CHAPTER 2

FOUR-YEAR COLLEGE AND UNIVERSITY FACULTY CHARACTERISTICS

This chapter deals with characteristics of those faculty teaching mathematics, statistics and computer science. In Chapter 4, there is considerable additional information on the faculty teaching computer science. And Chapter 3 includes some data on instructional methods, on computer usage, and on teaching assistants. See Chapter 6 for two-year college faculty characteristics.

TERMINOLOGY USED FOR FOUR-YEAR COLLEGE AND UNIVERSITY FACULTY

The mathematics (departmental) faculty refers to all members of the nation's mathematics departments. The statistics (departmental) faculty refers to all members of statistics departments separate from mathematics departments. The mathematical sciences (departmental) faculty refers to the combined mathematics and statistics (departmental) faculties. The computer science (departmental) faculty refers to all members of separate computer science departments. Thus it is disjoint from the mathematical sciences departmental faculty. The total computer science faculty refers to the computer science departmental faculty together with all members of the mathematical sciences departmental faculty who taught at least one computer science course in their own department in fall 1985. Members are full- or part-time in this total faculty according as they taught computer science full- or part-time.

Any FTE (full-time equivalent) faculty size is computed as the size of the full-time faculty plus one-third the size of the part-time faculty. The references to the mathematical and computer science faculty in higher education refer to the combined two- and four-year college and university faculty.

HIGHLIGHTS

■ The full-time faculty in the mathematical and computer sciences grew by 21% in the period 1980-1985 and now numbers 22,194 while the part-time faculty grew by 46% to 9,189.

■ Since 1970, the FTE (full-time equivalent) faculty of all those teaching in the mathematical sciences in four-year colleges and universities increased by 6% while the course enrollments in the mathematical sciences increased by 41%. In the same period, the overall FTE faculty in the mathematical and computer sciences grew by 40% while course enrollments grew by 72%.

■ The total computer science faculty (i.e. teachers of computer science) is now 5,651 full-time (3,605 in computer science departments), 5,342 part-time (1,984 in computer science departments) for a total 7,432 FTE, up from an estimated 1,182 FTE in 1970.

■ The percentage of doctorates among the full-time faculty in the mathematical and computer sciences has decreased from 82% in 1975 to 73% in 1985 in the overall four-year college and university category.

■ The percentages of tenured faculty in the mathematical and computer sciences have decreased to 66%, 54% and 49% in the university, public four-year college and private four-year college categories while the non-tenured non-doctorate full-time faculty percentages have increased to 7%, 17% and 28% respectively.

■ The net outflow (outflow minus inflow) of the mathematical sciences faculty to industry, business and government was about 1/2% of the total faculty in 1984-1985.

■ Teaching load assignments generally are similar to those in 1970. Typical computer science and statistics faculty teaching assignments are less than those for mathematics faculty.

■   Of all sections taught by full-time and part-time faculty, full-time professorial level (assistant to full) faculty teach about two-thirds, other full-time faculty teach about one-seventh, and part-time faculty teach the rest (almost one-fifth). GTA's teach about 20% of all sections in universities and under 10% in public four-year colleges.

FACULTY IN HIGHER EDUCATION

In Table 2-1 we give data on faculty size for all of higher education (from Department of Education publications: <u>Digest</u> <u>of</u> <u>Educational</u> <u>Statistics</u> and <u>Projections</u> <u>of</u> <u>Educational</u> <u>Statistics</u>).

In Table 2-2 we give the comparable data on faculty size for the mathematical and computer sciences combined (from the CBMS Survey). The totals for both tables refer to so-called "senior" faculty including those at the instructor or comparable level but not including graduate assistants.

TABLE 2 - 1

FULL- AND PART-TIME FACULTY AND FTE's IN HIGHER EDUCATION
(In Thousands)

	1970	1975	1980	1985
Full-time	369	440	458	456
Part-time	104	188	236	254
Full-time Equivalents	402	501	538	534
4-Yr. Coll. & Univ. FTE	333	397	420	409*
2-Yr. College FTE	68	104	118	124*

*   These two numbers are estimates and are probably slightly too low and too high respectively.

TABLE 2 - 2

FULL-, PART-TIME AND FTE FACULTY IN THE MATHEMATICAL AND COMPUTER SCIENCES IN HIGHER EDUCATION

	1970	1975	1980	1985
Full-time	21,922	22,807	23,927	28,471
Part-time	5,042	7,009	12,975	16,622
FTE	23,603	25,143	28,252	34,012
4-Yr. Coll. & Univ. FTE	17,986	18,062	20,409	25,257
2-Yr. College FTE	5,617	7,081	7,843	8,755

While the overall FTE faculty in higher education has increased 33% since 1970, the mathematics and computer science faculty has increased by 44%. However in the same period, the FTE enrollments in higher education have gone up 30% (see Graph 1-A) while enrollments in the mathematical and computer sciences have gone up 74% (see Graph 1-B). Thus over the period 1970-1985 there has been a serious deterioration in the relative size of the overall mathematical and computer science faculty.

