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SEVENTEENTH

ANNUAL AMS SURVEY

This is a reprint of the second of three articles that appeared in the *Notices of the American Mathematical Society* in October, November, and December 1973. Reprints of the other two articles are available upon request.

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SEVENTEENTH ANNUAL AMS SURVEY

Mathematical Science Faculty and Enrollments

by John Jewett

This article is to report on certain aspects of the 17th Annual AMS Survey. It supplements the salary data and other related information contained in the October issue of these *Notices*. This year's survey was more extensive than in previous years, largely in order to investigate various conjectures and anecdotal reports of increased class size, rising teaching loads, and various conflicting opinions concerning enrollment trends.

The results can be summarized succinctly as follows: There has been no significant evidence of increased teaching loads; average class size has gone down slightly; mathematical science classes have declined in enrollment by two percent at the undergraduate level and seven percent at the graduate level; faculty size is essentially unchanged; there has been a very slight increase in the number of graduate students in mathematics and a larger increase in the number of graduate students in other mathematical science departments.

Our results are based on data collected in the summer of 1973 from chairmen of mathematical science departments. The data were collected and tabulated under the direction of Dr. Lincoln K. Durst. The numbers appearing in the tables are estimates of national totals as derived from sample data. Any number representing some national total and appearing in one of the tables which follow was estimated separately for each of seven groups of U.S. departments* by multiplying the total reported by the actual respondents in that group by the reciprocal of the response ratio. If, as we believe, the larger institutions within a given group are more likely to respond than smaller institutions, the data reported would tend to be larger than actual values. The lower the response rate the more pronounced this effect would be. Where possible we have checked the data reported here with data from other sources. In particular, our data seemed to be consistent with the CBMS survey of 1970.

In analyzing data, U.S. doctorate-granting mathematics departments were divided into three groups:

Group 1. The 27 leading mathematics departments as ranked in the ACE Survey of 1969.**
Group 2. The 38 other mathematics departments which were rated in the ACE Survey.
Group 3. The 89 doctorate granting mathematics departments not ranked in the ACE Survey.

Included in our totals for the mathematical sciences are returns from statistics and computer science departments and from non-doctorate-granting mathematics departments. Canadian doctorate granting departments are treated separately in order that U.S. data can be compared with other data produced by N.S.F. or other government surveys. The response rate for U.S. doctorate granting departments was just over 50 percent, while for some other groups it was as low as 25 percent. Therefore, our estimates of, say, faculty size cannot be expected to agree precisely with estimates derived from other sources. However, if a figure is given for successive years, it is derived from data furnished by exactly the same set of respondents in both years, so that information about trends is probably more reliable than estimates of national totals.

ENROLLMENTS IN MATHEMATICAL SCIENCE COURSES

The general picture of enrollments and class size in all mathematical science courses is presented in Table 1. Since 93 percent of all mathematical science enrollments are in mathematics departments, a table for mathematics only would not differ significantly except for the entries for statistics and computer science. Even there, due to the infrequency of statistics and computer science departments outside doctorate granting universities, over half of the national enrollment both in statistics and in computer science is in mathematics departments.

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*The same seven groups of U.S. departments used in the report of salary data in the October issue of these *Notices*.

**The findings were published in "A Rating of Graduate Programs" by Kenneth D. Roose and Charles J. Anderson, American Council of Education, Washington, D.C., 1969, 115 pp. The information on mathematics was reprinted by the Society and can be found on pages 338–340 of the February 1971 issue of these *Notices*.

Table 1

Fall Enrollments in U.S. Mathematical Science Departments

	1971	1972	Percent Change	Avg. Class Size 1971	Avg. Class Size 1972
Courses Below Level of Calculus	652,000	651,000	—	32.4	31.5
Calculus Courses	409,000	387,000	Down 5%	26.2	25.8
Undergraduate Courses in Statistics	93,000	101,000	Up 9%	31.0	30.1
Undergraduate Courses in Computer Science	109,000	120,000	Up 10%	29.8	31.8
Undergraduate Math. Courses Above Calculus	252,000	229,000	Down 9%	20.9	19.6
Total Undergraduate	1,515,000	1,488,000	Down 2%	27.8	27.3
Graduate Courses					
Mathematics Departments	52,000	48,000	Down 8%	11.5	10.9
Statistics Departments	10,000	10,000	—	14.3	14.3
Other Math. Science Departments	9,000	8,000	Down 11%	13.6	11.9
Total Graduate Courses	71,000	66,000	Down 7%	12.0	11.4
All Courses	1,586,000	1,554,000	Down 2%	26.3	25.8

