

# NOTICES

OF THE

---

AMERICAN MATHEMATICAL SOCIETY

---

## 1991 Annual AMS-MAA Survey

*(Second Report)*

Enrollments, Faculty Characteristics, and  
Update on New Doctorates, Fall 1991

*Donald E. McClure*

Reprinted from *Notices*, July/August 1992  
© 1992 American Mathematical Society  
Printed in the United States of America

# 1991 Annual AMS-MAA Survey

## (Second Report)

### Enrollments, Faculty Characteristics, and Update on New Doctorates, Fall 1991

Donald E. McClure

#### Highlights

- The final (spring) count of new doctorates shows a total of 1,125 doctorates in the mathematical sciences awarded by U.S. institutions in the period July 1, 1990 through June 30, 1991. This is the largest number since 1971–72 and is 18% higher than the 1989–90 final count.
- The final count shows 478 U.S. citizens among the 1,089 doctoral recipients whose citizenship status is known. This is the largest number of U.S. citizen new doctorates since 1981–82.
- A total of 611 non-U.S. citizens were awarded doctorates in 1990–91. This is the largest number ever reported and represents an increase of 105% over the number of non-citizen new doctorates ten years earlier.
- Recruitment of new faculty showed a sharp decrease in 1990–91 from the level of the previous year. The doctorate-granting mathematics departments in the U.S. attempted to fill 17% fewer full-time positions in 1990–91 than in 1989–90. The master's and bachelor's degree granting mathematics departments sought 34% and 18% fewer new faculty members, respectively, than the year before.
- Unemployment and underemployment among new doctorates reflected the reduced recruitment and increased numbers of new doctorates. Out of 1,070 new doctorates whose employment status is known, 5% were reported to be unemployed and still seeking employment at the time of the spring count. This is the highest level of unemployment at this time of the year since spring data were first reported in 1977. An additional 5% of the new doctorates took part-time employment.
- In the final count, there were 112 women (23%) among the 478 U.S. citizen new doctorates. Among non-U.S. citizens, women represent 17% of the new doctorates. These percentages are substantially lower than the ones for earlier stages of the mathematics education pipeline. Among all U.S. citizen graduate students in U.S. mathematical sciences departments, women constitute 36% of the total. At the undergraduate level, 43% of junior/senior mathematical sciences majors are women.

This is the second report of the 1991 Survey. A first report appeared in the November 1991 *Notices*, pages 1086–1122. It included a report on the 1990–1991 new doctorates, starting salaries, faculty salaries, and a list of names and thesis titles of the 1990–1991 doctorates. A supplementary list of 1990–1991 doctorates appears in the May/June 1992 issue of the *Notices*.

The 1991 Annual AMS-MAA Survey represents the thirty-fifth in an annual series begun in 1957 by the Society. The 1991 Survey was under the direction of the AMS-MAA Data Committee whose members are: Edward A. Connors, Lincoln K. Durst (consultant), John D. Fulton, James F. Hurley, Charlotte Lin, Don O. Loftsgaarden, David J. Lutzer, James W. Maxwell (ex officio), Donald E. McClure (chair), and Donald C. Rung. Comments or suggestions regarding the Annual Survey may be directed to members of the AMS-MAA Data Committee.

For these reports, departments are divided into groups according to the highest degree offered in the mathematical sciences:

**Groups I and II** include the leading departments of mathematics in the U.S. according to the 1982 assessment of Research-Doctorate Programs conducted by the Conference Board of Associated Research Councils in which departments were rated according to the quality of their graduate faculty.<sup>1</sup>

**Group I** is composed of 39 departments with scores in the 3.0–5.0 range  
**Group II** is composed of 43 departments with scores in the 2.0–2.9 range.

**Group III** contains the remaining U.S. departments reporting a doctoral program.

**Group IV** contains U.S. departments (or programs) of statistics, biostatistics, and biometrics reporting a doctoral program.

**Group V** contains U.S. departments (or programs) in applied mathematics/applied science, operations research, and management science that report a doctoral program.

**Group Va** is applied mathematics/applied science; **Group Vb** is operations research and management science.

**Group VI** contains doctorate-granting departments (or programs) in the mathematical sciences in Canadian universities.