FACULTY SIZE TRENDS IN THE MATHEMATICAL AND COMPUTER SCIENCES

The faculty size changes in various categories of institutions and types of departments are shown in Tables 2-3 and 2-4. The 1985 figures generally agree with AMS Survey figures when allowances are made for known differences in the composition of the different sets of categories used. See the Introduction for more discussion of this issue.

TABLE 2 - 3

DEPARTMENTAL FACULTY SIZES IN FOUR-YEAR COLLEGES AND UNIVERSITIES

	1970		1975		1980		1985	
	Full	Part	Full	Part	Full	Part	Full	Part
Universities								
Math. Dept.	6235	615	5405	699	5605	1038	5333	1044
Stat. Dept.	700	93	732	68	610	132	662	103
C.S. Dept.	688	300	987	133	1236	365	1448	491
Public Colleges								
Math. Dept.	6068	876	6160	1339	6264	2319	7754	3337
Stat. Dept.	N/A		N/A		N/A		78	15
C.S. Dept.	N/A		N/A		436	361	1554	862
Private Colleges								
Math. Dept.	3352	945	3579	1359	4153	2099	4762	2706
C.S. Dept.	N/A		N/A		N/A		603	631
TOTAL	17,043	2,829	16,863	3,598	18,304	6,314	22,194	9,189

The data above show a 21% increase in the overall full-time mathematical and computer science four-year college and university faculty and a 46% increase in the part-time faculty from fall 1980 to fall 1985. These faculty increases occurred when the mathematical and computer science student enrollments, Table 1-6A, were increasing by 20%. Thus the period from 1980 to 1985 has seen our faculty size slightly more than keep up with student enrollments.

In Table 2-4, we give the same counts summed different ways.

TABLE 2 - 4

MATHEMATICS, STATISTICS AND COMPUTER SCIENCE DEPARTMENTAL FACULTY SIZES
IN FOUR-YEAR COLLEGES AND UNIVERSITIES

	1970	1975	1980	1985
Mathematics Depts.				
Full-time	15,655	15,144*	16,022	17,849
Part-time	2,436	3,397	5,456	7,087
FTE	16,467	16,276	17,841	20,211
Statistics Depts.				
Full-time	700	732	610*	740
Part-time	93	68	132	118
FTE	731	755	654	779
Computer Science Depts.				
Full-time	688	987	1,672	3,605
Part-time	300	133	726	1,984
FTE	788	1,031	1,914	4,266

* This may represent an undercount.

The departmental faculty size data in Table 2-4 show a rather slowly growing mathematics departmental faculty and a much more rapidly growing computer science departmental faculty over the past fifteen years. Since the mathematics departmental faculty teaches a considerable amount of computer science, it is perhaps even more appropriate to separate out the total computer science faculty and look at the trends over time. In Chapter 4, we have a count of the total computer science faculty (i.e. the faculty who taught computer science in Fall 1985), which shows 5,651 full-time and 5,342 part-time for an FTE total of 7,432. The total FTE faculty that taught mathematics is the difference between the total FTE mathematical and computer science faculty (from the last columns of Table 2-3) and the total FTE computer science faculty. Table 2-5 gives the breakdown of the total mathematical and computer science faculty into

those who teach the mathematical sciences and those who teach computer science, along with course enrollments in the mathematical and computer sciences. While the enrollments per FTE faculty member in the total computer science faculty have stayed almost constant from 1970 to 1985, the corresponding ratio for the mathematical sciences teaching faculty has gone up dramatically. Over the past fifteen years, while the mathematical sciences faculty has been helping to create, and spin off, the computer science faculty, it has been seriously neglected in terms of its own growth.

TABLE 2 - 5

FTE FACULTY AND COURSE ENROLLMENTS

	1970	1985
FTE Mathematical Science Teaching Faculty	16,804	17,825
Mathematical Science Enrollments	1,296,000	1,827,000
Enrollments per FTE Faculty	77	102
Total FTE Computer Science Faculty	1,182*	7,432
Computer Science Enrollments	90,000	558,000
Enrollments per FTE Faculty	76	75

* The FTE computer science departmental count of 788 from Table 2-4 is the only count available from 1970. To be comparable to the 1985 figures, the count should include other teachers of computer science. We have arbitrarily assigned a 50% factor to 788 to get the 1,182 total. This total is consistent with the later enrollment-faculty ratio.

The faculty counts do not include any allowance for graduate teaching assistants. As stated above, the FTE mathematical science teaching faculty is used in Table 2-5 in a special sense: it is the complement of the total FTE computer science faculty. From Table 2-5 it follows that the FTE faculty of all those teaching mathematical science courses increased 6% from 1970 to 1985 while the course enrollments in the mathematical sciences increased 41%.

ENROLLMENTS PER FTE FACULTY MEMBER BY CATEGORY OF INSTITUTION

The data given here is for combined mathematical and computer sciences faculty and enrollments. The undergraduate course enrollments per FTE faculty member have stabilized and, in fact, dropped slightly since 1980. The trends since 1965 reflect the rapid faculty expansion in the sixties, followed by fairly stable total faculty numbers in the seventies, while enrollments were going up in both mathematics and computer science, and in the eighties, the faculty expansion in the public and private college sectors with more modest enrollment increases.