In 1972, a total of 44 percent of all undergraduate mathematical science courses were in pre-calculus courses and an additional 26 percent were in calculus. The total enrollment in statistics and computer science courses was only slightly less than the enrollment in upper division mathematics courses.

The decrease of four percent in enrollment in mathematics courses from 1971 to 1972 is significant and, to a certain extent, unexpected. The largest decrease is in undergraduate courses above calculus. This decrease of nine percent was most marked in the top ACE group of 27 leading departments where it amounted to a one year decline of 13 percent. In other categories of mathematics departments the decline, although present, was not so great, reaching a low of only 1.4 percent in bachelor's granting departments. It is interesting to note that the decrease of 23,000 in upper division mathematics enrollment was comparable in size to the combined increases of 19,000 in undergraduate statistics and computer science courses.

A decrease in calculus enrollments occurred in all groups of institutions except the two groups of ACE rated departments. An increase of four percent occurred in the highest group, while calculus enrollment in other ACE rated departments increased by less than one percent.

The last two columns of Table 1 give information on average class size. A modest decrease in class size was reported by every type of institution in courses of almost every level, the only exceptions being computer science courses generally and calculus courses in the highest ACE group.

MATHEMATICAL SCIENCE FACULTY

The data presented in Table 2 on number of mathematical science faculty shows a slight increase from the Fall of 1971 to the Fall of 1972 with a report of essentially no change from the Fall of 1972 to the expected numbers for the Fall of 1973. The chairmen reported that they expected a decrease of 11 percent in the number of part-time faculty for the Fall of 1973. Since plans for part-time staff may not yet have been too firm in the summer, when chairmen completed the questionnaires, it is not clear that this large a decline actually materialized.

The respondents reported not only on the number of part-time staff and graduate assistants but also on the full-time equivalents which these numbers represented. On the average each part-time staff member represented .43 full-time equivalents with the same ratio holding for graduate assistants. On this basis we have calculated the total full-time equivalent staff and have entered it in the last row of Table 2.

Table 2

Faculty and Staff in U.S. Mathematical Science Departments

	Number Fall 1971	Number Fall 1972	Estimated Fall 1973
Number of Full-Time Teaching Staff	17,906	18,177	18,169
Number of Part-Time Staff	3,220	3,430	3,054
Number of Graduate Teaching Assistants	9,384	9,582	9,545
Total Full-Time Equivalent Staff	23,438	23,800	23,577

Table 3

Full-Time Faculty in U.S. Mathematical Science Departments

Type of Department	Number Fall 1971	Number Fall 1972	Estimated Fall 1973
Doctorate Granting			
Mathematics			
Top 27 ACE Ranked	1,563	1,572	1,575
Other ACE Rated	1,464	1,471	1,441
Unrated	2,519	2,467	2,450
Statistics	573	580	577
Other Mathematical Sciences	868	987	1,031
Master Degree Granting	5,099	5,196	5,155
Bachelor Degree Granting	5,820	5,904	5,940
Total (U.S.)	17,906	18,177	18,169

Table 3 shows that the essential constancy of faculty size is reflected in the data for full-time faculty in specific types of mathematical science departments.

TEACHING LOADS AND STUDENT-FACULTY RATIOS

One major purpose of this year's survey was to test the hypothesis that there have been significant recent increases in teaching load. The respondents were asked the average teaching load of their faculty in hours per week for the academic year 1971–1972 and for 1973–1974, two years later. Despite small changes reported by individual schools, the median teaching loads were identical for the two years for each category of mathematical science departments. The median teaching loads were six hours for ACE ranked mathematics departments and also for statistics and for computer science departments. For unranked Ph.D. granting mathematics departments the median teaching load was seven hours in both years, while for both master's degree granting and bachelor's degree granting departments, the median was 12 hours.