**Group M** contains U.S. departments granting a master's degree as the highest graduate degree.

**Group B** contains U.S. departments granting a baccalaureate degree only.

<sup>1</sup>These findings were published in *An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences*, edited by Lyle V. Jones, Gardner Lindzey, and Porter E. Coggeshall, National Academy Press, Washington, D.C., 1982. The information on mathematics, statistics and computer science was presented in digest form in the April 1983 issue of the *Notices*, pages 257–267, and an analysis of the above classifications was given in the June 1983 *Notices*, pages 392–393. For a listing of departments in Groups I and II see the April 1988 *Notices*, pages 532–533.

## I. Introduction

The Annual AMS-MAA Survey collects information each year about departments, faculties, and students in the mathematical sciences in the United States and Canada. This article reports results from two parts of the 1991 Annual AMS-MAA Survey. First, we update information about new doctorates reported earlier in the November 1991 issue of the *Notices* (see pages 1086–1102). Second, we present results about characteristics of faculties and of instructional programs at the undergraduate and graduate levels.

In the interest of continuity in the analysis and presentation, and to make year-to-year comparisons possible, we report the same kinds of information that were included in last year's Second Report. At the same time, we have added new details to the analysis to highlight data of current interest to the mathematics community about recruitment and the employment market.

Further, in order to present a picture of the current status of academic mathematics, we have used the survey responses to make projections to various statistics of the entire population of mathematical sciences departments. In contrast, the reports of the last three Annual Surveys concentrated on reporting year-to-year changes in statistics instead of their absolute values at the time.

The projections of survey responses to the full population are done within strata defined by the survey Groups. For example (see Table 3A), to obtain the total number of Group I faculty who retired or died between fall 1990 and fall 1991 we multiplied the 37 deaths and retirements reported in the 35 Group I responses by the ratio 39/35 of Group size over number of responding departments. Admittedly, this is not the ideal method of estimating population totals since biases may be introduced because of (i) selection bias of the responding departments and (ii) inhomogeneity of departments within the separate Groups. However, the problems of a possible selection bias are mitigated by the generally high response rates to the Annual Survey. In Groups with a lower response rate (Groups M and B), there is greater potential for biased projections. In the future we intend to use population strata defined by institutional enrollment and control (public or private), as was done in the 1990 CBMS Survey of Undergraduate Programs.

The reader may wish to compare results of the Annual AMS-MAA Survey with summary results reported for the 1990 CBMS Survey elsewhere in this issue of the *Notices*.

## II. Update on the 1990–1991 New Doctorates

Information about new doctorates awarded between July 1, 1990 and June 30, 1991 was collected from doctorate-granting departments in late spring 1991 and from a follow-up census of individual degree recipients. The First Report of the 1991 Annual Survey (November 1991 issue of *Notices*, pages 1086–1102) presents the survey results obtained about new doctorates up to the time of that report. Here we update the earlier figures on the basis of more complete returns.

**Table 1: New Doctorates, Fall and Spring Counts**

	1986–87		1987–88		1988–89		1989–90		1990–91	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
U.S.	779	808	804	828	905	919	933	950	1074	1125
Canada	66	66	52	55	53	62	58	59	68	68
Total	845	874	856	883	958	981	991	1009	1142	1193

The spring count of new doctorates (Table 1) shows a total of 1125 doctorates in mathematical sciences awarded by U.S. institutions and 68 awarded by Canadian institutions. The final count for U.S. institutions is an 18% increase from the previous year and is the highest number reported since 1971–72.

Citizenship status is known for 1089 of the new doctorates awarded by U.S. institutions. The total of 478 U.S. citizens is 17% greater than last year's spring count, and is the highest number reported since 1981–82. The percentage of U.S. citizens (44%) remains near its all-time low of 43%, largely because the increase in non-U.S. citizen new doctorates is keeping pace with the increase of U.S. citizens.

The number of non-U.S. citizen new doctorates has risen steadily since 1978–79. The final spring count shows 611 non-U.S. citizens, an increase of 14% above last year's spring count. Over the last ten years the number of non-U.S. citizen new doctorates has increased 105%. Most of the increase has occurred during the last five years. From 1980–81 to 1985–86 the number of non-U.S. citizen new doctorates increased 25%, based on counts reported in the fall analysis. From 1985–86 to 1990–91, the number of non-U.S. citizens increased by 65%. The most substantial increases are due to the new doctorates who are citizens of eastern Asian countries. Over the ten-year period, this number has increased by 300%, the compound effect of a 61% increase from 1980–81 to 1985–86 and a 148% increase from 1985–86 to 1990–91.

Among the U.S. citizens, the final tally shows 112 women and 366 men. The percentage of women (23%) among the U.S. citizens is substantially higher than the percentage (17%) among non-U.S. citizens.