GRAPH 2 - A

COURSE ENROLLMENTS PER FTE TOTAL MATHEMATICS
AND COMPUTER SCIENCE FACULTY

All Four Year
Institutions
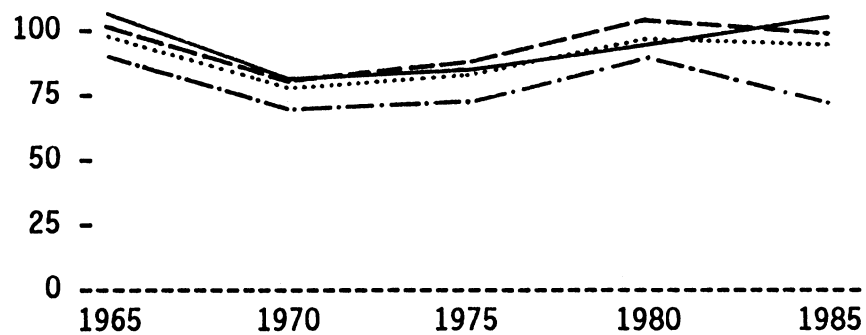
	1965	1970	1975	1980	1985
Universities ———————	104	79	85	96	105
Public Colleges—————	101	78	87	105	100
Private Colleges—·——·—	90	71	73	90	73
All Institutions·········	99	77	83	98	95

The data do not include either graduate teaching assistants on the one hand or graduate enrollments on the other.

TEACHING LOADS

In each Survey questionnaire since 1970 there has been a question concerning expected or typical teaching loads of faculty. Because of the increasing incidence of full-time faculty below the assistant professor level (see Tables 2-9 and 2-10 for current data on the percentages of sections taught by various components of the faculty), it was decided in this Survey to separately collect and report the data on teaching loads for such faculty (Table 2-8).

The percentages of departments in various categories reporting various expected loads over the past 15 years are given in Tables 2-6 through 2-8. There are several observations worth making.

(1) University statistics and computer science departments have consistently had noticeably lower loads (median 6 hours) as contrasted with university mathematics departments (median 7 hours).

(2) The public and private colleges have consistently had median loads at the 12-hour level except for public four-year college computer science departments which had a median 10-hour load in 1985.

(3) In all categories for which data from 1970 are available, the 1985 load patterns are quite similar to the 1970 patterns.

TABLE 2 - 6

EXPECTED OR TYPICAL CREDIT-HOUR TEACHING LOADS IN <u>MATHEMATICS</u> DEPARTMENTS
(PROFESSORIAL FULL-TIME FACULTY)

Percentage of Departments Indicating Given Load Per Semester or Quarter

	< 6	6	7-8	9-11	12	>12
Univ.						
1970	8%	40%	32%	13%	7%	--
1975	--	26%	39%	26%	10%	--
1980	10%	23%	29%	30%	9%	--
1985	11%	27%	36%	16%	10%	--
Pu. 4-Yr.						
1970	--	3%	5%	39%	35%	18%
1975	--	1%	5%	15%	57%	21%
1980	--	3%	6%	11%	59%	22%
1985	3%	4%	4%	19%	50%	20%
Pr. 4-Yr.						
1970	--	--	--	24%	60%	16%
1975	--	4%	2%	24%	56%	14%
1980	2%	3%	5%	24%	45%	22%
1985	--	--	6%	10%	64%	20%

The 1985 data refer to mathematics faculty teaching in the mathematical sciences, not in computer science. However, the computer science teaching loads in mathematics departments are quite similar. The 1970, 1975, and 1980 data presumably also refer primarily to professorial level faculty since that was the dominant faculty and only one percentage was recorded.

TABLE 2 - 7

EXPECTED OR TYPICAL CREDIT-HOUR TEACHING LOADS IN STATISTICS AND
COMPUTER SCIENCE DEPARTMENTS
(PROFESSORIAL FULL-TIME FACULTY)

Percentage of Departments Indicating Given Load Per Semester or Quarter

	< 6	6	7-8	9-11	12	>12
Univ. Statistics						
1970	44%	28%	12%	16%	--	--
1975	17%	45%	11%	22%	5%	--
1980	9%	41%	34%	16%	--	--
1985	25%	54%	3%	17%	--	--
Univ. Comp. Sci.						
1970	17%	46%	27%	7%	3%	--
1975	14%	34%	19%	28%	5%	--
1980	24%	44%	8%	20%	4%	--
1985	25%	39%	25%	5%	5%	--
Pu. 4-Yr. Comp. Sci.						
1980	--	7%	--	23%	54%	15%
1985	6%	14%	17%	19%	34%	10%

It seems clear from Tables 2-6 and 2-7 that over the past five years,
with the exception of private college mathematics departments, standard
teaching loads are holding steady or dropping slightly. The data on
private colleges seem inconsistent with the drop in course enrollments per
FTE faculty member in that category, data given with Graph 2-A. But the
data on recent trends in universities toward slightly lower expected loads
also runs counter to the fifteen year rise in course enrollments per FTE
faculty, data given with Graph 2-A. Perhaps the increase in the incidence
of lecture sections in university departments and the hiring of more
non-professorial faculty explain how expected professorial teaching loads

can be kept low in the face of rising enrollments per FTE faculty member. Another factor affecting university faculty teaching loads is the graduate component. The Survey data do not specifically address this issue.