More details are given in Table 4. Each entry in this table is the number of departments reporting a given average teaching load in a given year.

Table 4

Frequency of Given Teaching Loads in U. S. Mathematical Science Departments

Type of Department		Average Teaching Load in Hours per Week								
		<6	6	7	8	9	10	11	12	>12
ACE Rated Mathematics	1971–1972	4	15	14	1					
	1973–1974	3	15	13	3					
Unrated Ph. D. Granting Mathematics	1971–1972		18	10	8	5	2	1	2	
	1973–1974		13	11	9	8	3	0	2	
Other Ph. D. Granting Mathematical Sciences	1971–1972	8	20	3	3	3				
	1973–1974	9	18	3	3	4				
Master Degree Granting Mathematics	1971–1972		4	4	4	13	16	5	42	5
	1973–1974		3	3	4	15	13	4	46	5
Bachelor Degree Granting Mathematics	1971–1972		3	2	7	27	25	16	129	44
	1973–1974		5	3	5	26	26	18	121	49

Although the average number of hours spent in class is the most customary measure of teaching load, another and perhaps more significant measure is the ratio of the number of students to the number of teachers. The ratio of total mathematical science enrollments to full-time faculty members declined from 88.6 in the Fall of 1971 to 87.3 in the Fall of 1972 while the ratio of enrollments to full-time equivalent faculty declined from 67.7 to 65.3. These ratios both declined in almost every type of department considered except for ACE ranked mathematics departments, in which the increase was less than one percent, and for statistics departments, in which the first ratio increased by nine percent and the second by four percent.

The slightly different ratio of undergraduate enrollment to the number of full-time faculty was reported in the CBMS survey of 1970 to be 81.3. From the present data, this ratio can be calculated to be 81.8 for the fall of 1972.

GRADUATE ENROLLMENTS

It has been observed above that mathematics enrollments declined slightly from 1971 to 1972 and that faculty size has been essentially constant. In the light of this and other discouraging projections of job opportunities both for Ph. D.'s and non-Ph. D.'s, it is both interesting and sobering to observe that the total number of graduate students in mathematics was expected to increase by one percent from 1972 to 1973. This increase moreover comes about through a decrease in ACE rated departments combined with an increase in the number of graduate students in master's granting and unrated doctorate granting departments. The number of graduate students in statistics departments increased by six percent from 1,805 to 1,906. The low response rate to this question from other doctorate granting mathematical science departments precludes making any reliable estimates. The details for mathematics departments are given in Table 5.

Table 5

Number of Graduate Students in U. S. Mathematics Departments

Type of Mathematics Department	Number 1972–1973	Estimate 1973–1974	Percent Change
Top 27 ACE Ranked	3,119	2,943	Down 6%
Other ACE Rated	2,690	2,602	Down 3%
Unrated Ph. D. Granting	3,373	3,452	Up 2%
All Ph. D. Granting	9,182	8,997	Down 2%
Master Degree Granting	3,849	4,159	Up 8%
All Mathematics Departments	13,031	13,156	Up 1%

The questionnaire requested chairmen to estimate, during the summer of 1973, the number of first year graduate students expected in the fall. Although these estimates cannot be expected to be extremely accurate, indications are that the number of first year graduate students in mathematics was expected to be about the same for the fall of 1973 as the fall of 1972 both in doctorate granting and nondoctorate granting departments. Within this, the group of 27 highest ranked mathematics departments expected an increase in first year graduate students of almost ten percent. Statistics departments anticipated an increase of almost 20 percent and there were indications of a sizable increase for other mathematical science departments.

CANADIAN DEPARTMENTS

The same general trends were evident in Canadian doctorate granting mathematical science departments as in U.S. departments. A much smaller percent of their teaching is in precalculus courses; the typical class size is larger (but declining) and faculty size seems to now be fairly well stabilized. The enrollment decline in upper division mathematics courses matched that in the United States and there were also declines in enrollments in graduate courses. The details are summarized in Tables 6 and 7.