Employment data for new doctorates, broken down by the field of their thesis research, are updated in Tables 2A and 2B (see next page). The employment matrices report the status of the 1142 new doctorates included in the fall count; employment status is known for 1070. (The employment matrix includes new doctorates from Canadian departments.) Overall, the majority (60%) of new doctorates assumed academic positions in the U.S., the same as the percentage reported last year. The percentage assuming academic positions, regardless of country, is 76%. The proportions assuming academic vs. nonacademic positions vary greatly with the field of thesis. For example, in probability and statistics, which includes 170 doctoral recipients from statistics and biostatistics programs, a greater proportion assume nonacademic positions. The First Report shows

**Table 2A: Employment Status of 1990–1991 New Doctorates in the Mathematical Sciences, updated March 1992**

Type of Employer	Field of Thesis										TOTAL
	Algebra/ Number Theory	Real or Complex Analysis	Geometry/ Topology	Logic	Probability/ Statistics	Applied Math	Discr. Math/ Combinatorics	Numerical Analysis	Linear or Non-linear Optim.	Other	
Group I	24	21	35	6	5	16	1	2	1	4	115
Group II	5	9	9	1	5	11	2	4	1	2	49
Group III	10	9	16		9	10	4	1	1	3	63
Group IV					37	3					40
Group V					6	7	1	2	1	2	19
Masters	21	13	8		17	11	8	3	2	8	91
Bachelors	20	18	31	2	15	20	6	5	1	18	136
Two-year Colleges	5	4	1		3	7	1			3	24
Other Academic Departments	3	1	1	3	19	16	2	2	2	18	67
Research Institutes	5	3	5		9	3			1	7	33
Government		2	1		9	13	2	1		4	32
Business and Industry	8	5	6	2	55	17	8	6	13	16	136
Canada, Academic	11	4	10		8	13	6	1	1	9	63
Canada, Nonacademic							1	1			2
Foreign, Academic	15	22	11	4	29	14	1	2	5	12	115
Foreign, Nonacademic		2			5	1	1			3	12
Not seeking employment	4	2	2		4		1	2		4	19
Still seeking employment	5	7	8	1	13	9	4	2	1	4	54
Unknown (U.S.)	4	3	5		1	2		1	2	2	20
Unknown (non-U.S.)*	8	11	3	1	12	4	2	5	2	4	52
Total	148	136	152	20	261	177	51	40	34	123	1142

\*Non-U.S. citizens who returned to their country of citizenship and whose status is reported as "unknown" or "still seeking employment".

286  
318  
168

**Table 2B: Employment Status of 1990–1991 New Doctorates in the Mathematical Sciences Females Only, updated March 1992**

Type of Employer	Field of Thesis										TOTAL
	Algebra/ Number Theory	Real or Complex Analysis	Geometry/ Topology	Logic	Probability/ Statistics	Applied Math	Discr. Math/ Combinatorics	Numerical Analysis	Linear or Non-linear Optim.	Other	
Group I	3	4	3	2		2				1	15
Group II		3	1		2	3	1	1	1		12
Group III	2		3		2	4					11
Group IV					9						9
Group V					3					1	4
Masters	7	1	2		4	3	2				19
Bachelors	8	5	15		3	4	1	2		3	41
Two-year Colleges	1					2					3
Other Academic Departments	1	1			6	3	1	1	1	7	21
Research Institutes					2					3	5
Government					2		1			2	5
Business and Industry		1			16	3		1	3	3	27
Canada, Academic					1		1		1	1	4
Canada, Nonacademic							1				1
Foreign, Academic	2	4		1	9	3		1		3	23
Foreign, Nonacademic											
Not seeking employment	1		1		1			1		1	5
Still seeking employment	1			1	5		2				9
Unknown (U.S.)		1	3		1						5
Unknown (non-U.S.)*	2	1			4	1					8
Total	28	21	28	4	70	28	10	7	6	25	227

\*Non-U.S. citizens who returned to their country of citizenship and whose status is reported as "unknown" or "still seeking employment".

additional differential patterns of employment depending on the type of department awarding the degree and on the citizenship status of the new doctorate.

The updated matrix shows 54 new doctorates (5%) still seeking employment. This figure does not include non-U.S. citizens who are known to have returned to their country of origin and who may be still seeking employment outside the U.S. At the same time a year ago, 2% of the 1989-90 new doctorates were reported as still seeking employment. As is widely known, the level of unemployment is worse for the 1990-91 cohort of new doctorates than is customary. In fact, the unemployment reported in the spring analysis has never exceeded 3% since the number was first reported in 1977.