Since 1980 there has been a dramatic increase in the percentage of the faculty which is full-time non-doctorate and non-tenured (Table 2-12). A good many of such faculty would be expected to be in the non-professorial component of the faculty.

TABLE 2 - 8

1985 EXPECTED OR TYPICAL CREDIT-HOUR TEACHING LOADS
(NON-PROFESSORIAL FULL-TIME FACULTY)

Percentages of Departments Indicating Given Load Per Semester or Quarter

	< 6	6	7-8	9-11	12	>12
Math. Depts.						
Univ.	8%	9%	5%	20%	46%	12%
Pu. 4-Yr.	2%	3%	--	8%	59%	28%
Pr. 4-Yr.	--	--	9%	11%	62%	18%
Stat. Depts.						
Univ.	38%	7%	6%	42%	7%	--
Comp. Sci. Depts.						
Univ.	18%	11%	14%	41%	16%	--
Pu. 4-Yr.	3%	7%	4%	16%	58%	12%

The combination of low loads for a few and high loads for many suggests that there are two different types of full-time faculty below the professorial level:

(1) a fairly small number of research-type instructors chiefly in university departments and;

(2) a much larger number of faculty hired primarily as teachers with relatively high course loads.

48

TEACHING BY VARIOUS GROUPS OF FACULTY

This year, for the first time, the Survey reports on a more detailed analysis of teaching responsibilities by professorial level faculty (assistant to full), by other full-time faculty and by part-time faculty for the three categories of institutions and various types of departments. The results summarized in Tables 2-9 and 2-10 below show a rather consistent pattern: full-time professorial level faculty teach about 2/3 of the sections taught, other full-time faculty teach about 1/7 of the sections taught, and part-time faculty teach the remainder. The teaching of TA's was not included in these data. See the discussion following Table 2-10 and also Tables 3-4 to 3-6 for other data on teaching assistants. Table 2-9 refers to sections taught within mathematics departments only and Table 2-10 to sections taught in computer science and statistics departments.

TABLE 2 - 9

MATHEMATICS DEPARTMENT SECTIONS TAUGHT BY FULL- AND PART-TIME FACULTY
Rows sum to 100%

	Assistant to Full Professors	Other Full-Time	Part-Time
Mathematics Sections			
Univ. (n=12,185)	70%	14%	16%
Pu. 4-Yr. (n=21,489)	67%	14%	19%
Pr. 4-Yr. (n=11,727)	72%	10%	18%
Statistics Sections			
Univ. (n=759)	77%	10%	13%
Pu. 4-Yr. (n=1,912)	80%	10%	10%
Pr. 4-Yr. (n=1,531)	67%	10%	23%
Computer Science Sections			
Univ. (n=681)	78%	7%	15%
Pu. 4-Yr. (n=3,999)	64%	15%	21%
Pr. 4-Yr. (n=5,064)	64%	15%	21%

TABLE 2 - 10

COMPUTER SCIENCE AND STATISTICS DEPARTMENT SECTIONS TAUGHT BY
FULL- AND PART-TIME FACULTY
Rows sum to 100%

	Assistant to Full Professors	Other Full-Time	Part-Time
Comp. Sci. Depts.[1]			
Univ. (n=3,208)	63%	18%	19%
Pu. 4-Yr. (n=4,869)	68%	15%	17%
Pr. 4-Yr. (n=2,313)	54%	13%	33%
Stat. Depts.[1]			
Univ. & Pu. 4-Yr. (n=1,212)	83%	7%	10%

To get an estimate on the percentage of sections in universities or public colleges taught by graduate teaching assistants, we can compare the total number of sections reported in each of mathematics, statistics and computer science for questions 3 and 6D of the main questionnaire (Appendix B). The former gives total numbers of sections taught and the latter, as compiled, the numbers taught by full and part-time faculty (not GTA's) in each of the mathematics, statistics and computer science categories. For universities, this analysis shows the percentage of sections taught by GTA's for each of the three subject areas to be close to 20%. For public colleges, the overall percentage of sections taught by GTA's is less than 10%. Thus, to include the teaching of GTA's, the percentages of sections reported taught in universities in Tables 2-9 and 2-10 should be reduced by about 20% of the figures shown. In public colleges the percentages should be reduced by somewhat less than 10% of those figures. In private colleges there are a negligible number of

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[1] The percentages shown are of all sections taught by the departments indicated. They include a small number of sections in mathematics or in the other of the two fields.

GTA's. The figures on numbers of sections taught by GTA's, by this analysis are generally consistent with the numbers, from Table 3-5, of GTA's in various categories, reported as teaching their own classes.