Table 6

Fall Enrollments in Canadian Doctorate Granting Mathematical Science Departments

	1971	1972	Percent Change	Avg. Class Size 1971	Avg. Class Size 1972
Courses Below Level of Calculus	3,900	3,600	Down 8%	54.5	46.5
Calculus Courses	31,100	32,600	Up 5%	54.1	56.2
Undergraduate Courses in Statistics	10,000	10,100	Up 1%	44.6	46.1
Undergraduate Courses in Computer Science	22,000	19,400	Down 12%	67.7	59.4
Undergraduate Math. Courses Above Calculus	52,500	47,900	Down 9%	40.6	36.3
All Graduate Courses	4,900	4,500	Down 8%	9.6	8.7
Total	124,400	118,100	Down 5%	41.4	38.9

Table 7

Faculty and Staff in Canadian Doctorate Granting Mathematical Science Departments

	Number Fall 1971	Number Fall 1972	Estimated Fall 1973
Full-Time Teaching Staff	1,208	1,234	1,245
Part-Time Staff	176	164	184
Graduate Teaching Assistants	1,112	988	994
Total Full-Time Equivalent Staff	1,649	1,640	1,695

The Annual Survey, 1973, Part Two, Notices of the American Mathematical Society, Volume 20, Issue 6, October 1973

Jobs and Ph.D.'s in the Mathematical Sciences, I.

By R. D. Anderson

This report consists of four sections:

1. The current job market situation,
2. Job prospects for September 1974,
3. Job prospects for the next 20 years,
4. Tenure, moral tenure, and job retention.

The first two sections comprise Part I. The third and fourth sections will be published as Part II in the December issue of these *Notices*.

The report has been prepared by the author on behalf of the AMS Committee on Employment and Educational Policy, but the responsibility is the author's. Other reports already prepared or planned on behalf of the Committee are on Mathematical Science Faculty and Enrollments (by John Jewett, this issue), Part-Time Jobs, The Economics of Early Retirement, and Ph. D.'s in Two Year Colleges. In addition, Committee plans call for the publication of reports on the panel discussions at San Francisco, as well as one or more articles on role models for graduate programs.

The members of the AMS Committee on Employment and Educational Policy are Richard D. Anderson (chairman), Michael Artin, John W. Jewett, Calvin C. Moore, Richard S. Palais, and Martha K. Smith.

1. THE CURRENT JOB MARKET SITUATION

Data collected by the AMS this summer from department chairmen, from new Ph. D.'s for the starting salary survey, and from a sample of nonretained Ph. D.'s in a special pilot mobility study, show a number of things about the current job market for Ph. D.'s in the mathematical sciences.

There were probably about 150 to 200 Ph. D.'s who graduated this past year or who graduated earlier and were employed in 1972–1973 who were still seeking professional employment on September 1. Data collected principally in June and July showed about 118 new Ph. D.'s not then employed and perhaps 210 nonretained Ph. D.'s who did not then have jobs for 1973–1974. But there were considerable employment opportunities in July and August and extrapolating from several recent reports, it seems likely that the not-yet-employed figure on September 1 was between 150 to 200. The comparable figure a year ago was probably about 200. Somewhat higher estimates from a year ago included continuing unemployed, i. e. Ph. D. mathematicians who had been professionally unemployed earlier and who were still seeking mathematical employment. This year we are not citing a figure for the continuing unemployed as it is very hard to give a reliable estimate of that number.

The accompanying table on 1973 doctorates with degrees granted from July 1, 1972, to June 1973 in the United States and Canada and their employment for 1973–1974 was prepared by Lincoln K. Durst of the AMS on the basis of advice from the AMS Committee on Employment and Educational Policy. It is similar to tables published in the *Notices* in November 1971 and October 1972 and in the Monthly in June 1970.

The data for the table were collected primarily from chairmen of doctorate producing departments in the mathematical sciences on forms listing new doctorates with their dissertation titles. The information was updated during the late summer and early fall of 1973 by data submitted by 593 of the new doctorates on starting salary survey forms. A summary of starting salaries was published in the October *Notices*.