The survey responses also reveal other indicators of the difficult employment market that are hidden in Tables 2A and 2B. The proportion of individuals in academic positions that are not tenure-eligible is high. Based on 434 individual responses from holders of academic positions, 50% report that their position is not tenure-eligible. Almost half of the nontenure-eligible positions have contract durations of one or two years. Seventy-two new doctorates (11 from Canadian departments and 61 from U.S. departments) report that they are employed by the same institution that awarded their degree. Table 2A shows 286 new doctorates holding positions in a doctorate-granting department in the U.S. (Groups I-V). Out of these 286 individuals, 45 received their degree from the same institution.

Fifty-two of the jobs tallied in Table 2A are part-time positions.

Individual respondents also provided information about jobs for which they applied. Among 436 new doctorates who reported applying for an academic position, the average number of applications made for academic positions was 5.7 and the average number of applications made for nonacademic positions was 5.6. Among 159 new doctorates who reported applying for a nonacademic position, the average number of applications made for academic positions was 4.6 and the average number of applications made for nonacademic positions was 13.5.

Finally, we note that the names of the 1990-91 new doctorates and their thesis titles were published in the *Notices* (November 1991 and a supplemental list in May/June 1992).

### III. Faculty Characteristics

Information about faculty and instructional programs was obtained from the Departmental Profile Survey sent to mathematical sciences departments in fall 1991. The First Report contained information collected earlier about faculty salaries.

Table 3A shows attrition due to deaths and retirements of faculty in mathematical sciences. Numbers of retirements tend to fluctuate substantially from year to year. Presumably these rates are sensitive to the effects of early retirement plans, and the attrition rates for a Group as a whole can show the effects of perturbations introduced by only a few institutions. The overall

Table 3A. Faculty Attrition\*

	I	II	III	I+II+III	GROUP		M	B	VI	<i>1+II+III+M+B</i>
					IV	V				
Number of full-time faculty who retired or died (Group total)	41	25	52	118	16	3	116	132	23	<i>366</i>
% of full-time faculty in Group	2.0%	1.4%	2.1%	1.9%	1.4%	0.6%	2.0%	1.6%	1.7%	
Number of usable responses**	35 (90%)	41 (95%)	80 (91%)	156 (92%)	52 (70%)	22 (59%)	151 (58%)	451 (46%)	20 (65%)	

\* Number and percentage of full-time faculty who were in the department in fall 1990 but were reported to have retired or died by fall 1991.

\*\* The number of usable returns varies for different sections of the Departmental Profile Survey. The response rates reported here apply to faculty size and recruitment data only. All counts are projected from the survey response to the respective Group as a whole.

Table 3B. Faculty Recruitment

	I	II	III	I+II+III	GROUP		M	B	VI
					IV	V			
Number of open positions (Group total)*	181	89	172	441	81	30	316	558	65
Doctoral hires, male	144	68	113	326	47	17	175	308	50
Doctoral hires, female	26	5	18	49	14	2	45	94	8
Nondoctoral hires, male	1	1	3	5	0	0	12	70	0
Nondoctoral hires, female	0	1	3	4	0	0	19	35	0
Number of unfilled positions	9	14	34	57	20	12	66	51	8

\* Number of positions under recruitment in 1990-1991 to be filled for 1991-1992.

Subtotals of rounded table values may exhibit rounding errors.