From the data from which the above tables are obtained, and Table 2-3, we can also find the average numbers of sections taught by part-time faculty in various types of departments. These numbers are given in Table 2-11.

TABLE 2 - 11

AVERAGE NUMBER OF SECTIONS TAUGHT BY A PART-TIME FACULTY MEMBER

| Math. Dept.	Stat. Dept.	Comp. Sci. Dept.	All Depts.
1.54	1.01	1.11	1.44

Since about 5/6 of the total part-time faculty is in public or private colleges where the median expected load is close to 12 hours and most sections almost certainly are 3 hours per week, an estimate of a part-time faculty member as roughly equivalent to 1/3 FTE is reasonable.

DOCTORATES AMONG FULL-TIME MATHEMATICAL AND COMPUTER SCIENCE FACULTY

The trends over time in the percentages of doctorates among the combined full-time mathematical and computer sciences faculty are given by category of institution in Graph 2-B. We do not know how to explain the non-decrease in the public college percentage since 1980. Being counter to the overall trend, there could be a sampling abnormality in either year or a recording error in 1980. The decreases in the university and private college sectors are consistent with the large increases in total faculty (Table 2-3), and the large increases in the non-doctorate non-tenured faculty (Table 2-12). The overall percentage of doctorates among the total full-time faculty in 1985 was 73%.

GRAPH 2 - B

PERCENTAGES OF FULL-TIME MATHEMATICAL AND
COMPUTER SCIENCES FACULTY HOLDING DOCTORATES
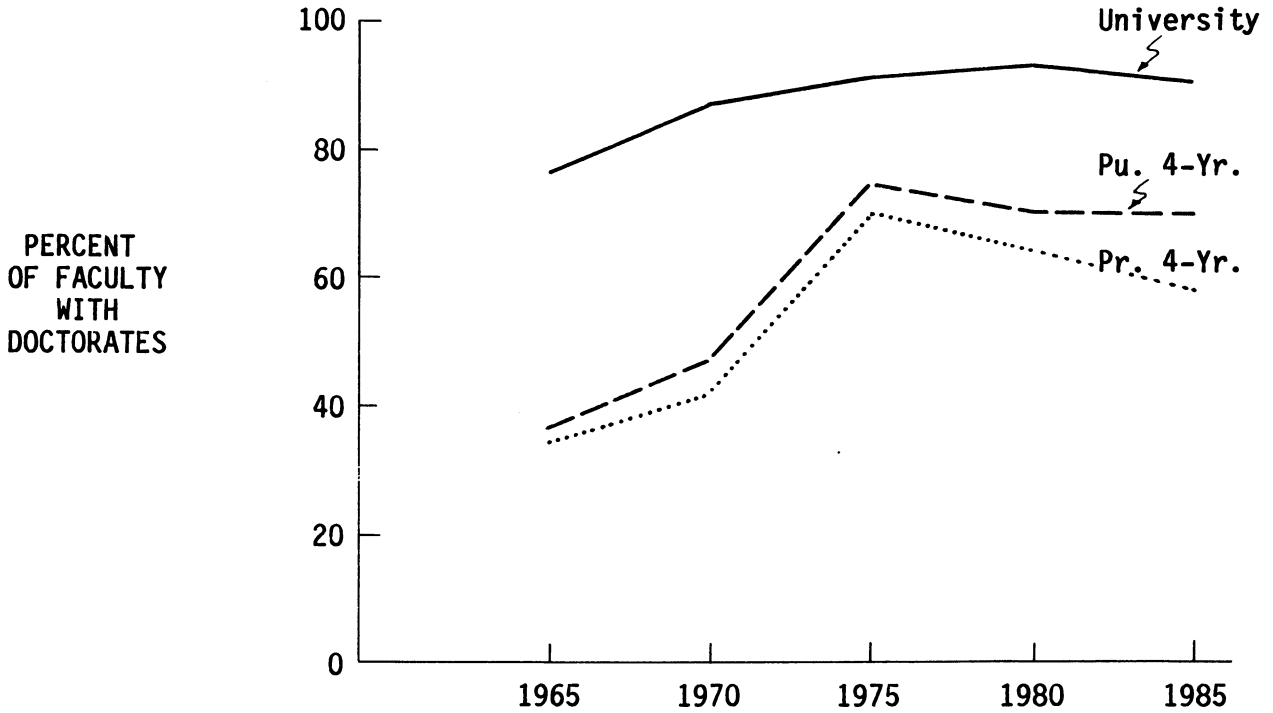
	1965	1970	1975	1980	1985
Univ.	76%	87%	91%	93%	90%
Pu. 4-Yr.	36%	47%	74%	70%	70%
Pr. 4-Yr.	34%	42%	69%	64%	58%

TENURE AND DOCTORAL STATUS OF THE FACULTY

In Table 2-12, we give 1975, 1980 and 1985 percentages of the total mathematical and computer sciences full-time faculty, with and without tenure and with and without doctorates. These data clearly show decreases in all categories of tenured doctorates and very marked increases in the

percentages of non-tenured non-doctorate faculty. From Table 2-9 concerning the distribution of the teaching of sections among professorial level faculty, other full-time faculty and part-time faculty, it follows that a good many of the non-tenured non-doctorate faculty reported in Table 2-12 for 1985 do have professorial status in both the public and private college categories.