The table includes information on all 1973 doctorates listed in the October and November issues of these *Notices*. It should be observed that this year 1, 270 total Ph. D.'s are reported in the table, whereas, in 1971, 1, 356 were reported and, in 1972, 1, 375 were reported. For 1972, 83 additional Ph. D.'s were listed in the January and February 1973 *Notices* and, based on experience and on counts of degrees from departments which reported 1972 doctorates and have not yet reported 1973 doctorates, it is estimated that perhaps 50 to 100 additional doctorates will be reported later. The data are almost complete (> 95%) for departments of mathematics but are less complete for doctorates in statistics and computer related subjects. Indeed, due to lack of response to AMS requests and due to the absence of any clear basis on which to identify some departments as well as some dissertations as being properly in the mathematical sciences, there is no valid basis except perhaps the fact of listing in the *Notices* as a criterion for actually counting dissertations and thus total doctorates in the mathematical sciences. It should be noticed that only 20 degrees in mathematics education are listed, whereas Office of Education figures have listed over 100 such doctorates annually. Many of these not listed in AMS data are in elementary or secondary school education but some do take or retain positions in college mathematics departments.

1973–1974 EMPLOYMENT STATUS OF NEW DOCTORATES IN THE MATHEMATICAL SCIENCES

Type of Employer	PURE MATHEMATICS											
	Algebra and Number Theory	Analysis and Functional Analysis	Geometry and Topology	Logic	Probability	Statistics	Computer Science	Operations Research	Applied Mathematics	Mathematics Education	Other	Totals
University	40	53	48	5	12	44	46	7	17	2	7	281
College	71	81	44	10	8	40	39	5	17	11	7	333
Two-year colleges and high schools	7	4	3		1		1			2	1	19
Business and industry	15	15	3	2	7	18	46	7	10	1	6	130
Government	4	6	3	2	1	12	8	5	12		4	57
Research insts.	2	5	3			4	10	2	3		2	31
Canada	22	21	7		3	8	15	3	6		3	88
Foreign	17	32	11	4	4	20	18	6	14	3	4	133
Not seeking employment			1					2			1	4
Not yet employed	28	37	22	4	1	8	3		11	1	3	118
Unknown	5	15	8	1	2	4	26	1	14			76
Totals	211	269	153	28	39	158	212	38	104	20	38	1,270

Comparing the data in this table with the October 1972 table, there are several facts that stand out. The total number of Ph. D.'s listed is down by 105, the number of pure math. Ph. D.'s (the first five columns this year) being 35 below the pure math. totals of 1972. The number of those employed in universities (i.e. Ph. D. producing schools) is down by 85. The number of those employed in business, industry, government, and research institutions is up slightly from 206 to 218. The number listed as unemployed went from 103 to 118. In fact, because of reported hiring in late summer, it is believed that the number of 1973 Ph. D.'s still seeking employment on September 1 was probably 50 to 60.

Not revealed in the published tables is a rather sharp change in the distribution of the Ph. D.'s between the July–December and January–July halves of the year. In 1971–1972 sixty percent of the degrees were conferred in the latter half of the academic year, which was comparable to the 1971 figure of 62%, whereas in 1973 it was down to 53%. Thus, the reduction of doctorates this summer may actually be more pronounced than the fiscal year figures indicate. The figures for degrees from Canada were 99 in 1972 and 85 in 1973. This year, for the first time, data on citizenship of Ph. D. recipients was requested and revealed that about 21% of the U. S. degrees were earned by non U. S. citizens. Of the noncitizens receiving degrees in the U. S., about 100 got positions in the U. S. for 1973–1974.

According to data submitted to the AMS by department chairmen, the total numbers of beginning graduate students and of total graduate students in mathematics departments has been approximately stable over the past three years and the numbers of graduate students and of beginning graduate students has gone up at least 20% to 30% over the past three years in other mathematical sciences, such as statistics and computer science. Some NSF data show modest reductions in the figures between 1971 and 1972. It seems clear that the observed reduction in the number of Ph. D.'s this year over last year is a result either of a higher attrition rate or of a rather sudden stretching out of the time taken to get degrees. While available AMS data does not appear to give definitive evidence on which cause is more important, the author feels that it is very likely that the primary cause is a higher attrition rate. This is probably due in part to slightly higher standards but mainly to voluntary withdrawals from Ph. D. programs by students prior to getting their doctorates. Completing graduate training means long, hard and dedicated work for most students. If the prospects for continued (post-doctoral) research activity and economic well-being are dismal, a number of students can be expected to feel that the effort isn't worth it. Perhaps the earlier observed lower levels of attrition were artificially affected by apparent good job prospects and we are now seeing a return to a more "normal" phenomenon. However, the patterns reported above of the