Annual AMS-MAA Survey

**Table 3C. Faculty Size, Fall 1991, and Percentage Change in Size, Fall 1990 to Fall 1991**

	GROUP								
	I	II	III	I+II+III	IV	V	M	B	VI
Total number of full-time faculty (Group total)	2059	1825	2461	6345	1157	572	5813	8214	1367
% change in full-time faculty	-0.0%	0.1%	-2.0%	-0.8%	0.1%	1.5%	-1.4%	0.1%	0.1%
Number of doctoral full-time faculty	2030	1710	2268	6008	1123	563	4444	5550	1280
% change in doctoral full-time faculty	-0.3%	-0.4%	-1.5%	-0.8%	0.1%	1.8%	0.2%	1.7%	2.6%
Number of tenured doctoral full-time faculty	1521	1336	1650	4507	756	372	3241	3687	1015
% change in tenured doctoral full-time faculty	-1.9%	-0.0%	-1.4%	-0.1%	-1.1%	2.8%	2.1%	0.2%	-2.2%
Number of untenured, tenure-eligible doctoral full-time faculty	203	278	521	1002	276	126	1080	1646	167
% change in untenured, tenure-eligible doctoral full-time faculty	-0.4%	-1.1%	-2.2%	-1.3%	2.2%	-0.5%	-1.5%	2.7%	1.9%
Number of untenured, nontenure- eligible doctoral full-time faculty	306	95	97	499	91	66	123	218	98
% change in untenured, nontenure- eligible doctoral full-time faculty	10.9%	8.3%	-18.5%	3.2%	-7.2%	2.6%	-9.0%	-5.7%	57.5%
Number of part-time faculty	113	201	596	910	78	74	1813	3494	53
% change in part-time faculty	3.1%	-18.6%	3.6%	-2.6%	-8.3%	10.0%	-2.7%	3.1%	-15.0%

**Table 3D. Women Faculty Size, Fall 1991, and Percentage Change in Size, Fall 1990 to Fall 1991**

	GROUP								
	I	II	III	I+II+III	IV	V	M	B	VI
Total number of full-time women faculty (Group total)	134	191	306	630	167	44	1200	1982	105
% change in full-time women faculty	0.0%	2.3%	-5.1%	-1.9%	-0.9%	0.0%	-0.7%	3.7%	-4.2%
Number of doctoral full-time women faculty	126	125	197	448	155	42	595	936	88
% change in doctoral full-time women faculty	4.6%	0.8%	-4.8%	-0.7%	-1.8%	4.2%	0.3%	7.6%	-3.4%
Number of tenured doctoral full-time women faculty	64	70	90	224	53	15	361	503	50
% change in tenured doctoral full-time women faculty	-6.6%	-1.5%	-1.2%	-2.8%	2.8%	0.0%	5.6%	15.1%	3.2%
Number of untenured, tenure-eligible doctoral full-time women faculty	14	37	91	142	77	19	207	378	33
% change in untenured, tenure-eligible doctoral full-time women faculty	-18.8%	2.9%	-5.7%	-5.1%	-1.8%	0.0%	-2.4%	0.0%	-4.6%
Number of untenured, nontenure- eligible doctoral f-t women faculty	48	18	15	81	26	8	26	55	6
% change in untenured, nontenure- eligible doctoral f-t women faculty	38.7%	6.2%	-17.6%	15.6%	-10.0%	25.0%	-31.8%	0.0%	-33.3%
Number of part-time women faculty	37	70	212	319	24	7	729	1455	8
% change in part-time women faculty	-5.7%	-20.2%	3.8%	-3.9%	30.8%	33.3%	-1.9%	5.3%	-50.0%

attrition rate for Group I, for example, nearly doubled from the rate a year ago, and this mainly reflects a number of retirements that more than doubled in Group I. At the same time, the number of retirements from departments in Group B in 1990–91 is approximately half the number of the year before.

Table 3B reports information on the number of full-time faculty positions that departments attempted to fill during 1990–91. Here there is a striking difference from the previous year. In every Group the number of positions recruited is significantly lower than in 1989–90. Overall, Groups I through III (the doctorate-granting mathematics departments) sought 17% fewer new faculty in 1990–91 than in 1989–90. Group III was especially hard hit; in 1990–91 Group III departments recruited 26% fewer new faculty than the year before. Similar cuts affected the other Groups: Group IV recruited 33% fewer new faculty; Group M sought 34% fewer new faculty; and Group B recruitment was down by 18%. We believe that these data indicate the effect of economic conditions on the difficult employment market for doctoral mathematical scientists.

Table 3B also provides information about hiring patterns for doctoral faculty. Among doctoral new hires, 13% of the new hires in Groups I, II, and III combined are women and 22% of the new hires in Groups M and B combined are women. Both of these percentages are marginally lower than last year.

Tables 3C and 3D describe the makeup of faculties by sex, tenure status, and doctoral/nondoctoral degree in the different Groups. These data show that there have not been substantial changes since the previous year in total faculty size. The only significant variations from the 1990 Annual Survey occur among numbers of untenured, nontenure-eligible faculty. Traditionally, among mathematics departments, Groups I and II employ larger numbers of faculty in this category relative to

their total doctoral faculty size, and Groups III, M, and F employ smaller numbers. From 1989–90 to 1990–91, there were very substantial increases in untenured, non tenure-eligible full-time faculty in Groups I and II and similarly substantial decreases within Groups III, M, and B. These changes may also reflect effects of the difficult employment market.

