moufang loop.

Since ordered division rings arose in her work, Moufang was led to consider the problem of what group rings can be ordered. She showed in [8] that the group ring of the free metabelian group of 2 generators can be embedded in a division ring which can be ordered. This was followed by a paper by B. H. Neumann [20] on ordered division rings of which she wrote the review [MR 11, 311].

Moufang had many intellectual interests besides mathematics. She was very modest about her work; when I contacted her last year about the possibility of writing an article about her work she wrote back that she did not feel it was important enough to be written about.

I am very grateful to W. Magnus for his generous help in providing me with information about Moufang's life and career. I also thank J. Jantzen and W. Ziller for their assistance in translating Moufang's letters to me and the letter from the Third Reich. Finally I dedicate this article to the many mathematicians that I met, young and old, male and female, famous and not so famous, who exclaimed, "You mean Moufang is a woman?!", and inspired me to publicize the fact that yes, indeed, Moufang was a woman.

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NSF ROTATOR PROGRAM

Herbert Harrington, Jr., Director, Office of Equal Employment Opportunity, NSF, has asked mathematical organizations to help in their continuing efforts to increase the responsibilities of women, minorities and the handicapped in the National Science Foundation's Rotator Program . Rotators are appointed by NSF for one or two years in non-career positions at NSF and are chosen from faculties of colleges and universities. Usually a rotator serves as a program director or associate program director. In general, the requirements are a Ph.D. degree and 6 years of scientific research experience. There is no fixed deadline for applications. Individuals applying after all rotators have been selected for a given academic year are considered for the next year. The next assignments will be for September 1978. If you are interested, write to Herbert Harrington, Jr. at NSF, 1800 G Street, N.W., Washington, D.C. 20550 (202/632-9178).

WOMEN IN ENGINEERING: CAREER FACILITATION PROJECT

Women are significantly under represented in the scientific workforce (see statistics in "Women in Scientific Research", this issue). The field of engineering, in particular, has traditionally been perceived as inappropriate for women, to the extent that currently fewer than one percent of the one million engineers in the United States are women. The Women in Engineering Career Facilitation Project at California State University, Northridge, an NSF-supported program directed by Bonita J. Campbell, Assistant Professor of Engineering at CSUN, is designed to aid the career entry of women previously trained in the physical sciences who have not entered the scientific workforce in positions commensurate with their abilities into engineering.

The twelve-month program (from July, 1978 to June, 1979) at CSUN is designed to provide the following: 1) review and update of basics in mathematics, physics, chemistry, and computer programming; 2) knowledge of fundamental engineering core (i.e., mechanics, fluid mechanics, thermodynamics, mechanics of materials, electricity and electronics, engineering economics); 3) part-time employment in a specific engineering discipline to provide internship instruction and experience; 4) intensive academic instruction in a specific engineering discipline; 5) a Certificate in Engineering and the option of completing 30 additional semester units of study to obtain a Master of Science in Engineering; 6) services to obtain financial assistance in addition to that received through the internship; 7) extensive personal counseling and assistance in such matters as family orientation, final job placement, child care, and other personal, family, or job-related problems.

Inquiries should be sent to: Professor Bonita J. Campbell, School of Engineering and Computer Science, California State University, Northridge, CA 91330 (213)885-2146.

OF POSSIBLE INTEREST

AWIS (Association for Women in Science) is compiling a computer registry of women in science. The information will be placed on file in a storage and retrieval system and will be available on a non-confidential basis to persons seeking to fill vacancies on advisory bodies and to potential employers. It will also serve as a source of statistical data. The cost is $10.00 if you can afford it. Forms may be obtained by writing to: AWIS, Suite 1122, 1346 Connecticut Ave. N.W., Washington, D.C. 20036.

Emmy Noether T-shirts are available in sizes S/34-36, M/38-40, L/42-44 and colors lemon yellow or sky blue with royal blue ink. Cost: $5.00 plus 50¢ postage and handling. Send to: New Victoria Printers, 7 Bank Street, Lebanon, N.H. 03766.

DEADLINES

The next deadline for all material for the Newsletter (except ads) is July 8. Copy should be sent to Anne Leggett, Dept. of Math., Univ. of Texas, Austin, TX 78712. Anything else should be sent to AWM, %Dept of Math., Wellesley College, Wellesley, MA 02181. The ad deadline is July 15.

JOB ADS

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