numbers of graduate students suggest that we cannot soon anticipate further sizeable reductions in Ph. D. production. In fact, we should experience an increase in the number of Ph. D.'s produced in mathematical science departments other than traditional mathematics departments. We now have about 150 departments of mathematics and another 150 departments in other mathematical sciences which produce doctorates. It seems highly unlikely that 150 departments of mathematics which in 1972 produced about 900 doctorates in pure and classical applied mathematics can early or easily cut the annual production to the 200, 300 or 400 who are likely to be able to get long term mathematical employment in our economy in a steady state situation five or ten years from now.

Another factor affecting employment prospects for individuals but hard to assess is the relatively large number of Ph. D. level mathematicians who have left or are leaving the profession. The author personally knows at least 10: one in law school, one in medical school, one working for a brokerage house, one (announced as) a truck driver, one operating a marina, two in communes (at an earlier time) and three in other jobs about which he does not have detailed information. In addition, he knows one who is employed as an engineer and he has been told about others in farming and such activities.

In counting the number of professionally unemployed, it is almost impossible to keep track of those who were not either in school or employed last year. Some of the earlier unemployed have left the profession (voluntarily, semivoluntarily or involuntarily), some look for positions only in the areas where their spouses have jobs, some have occasional part-time jobs in mathematics, and some are self-employed. It seems better and more accurate only to keep a running count on those who are newly professionally unemployed. However, the existing rather large reservoir (several hundred?) of Ph. D. mathematicians who are not employed professionally and those who are expected to join this reservoir over the next several years make it almost certain that even if production is curtailed drastically we shall have a supply of Ph. D.'s sufficient for anticipated national needs. Indeed, if 1,000 additional academic jobs in mathematics with decent pay and some prospects of permanency could suddenly materialize for next year, it is very probable that Ph. D.'s would be available for most or even almost all of them.

The accompanying flow diagram is based on data from the faculty mobility survey and the annual salary survey. This diagram refers to U. S. faculty only and represents extrapolations from all data available at AMS headquarters on September 13. The data involved responses from departments having about 50% of the total national faculty. The figures in the flow diagram that do not have question marks involve direct extrapolation from data collected. Those with question marks are deduced or estimated indirectly or from other sources. The net increase (300) in doctorates and net decrease (300) in nondoctorates on the total faculty was computed from the salary survey. There was essentially no change in the total national four-year college and university mathematics faculty (including members of statistics and computer science departments).

The percentage of the faculty having doctorates went up almost 2%, from about 70% to about 72%.

The rather sizeable number 200 of those who got doctorates and stayed in their positions presumably includes many (perhaps 100) who got degrees outside the mathematical sciences as tabulated by the AMS, e.g. in some aspects of mathematics education. The employment of new Ph. D.'s in the AMS lists shows only about 600 getting academic positions in the U. S. and not all of these were in departments in the mathematical sciences.

The number of positions available due to death and retirement is up to about 240 this summer from 200 last summer and, according to CBMS Survey figures, from about 200 in the summer of 1970. Figures on age distribution of the faculty suggest that under stable conditions this 200 figure should be expected for another 15 years. Perhaps we are experiencing some early retirement or perhaps there is a statistical abnormality.