Tables 3C and 3D together show proportions of women faculty in different categories of tenure and employment status. For example, the proportion of women among full-time faculty in mathematics departments (Groups I, II, III, M, and B) is 19% (3812/20372) and the proportion among full-time faculty in statistics departments (Group IV) is 14% (167/1157). These percentages echo the results of the 1990 CBMS Survey summarized elsewhere in this issue of the *Notices*.

#### IV. Enrollment Profile and Undergraduate Majors

The Departmental Profile Survey collects information about enrollments and distribution of instructional effort in mathematical sciences departments.

Table 4A summarizes enrollment data for undergraduate and graduate courses. Undergraduate enrollments were generally stable and graduate enrollments increased modestly from 1989–90 to 1990–91.

Table 4A, together with Table 3C, provides illuminating statistics about the instructional load of mathematical sciences faculty. The CBMS Surveys have reported substantial increases in the number of enrollments per full-time faculty member over the past 20 years. Tables 4A and 3C show results consistent with the 1990 CBMS Survey and they show the variation of instructional load between Groups. The respective ratios by Group of enrollment per full-time faculty member (FTFM) are:

**Table 4A. Undergraduate and Graduate Enrollments (thousands), Fall 1991, and Percentage Change in Enrollments, Fall 1990 to Fall 1991**

	GROUP							
	I	II	III	IV	V	M	B	VI
Number of undergraduate course enrollments (thousands)	175	177	316	61	21	631	785	161
% change in undergraduate course enrollments	-0.8%	-0.5%	-1.4%	-0.5%	4.8%	0.5%	2.0%	11.0%
Number of graduate course enrollments (thousands)	10	8	12	22	9	20	2	2
% change in graduate course enrollments	0.7%	3.4%	5.7%	3.8%	4.1%	3.3%	-5.6%	78.0%
Number of usable responses	34 (84%)	41 (95%)	79 (90%)	51 (79%)	22 (59%)	149 (57%)	442 (45%)	20 (65%)

\* The number of usable returns varies for different sections of the Departmental Profile Survey. The response rates reported here apply to Tables 4A through 4C on enrollments and class size only. All counts are projected from the survey response to the respective Group as a whole.

Group I, 89.8 enrollments per FTFM; Group II, 101.4 enrollments per FTFM; Group III, 129.2 enrollments per FTFM; Group IV, 71.7 enrollments per FTFM; Group V, 52.4 enrollments per FTFM; Group M, 112.0 enrollments per FTFM; Group B, 95.8 enrollments per FTFM; and Group VI, 119.2 enrollments per FTFM.

Table 4B provides a summary of the largest components of undergraduate mathematics instruction. There are no striking changes from the 1990 Annual Survey. Table 4C reports average class size by type of course and survey Group.

In every group except Group V (applied mathematics and operations research departments), the number of undergraduate majors increased (Table 4D).

**Table 4B. Distribution of Undergraduate Enrollments, Fall 1991**

COURSES	GROUP						
	I	II	III	I+II+III	M	B	VI
Remedial mathematics*, %	10.0	7.5	11.0	9.8	16.7	18.4	1.7
Remedial mathematics + precalculus, %	24.2	28.3	38.7	32.1	34.2	33.1	4.6
Remedial mathematics + precalculus + calculus, %	63.8	59.3	62.1	61.8	49.2	47.4	36.6

\* Arithmetic, high school algebra, geometry.

**Table 4C. Average Class Size, Fall 1991**

COURSES	GROUP							
	I	II	III	IV	V	M	B	VI
Remedial mathematics*	36	31	39		23	32	28	46
Traditional precalculus	31	38	44			36	30	76
First-year calculus	35	42	40			32	25	81
Undergraduate statistics	33	39	37	45	55	33	26	44
Undergraduate computer science	36	21	23	26	57	22	19	22
Other undergraduate courses for majors	30	31	28			21	15	32
Other undergraduate courses (not for majors)	35	36	42			33	28	59
Graduate courses	10	10	9	17	18	10	10	4
All courses	30	32	34	31	31	29	24	40

\* Arithmetic, high school algebra, geometry.