TABLE 2 - 12

TENURE AND DOCTORAL STATUS OF TOTAL MATHEMATICAL AND COMPUTER SCIENCE FULL-TIME FACULTY FOR FALL 1975, 1980 AND 1985

	1975	1980	1985
Universities			
Tenured, PhD	67%	64%	63%
Tenured, non-PhD	5%	4%	3%
Non-tenured, PhD	26%	28%	27%
Non-tenured, non-PhD	2%	4%	7%
Public 4-Year			
Tenured, PhD	56%	52%[1]	51%
Tenured, non-PhD	18%	19%[1]	13%
Non-tenured, PhD	20%	16%[1]	19%
Non-tenured, non-PhD	6%	13%	17%
Private 4-Year			
Tenured, PhD	45%	38%	35%
Tenured, non-PhD	25%	16%	14%
Non-tenured, PhD	24%	26%	23%
Non-tenured, non-PhD	6%	20%	28%
All Institutions			
Tenured, PhD	58%[2]	55%	51%
Tenured, non-PhD	14%[2]	12%	10%
Non-tenured, PhD	24%	23%	23%
Non-tenured, non-PhD	4%	10%	16%

(1) The figures given here from the 1980 report are slightly inconsistent with other numbers of faculty given on page 45 of that report showing 70% of the faculty with doctorates.

(2) The figures given in Table 3.13 on page 49 of the 1975-76 report for all institutions are inconsistent with the figures given there for various categories of institutions. The figures we use are based on a recalculation using faculty totals for the various categories given on page 48 of that report.

There are three factors, each of which would be expected to contribute to the modest reductions in percentages of total full-time faculty holding doctorates, from 82% in 1975 to 78% in 1980 to 73% in 1985, and the corresponding increases in the size of the non-tenured non-doctorate level faculty. First is the major increase in the teaching of remedial (high school level) mathematics between fall 1975 and fall 1980, from 141,000 course enrollments to 242,000. A doctorate is hardly a prerequisite for teaching courses at or below the level of second year high school algebra. Second is the major 21% expansion in the overall size of the full-time faculty between fall 1980 and fall 1985; there simply weren't enough PhD's available to maintain the percentage of doctoral holding faculty among all faculty. Third is the continuing major expansion of enrollments in computer science and, thus, in faculty teaching computer science. This occurs at a time when relatively few doctorates in computer science are being produced.

The percentages of tenured faculty and of doctorate-holding faculty are given in Table 2-13 by type of department and by category of institution. The overall percentages of the full-time mathematics departmental faculty and the full-time computer science departmental faculty that hold doctorates are 74% and 70% respectively (73% in the combined total faculty in the mathematical and computer sciences). Whereas 65% of the mathematics departmental faculty is tenured, only 42% of the computer science departmental faculty is tenured.

TABLE 2 - 13

TENURE AND DOCTORATE-HOLDING PERCENTAGES AMONG
FULL-TIME FACULTY IN 1985

	Tenured	Doctorate-Holding
Math. Depts.		
Univ.	71%	90%
Pu. 4-Yr.	69%	70%
Pr. 4-Yr.	51%	62%
Computer Sci. Depts.		
Univ.	49%	82%
Pu. 4-Yr.	40%	69%
Pr. 4-Yr.	31%	35%
Statistics Depts.		
	68%	97%

AGE AND SEX DISTRIBUTION OF FULL-TIME FACULTY

The age distributions of the full-time faculty in the mathematical and computer sciences for 1975 and 1985 are given in Table 2-14. The total faculty size in 1985 was 32% above that in 1975. In light of this increase in faculty size and assuming balanced attrition and new entrants, a 16% 40-44 age cohort in 1975 should be a 12% 50-54 age cohort in 1985. The figures given in Table 2-14 verify this observation for middle-level age groups.

At the younger age groups there will have been considerable attrition as well as new hirings over the 10 year span so that one does not expect the cohort to stay the same absolute size.

TABLE 2 - 14

AGE DISTRIBUTION OF FULL-TIME FACULTY IN THE
MATHEMATICAL AND COMPUTER SCIENCES

	1975	1985
< 30	10%	7%
30-34	22%	15%
35-39	22%	16%
40-44	16%	20%
45-49	11%	16%
50-54	9%	12%
55-59	5%	8%
60 or more	5%	6%

It is clear that the faculty is aging but not very rapidly. In the ten year span 1975-1985, the average faculty age has gone up from about 40.5 to over 43. Considering the big influx of new (younger) entrants, that seems about right.

The large increases in the part-time and in the non-tenured non-doctoral full-time components of the faculty, indicate that there is likely to be continuing turnover in the full-time faculty, producing, in the future, a more evenly spread out age distribution with a slowly increasing average age.