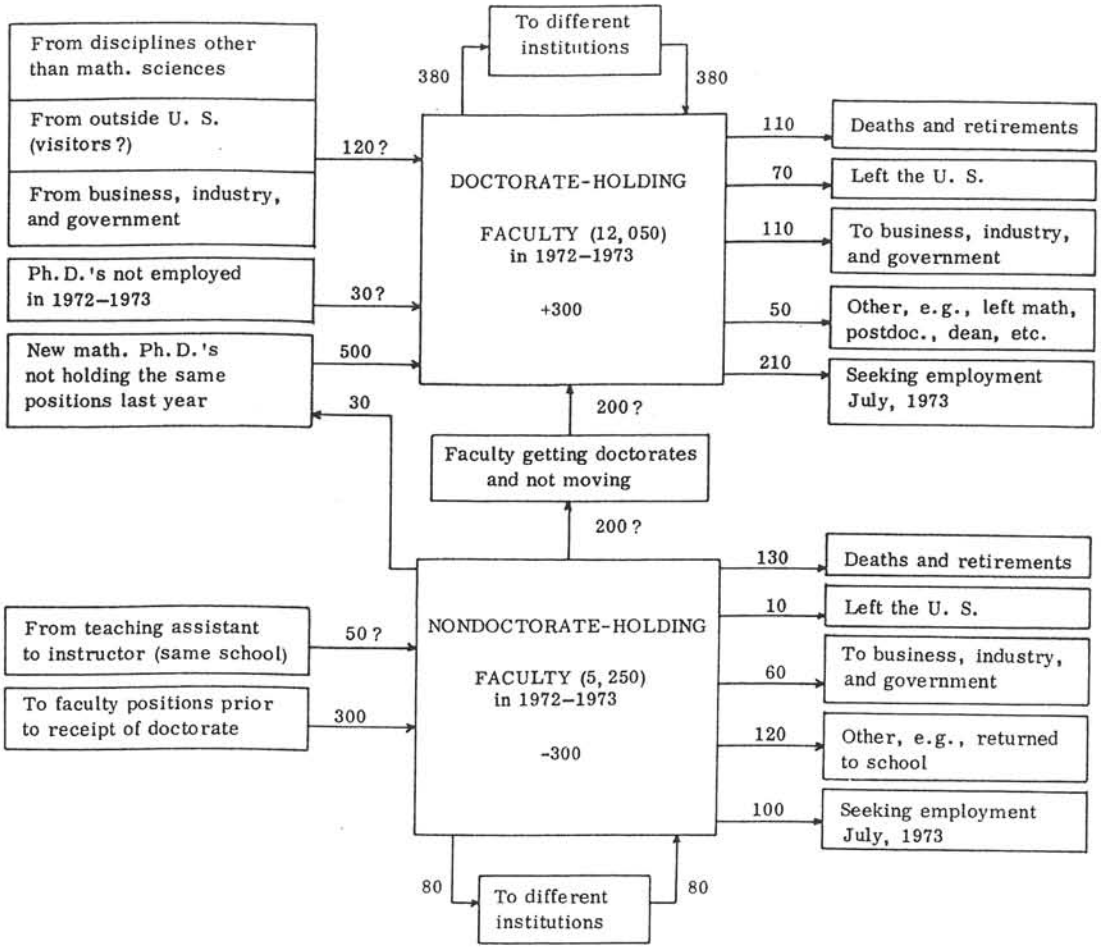
In comparing this flow diagram with that of last year (page 278, October *Notices* 1972), most figures are rather comparable. The replacement of master's level faculty by doctorates was down from 450 to 300. The doctorate level faculty leaving the U. S. was down from 120 to 70 but the number getting positions in business, industry and government was up from 80 to 110. Data of a type collected initially this year show a larger employment, 300, of new nondoctorates than had been supposed.

The number of nonretained faculty seeking employment is recorded as shown by the data which were collected chiefly in June and July. It seems probable that a third to a half of the 210 doctorates shown as seeking employment found positions by September.

The data published in the October *Notices* on faculty size, tenure and women in mathematics in connection with the annual salary survey are quite detailed and revealing for the interested reader. Returns were received from departments having 40%–50% of the total mathematics faculty (U. S. and Canada). As should be expected, a substantially greater percentage of returns were received from Ph. D. producing mathematics departments than from departments in the other mathematical sciences and master's and bachelor's level departments. In extrapolating to total figures, weights by known or estimated total faculty size in the various categories are probably better than weights by number of departments. For example, last year on another form returns from 50% of all departments showed about 62% of the total student population. Such weights by categories are used in computing figures for the flow diagram given above.