**Table 4D. Undergraduate Junior/Senior Majors (hundreds) and Undergraduate Women Junior/Senior Majors (hundreds), Fall 1991, and Percentage Change in Majors, Fall 1990 to Fall 1991**

	GROUP							
	I	II	III	IV	V	M	B	VI
Number of junior/senior majors (hundreds)	55	45	70	17	23	219	279	87
% change in junior/senior majors	0.5%	7.5%	6.4%	1.6%	-6.9%	3.1%	6.2%	2.0%
Number of women junior/senior majors (hundreds)	19	19	32	6	7	100	123	27
% change in women junior/senior majors	-5.6%	10.1%	11.2%	-5.6%	-7.7%	5.3%	7.2%	2.4%
Number of usable responses*	34 (87%)	40 (93%)	72 (82%)	50 (68%)	21 (57%)	125 (48%)	383 (39%)	14 (45%)

\* The number of usable returns varies for different sections of the Departmental Profile Survey. The response rates reported here apply to undergraduate major data only. All counts are projected from the survey response to the respective Group as a whole.

### V. Graduate Student Profile

Tables 5A through 5C summarize tallies of graduate students derived from the 1991 Departmental Profile Survey.

Numbers of first-year graduate students increased by 2.6% overall in the doctorate-granting U.S. mathematics departments. However, the increase was not experienced by all Groups. Group III showed a substantial increase (12.8%), while Group I showed a decrease in the number of first-year students (-6.8%). Last year the direction of these changes was reversed; commonly, Groups that experience a large increase in new students in one year will have a decrease in first-year students the following year. Group M follows this pattern also, with a 5.6% drop in new students in 1991 following a 4.3% increase the previous year.

Table 5B gives the numbers of women graduate students by Group. In the U.S. mathematics departments (Groups I, II, III, and M) 35.2% of the first-year students are women. Table 4D shows that among undergraduate majors in mathematics, 43.8%

are women. It is interesting to note that the pipeline for women in statistics does not narrow in the same way that it does in mathematics. While 38.0% of the junior/senior majors in Group IV departments are women, 45.2% of the first-year graduate students in Group IV are women. Among U.S. citizens, women represent 47.7% of the first-year graduate students in Group IV in 1991.

Table 5C records the numbers of U.S. citizen graduate students by Group. In Groups I, II, III, and M, the proportion of U.S. citizens among first-year students is approximately the same as the proportions reported a year ago for the 1990 Annual Survey. However, in Group IV 57.6% of the first-year students in fall 1991 were U.S. citizens, compared to 51.2% in the previous year.

In all doctorate-granting departments, the percentage of U.S. citizens among graduate students is substantially higher than their percentage among new doctorates.

**Table 5A. Full-time Graduate Students, Fall 1991, and Percentage Change in Graduate Students, Fall 1990 to Fall 1991**

	GROUP						
	I	II	III	IV	V	M	VI
Total number of full-time graduate students	3751	2635	3440	3085	2134	3285	1353
% change in full-time graduate students	-1.0%	4.8%	2.8%	3.4%	14.8%	-1.3%	6.0%
Number of first-year graduate students	928	771	1172	961	657	1257	416
% change in first-year graduate students	-6.8%	1.7%	12.8%	-0.3%	9.7%	-5.6%	9.9%
Number of usable responses*	35 (90%)	41 (95%)	75 (85%)	51 (69%)	21 (57%)	130 (50%)	19 (61%)

\* The number of usable returns varies for different sections of the Departmental Profile Survey. The response rates reported here apply to Tables 5A through 5C on graduate student enrollments. All counts are projected from the survey response to the respective Group as a whole.

**Table 5B. Women Full-time Graduate Students, Fall 1991, and Percentage Change in Women Graduate Students, Fall 1990 to Fall 1991**

	GROUP						
	I	II	III	IV	V	M	VI
Total number of full-time women graduate students	855	770	1143	1149	564	1399	276
% change in full-time women graduate students	-1.5%	6.2%	3.3%	3.7%	20.8%	-0.4%	9.0%
Number of first-year women graduate students	260	264	417	434	204	514	101
% change in first-year women graduate students	-2.9%	7.2%	9.9%	18.2%	13.7%	-7.6%	6.9%

**Table 5C. U.S. Citizen Full-time Graduate Students, Fall 1991, and Percentage Change in U.S. Citizen Graduate Students, Fall 1990 to Fall 1991**

	GROUP					
	I	II	III	IV	V	M
Total number of full-time U.S. citizen graduate students	1978	1489	2073	1531	1006	2267
% change in full-time U.S. citizen graduate students	1.0%	9.2%	4.1%	7.5%	12.8%	-3.2%
Number of first-year U.S. citizen graduate students	509	491	759	554	317	924
% change in first-year U.S. citizen graduate students	-9.3%	4.0%	14.7%	7.0%	-1.1%	-4.2%