It should be noted that some individual university faculties, including some of the better research faculties, are reported to have aging problems. But the picture in-the-large does not look discouraging except for the drop in the under 40 populations.

The age distribution of the university mathematics faculty is almost identical to that of the overall mathematical sciences faculty in Table 2-15, differing by one or less in every age group percentage and having the average age of 44. Only 35% of the university faculty is under 40, in contrast to 55% in 1975 and 48% in 1980, a fact that may be of some

concern. It is difficult to state what the norms should be. From Table 2-15 and from comparable figures in the university sector it is clear that the faculty has not been going on to retire at age 70 but rather has been retiring in the early to mid-sixties.

The men on the mathematical sciences faculty average about 44.5 years, four years older than the women. In computer science, the men average about 40.5 years of age, and the women 37. In Table 2-15 we give the age distributions of the separate departmental full-time faculties in the mathematical and computer sciences.

TABLE 2 - 15

AGE DISTRIBUTION OF MATHEMATICAL SCIENCE AND COMPUTER SCIENCE DEPARTMENTAL FACULTIES

	< 30	30-34	35-39	40-44	45-49	50-54	55-59	60 or more
Math. Sci.	6%	14%	15%	19%	17%	14%	8%	7%
Comp. Sci.	13%	18%	20%	21%	13%	8%	5%	2%

MINORITIES

The percentages of minorities on the four-year college and university full-time faculty in each of the mathematical and computer sciences is given in the following table.

TABLE 2 - 16

MINORITIES IN THE FULL-TIME MATHEMATICAL AND COMPUTER SCIENCES
DEPARTMENTAL FACULTIES

	Amer./Al.	Asian	Black	Hispanic
Math. Sci. Faculty	0.1%	7.1%	3.5%	3.4%
Computer Sci. Fac.	0.1%	11.7%	.3%	1.2%

In 1980 the Survey reported almost 3% of the faculty were Black. The current figures, compared with the 1975 Survey, do show a noticeable growth in the number of Asians on our faculties over the past 10 years, generally compatible with the growth (reported in other studies) of Asians among the graduate student population. In statistics departments, 22.5% of the faculty are Asian.

The Black faculty members are concentrated in the public college sector (6.9% of the total faculty there), presumably reflecting the faculty at historically Black institutions. In the university sector slightly less than 1% of the faculty is Black. The Hispanic mathematics faculty members are spread proportionately over all sectors of the four-year and university populations (except for statistics).

The percentage of the full-time departmental faculty who were female was 15% for mathematics, 10% for statistics, and 13% for computer science for an overall 14%, (the same percentage as that reported in 1980). As mentioned above, the average age of faculty women was about four years less than that of men.

Table 2-17 gives the percentages of faculty who are female by various types of departments and categories of institutions.

TABLE 2 - 17

PERCENTAGE OF FULL-TIME 1985 DEPARTMENTAL FACULTY WHO ARE FEMALE

- - - Mathematics Depts.- - -			- -Computer Science Depts.- -			Stat. Depts.
Univ.	Pu. 4-Yr.	Pr. 4-Yr.	Univ.	Pu. 4-Yr.	Pr. 4-Yr.	Combined
11%	19%	15%	11%	13%	23%	10%

DOCTORATE-HOLDING FACULTY

The 1985 age distribution of the doctorate holding mathematical and computer sciences faculties are available from two sources: (1) this Survey and (2) the biennial NSF publication, "Characteristics of Doctoral Scientists and Engineers in the United States". The gross figures are compatible although the details of the age distributions vary in the two studies. The NSF data is for academically employed doctoral scientists rather than for faculty, per se. But the two sets of data should be roughly comparable.

The total count of doctoral-holding mathematical scientists in this Survey is 13,025 compared to 13,027 in the NSF figures. The total count

of doctoral-holding members of the computer science departmental faculty is 2,537 in this Survey while the NSF figure for doctoral-holding computer specialists is 5,124, twice as much. The NSF figure presumably includes people in computer centers and on special research projects and presumably includes some faculty who are in mathematics or other departments but teach computer science. From the Survey's special computer science questionnaire, there are a total of 3,754 doctoral-holding full-time teachers of computer science and 2,231 doctoral-holding part-time teachers of computer science. Of the 2,231 part-time doctoral-holding faculty, 181 have degrees in computer science and 1,360 in mathematics and many are full-time in the reporting institution. Thus the NSF and Survey figures seem to represent comparable populations.

The age distribution of the doctoral-holding faculty from the Survey data and of academic scientists from NSF data are given in Table 2-18. It is not clear how the conflicting age patterns on the tails of the distributions should be reconciled. The current Survey data are quite consistent with past Survey data.

TABLE 2 - 18

AGE PATTERNS OF DOCTORAL FACULTY (SURVEY) AND ACADEMIC SCIENTISTS (NSF)

	< 30	30-39	40-49	50-59	60 or more
Mathematics					
Survey	5%	26%	40%	22%	7%
NSF Data	3%	25%	40%	22%	10%
Computer Science					
Survey	8%	37%	41%	11%	3%
NSF Data	2%	39%	40%	13%	6%

STATISTICS FACULTY

For all full-time faculty with **highest** degrees in statistics, Table 2-19 indicates their 1985 employment in mathematics, statistics and computer science departments.