Some of the noteworthy figures concerning faculty size and distribution are the very large percentages of nondoctorates with tenure among all nondoctorates in group III (ACE unrated doctorate producing U. S. mathematics departments),

FACULTY FLOW DIAGRAM 1972–1973 to 1973–1974
Full-Time Mathematics Faculty in Four-Year Colleges and Universities in the U.S.



master's and bachelor's level departments. Omitting instructorships (where the pay is low and the positions are more frequently temporary) the percentages were 86%, 84% and 68% respectively. Thus we must anticipate very little further replacement of master's level faculty by doctorates except for death and retirement reasons or by nondoctorate faculty themselves receiving doctorates. The "moral tenure" study reported in Part II shows that the tenure figures are probably deceptively indicative of much more flexibility that exists in the system.

Whereas the total women reported on the faculty in the sample changed very little over the past year, the total women with doctorates on the faculty rose from 290 to 325, a rather surprising 12%, while the total men with doctorates rose only from 6,000 to 6,104 or 1.7%. Whether such figures reflect reverse discrimination or an adjustment to a nondiscriminatory selection process is debatable and needs further study.

2. JOB PROSPECTS FOR SEPTEMBER 1974

At this time it is impossible to be certain about the employment status for next fall, but the author is pessimistic. There are at least two partially conflicting bases for estimates.

On the one hand, unemployment for September 1973 was probably lower than that for September 1972. A major factor was that production of Ph. D.'s in pure and classical applied mathematics was lower than that for the preceding year. Also, there were more jobs available in late July and August than experience had indicated should be expected. There is no known reason to believe that production will change very much—except that it probably will go up somewhat in statistics and computer related mathematics and jobs are more available in these areas. The economic prospects for the next year as they affect money both for higher education and for nonacademic employment appear generally comparable to this past year's phenomena except possibly for the effects of inflation. Thus, we might expect an employment situation like that for September 1973.

On the other hand, the tenure and long range retention phenomena are rapidly headed toward a state of inflexibility that will make it very difficult for nonretained Ph. D.'s to get academic positions, particularly those non-

retained Ph. D.'s who have had their degrees for several years. Also, the replacement of faculty with master's degrees seems to be slowing down (as it must, soon). The number of graduate students is stable in traditional mathematics and is rising in newer applied areas. Employment outside academia is rising, but not rapidly. The numbers of students in higher education generally and in mathematics courses specifically have been almost stable over the past two or three years leading to a lack of pressure for more faculty positions (except possibly in statistics or computer related areas).

There are two numerical indicators, not yet known, which may foretell the employment situation for next fall. However, neither is likely to be very favorable and, indeed, both are expected to be slightly unfavorable.

(1) Freshmen or first time students in four-year colleges and universities this fall. Most indications are for the same or a slightly smaller number than that of last fall—thus, indicating almost no pressure for increased mathematics faculty for September 1974 (there being some time lag between enrollment changes and faculty size changes). National data come out about January from the Office of Education and independently from a survey organized by Dr. Garland Parker of the University of Cincinnati. Even a 2% increase in numbers of freshmen would have only limited positive effect on employment since there was a decrease of almost 3% a year ago.

(2) Applications for admissions for next fall. Such data are available in admissions offices during the spring. With the individual's apparent need for multiple applications still dropping, and the age group population increasing only slightly, there is little prospect for a national pattern of enough increased applications to force increased hiring next spring and summer. Indeed, again, the recent trends are in the opposite direction.

If either or both of these indicators is negative, then there will be very little, if any, increase in the national faculty next fall and therefore a potentially serious unemployment problem. A fuller discussion of the role of the first year student is included in section 3, to be published in Part II.

Another potentially negative factor affecting prospective employment next fall is the rather sharp recent increase in the inflation rate. The need for the higher educational establishment to use much of whatever extra money it gets to meet higher costs other than that for faculty expansion is obvious. Whether available funds will go up faster than the rate of inflation seems very doubtful.

All things considered, it seems probable that unemployment for Ph. D.'s will be somewhat worse next fall, particularly for nonretained Ph. D.'s who have had their degrees for several years. It is possible that it will be much worse. We can anticipate some yearly fluctuations in market conditions based on economic and other factors. But, the trend appears definitely unfavorable. In light of the prospective stability of the freshman-sophomore student population over the next several years and of the data on tenure and moral tenure discussed in section 4, the evidence points to a generally deteriorating academic employment situation, with the possibility of a rather sharp decline in employment opportunities at some time in the next few years.