### Acknowledgment

The Annual AMS-MAA Survey attempts to provide an accurate appraisal and analysis of various aspects of the academic mathematical scene for the use and benefit of the mathematics community. Every year, college and university departments in the United States and doctorate-granting departments in Canada are invited to respond. The Annual Survey relies heavily for the quality of its information on the conscientious efforts of the dedicated staff members of these departments. On behalf of the AMS-MAA Data Committee and the Annual Survey staff, I thank the many secretarial and administrative staff members in the mathematical sciences departments for their cooperation and assistance in responding to the survey questionnaires. Monica Foulkes has made essential contributions to the coordination of the Annual Survey, management of the work of the Data Committee, full computerization of the data analysis, and preparation of the reports. The Data Committee expresses special thanks to her.

### Bibliography

- Albers, D. J., Loftsgaarden, D. O., Rung, D. C., and Watkins, A. E. *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences and Computer Sciences in the U.S.* 1990–1991 *CBMS Survey*, MAA Notes No. 23, 1992.
- American Association of University Professors. *The Annual Report on the Economic Status of the Profession 1990–1991*, Academe: Bulletin of the AAUP, March/April 1991, Washington, DC.
- Bowen, W. G. and Rudenstine, N. L. *In Pursuit of the PHD*, Princeton, NJ: Princeton University Press, 1992.
- Commission on Professionals in Science and Technology. Occasional Papers, prepared by Betty M. Vetter. *Who is in the Pipeline? Science, Math and Engineering Education* (90–2), July 1990. *Recruiting Doctoral Scientists and Engineers for the Twenty-first Century* (90–3), October 1990. *Women in Science and Engineering, An Illustrated Progress Report* (90–4), December 1990. *Recruiting and Retaining a Diverse, Quality Technical Workforce* (91–1), April 1991. *By the Year 2000: Myths and Facts* (91–2), July 1991. *Cultural Diversity in Higher Education* (91–3), October 1991. *Supply and Demand in Science and Engineering* (91–4), January 1992. CPST, Washington, DC.
- . *Salaries of Scientists, Engineers and Technicians: A Summary of Salary Surveys*, 15th Ed., Washington, DC, 1991.
- . *Professional Women and Minorities—1991*. Washington, DC, 1991.
- Jackson, A. "Top Producers of Women Mathematics Doctorates," *Notices of the AMS*, September 1991.
- Madison, B. and Hart, T. A. *A Challenge of Numbers: People in the Mathematical Sciences*. National Academy Press, Washington, DC, 1990.
- McClure, D. E. "Academic Hiring Survey, 1991–1992," *Notices of the AMS*, April 1992.
- National Research Council. *Summary Report 1990, Doctorate Recipients from U.S. Universities*, National Academy Press, Washington, DC, 1991.
- . *Moving Beyond Myths: Revitalizing Undergraduate Mathematics*. National Academy Press, Washington, DC, 1991.
- . *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, National Academy Press, Washington, DC, 1989.
- . *Renewing U.S. Mathematics: A Plan for the 1990s*. National Academy Press, Washington, DC, 1990.
- National Science Board. *Science and Engineering Indicators—1991*. U.S. Government Printing Office, Washington, DC, 1991 (NSB 91-1).
- National Science Foundation. *Science and Technology Data Book, 1990*, NSF 90-304, Washington, DC, 1990.
- . *Science and Engineering Degrees: 1966–89*, NSF 91–314, Washington, DC, 1991.
- . *Science and Engineering Doctorate Awards: 1991*, NSF 92–309, Selected Data Tables, Washington, DC, 1992.
- . *Science and Engineering Doctorates: 1960–1989*, NSF 90–320, Detailed Statistical Tables, Washington, DC, 1990.
- . *Academic Science and Engineering: Graduate Enrollment and Support*, 1989, NSF 90–324, Detailed Statistical Tables, Washington, DC, 1991.
- . *Selected Data on Graduate Students and Postdoctorates in Science and Engineering*, Fall 1989. Selected Pamphlet No. 11: Institutional Listings (NSF 90–324–11), Selected Pamphlet No. 12: Postdoctorates and Other Nonfaculty Research Staff (NSF 90–324–12), Washington, DC, 1990.
- . *Survey of Mathematics and Statistics Departments at Higher Education Institutions*. Higher Education Surveys Report, Survey Number 5, December 1990.