TABLE 2 - 19

EMPLOYMENT OF STATISTICIANS IN VARIOUS TYPES OF DEPARTMENTS

	Univ.	Pu. 4-Yr.	Pr. 4-Yr.	Total
Mathematics Depts.	283	488	158	929
Statistics Depts.	572	38	---	610
Computer Science Depts.	20	6	29	55
Total	875	532	187	1594

Of these total full-time faculty, the numbers with doctorates are: universities, 814; public four-year colleges, 468; and private four-year colleges, 118; for a total of 1,400 in all university and four-year colleges. The Survey estimate on the total number of separate statistics departments in universities is 40 and in public colleges, 5, with none identified in private colleges. Because the numbers are so small in the public and private college sectors, it is quite probable that the sampling procedures used did not reveal the actual numbers. However the total faculty and PhD counts of statisticians should be fairly reliable. It is known (and is consistent with the data above) that many universities and some colleges which do not have separate statistics departments do have groups of statisticians on their mathematics faculties acting as subdepartments. For information on students in statistics see Tables 1-11 to 1-13.

FACULTY MOBILITY IN THE MATHEMATICAL SCIENCES

Data on faculty mobility from academic year 1984-85 to academic year 1985-86 are given in Table 2-20 for the total full-time mathematical sciences departmental faculty. Details are not given by category of institution because the overall numbers concerned are fairly small. In the 1975 and 1980 Survey reports, comparable data were given for the combined mathematical and computer sciences departmental faculty. This year, results for computer science departments are given separately in Chapter 4. The data this year do not show significant differences from the 1980 data except that the overall hiring of non-doctorate faculty from graduate schools shows an increase of about 60% from the 1980 figures and the "other" categories this year are relatively larger, though still small in absolute numbers. The "deaths and retirements" category for faculty outflow is about 1.1% of the total faculty, a small percentage. For the 1980 Survey, the combined mathematical and computer science faculty had a 0.9% death and retirement rate. Interesting figures are the Inflow/Outflow ratios with respect to non-academic employment which are 76/157 for doctorates and 116/33 for non-doctorates. The net loss to non-academia for doctorate faculty is only about a half percent of all doctoral faculty. The total faculty who switched departments (institutions) was about 600 doctorates and 175 non-doctorates.

TABLE 2 - 20

FULL-TIME MATHEMATICAL SCIENCES DEPARTMENTAL FACULTY MOBILITY
1984-85 to 1985-86

Faculty Inflow	Doctorates	Non-Doctorates
From Graduate School	362	463
From Post-Doctoral or Research Appointments	75	4
From Non-Academic Positions	76	116
From "Other"	45	80
Total Inflow	558	663

Faculty Outflow		
Deaths and Retirements	163	57
To Graduate School	27	90
To Non-Academic Positions	157	33
Otherwise Occupied	62	99
Total Outflow	409	279

It should be noted that these are one-year figures on mobility. They represent a one-year increase of 533 in total mathematical science departmental faculty which, with a 148 increase in computer science department faculty, is quite consistent with the reported overall full-time faculty growth from 18,304 in 1980 to 22,195 in 1985. The figures are also reasonably consistent with AMS Survey data which projected a total mathematical sciences faculty growth of 682 from fall 1983 to fall 1984.

The one-year Survey growth figures given above are from changes in existing departments. They do not include the creation or abolition of separate departments or institutions. However, chairpersons may well have reported only changes in that component of the faculty (still) in the department, if the department had been split.

Question 10 on the main questionnaire tried to identify faculty openings and whether or not they were filled by people meeting the advertised qualifications. The reader is referred to Appendix B for the precise wording of this question. Because of spotty responses, the projections of the responses are statistically somewhat less reliable than those of most other questions. We present combined data for all four-year colleges and universities since there appeared to be only relatively minor differences between categories of institutions in most cases and the combined data is probably most reliable. Note from Table 2-21 that about three-fourths of all positions in mathematics and statistics and one-half of all positions in computer science were filled by people meeting advertised qualifications. Half the other openings were left unfilled.

TABLE 2 - 21

NEW JOB OPENINGS FOR 1985-86
PERCENTAGES OF OPENINGS FILLED IN VARIOUS WAYS

Qualif. Sought Number Sought	Math. Depts. Math. n=1502	C.S. n=598	Stat. n=149	C.S. Depts. n=784	Stat. Depts. n=68
Filled, Qualified	75%	44%	73%	53%	81%
Filled, Qualified, Part-time	5%	13%	5%	8%	4%
Filled, Unqualified	7%	15%	7%	15%	4%
Not-Filled	13%	28%	15%	24%	11%

Question 10, itself, avoids the issues of whether individual departments are realistic in terms of educational qualifications and salary levels for advertised positions. The results suggest that most departments are realistic.