



by Rolf F. Lehming

# WHAT IS HAPPENING TO ACADEMIC EMPLOYMENT OF SCIENTISTS AND ENGINEERS?

Division of Science Resources Studies

## ISSUE BRIEF

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*Employment of doctoral scientists and engineers by the nation's universities and colleges has continued to increase, but full-time faculty numbers have held steady.*

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Employment of science or engineering (S&E) doctorate holders by the Nation's universities and colleges grew slowly during the first half of the 1990s, from an estimated 206,800 in 1989 to 217,500 in 1995, the last year for which data are available. The bulk of the increase was concentrated in the life and computer sciences (table 1). The average annual increase reflected in these numbers—below 1 percent—contrasts with the 2.9 percent average during the 1980s and 4.7 percent for the 1970s.<sup>1</sup>

In contrast to the modest increase in overall academic doctoral S&E employment, the estimated number of full-time doctoral S&E fac-

ulty<sup>2</sup> peaked in 1991 at about 173,000. Consequently, full-time faculty in 1995 is estimated to represent only 79 percent of all doctoral scientists and engineers employed by the academy, an all-time low; this share had been 88 percent in the early 1970s.

Many of the faculty hired during the 1960s' expansion of U.S. higher education are at or nearing the age at which they can be expected to consider retirement. One in four full-time doctoral S&E faculty were 55 years old or older in 1995, and one in ten were at or above age 60. As universities and colleges struggle to gain financial flexibility,

Table 1. Academic doctoral scientists and engineers by type of position: 1973-95

Year	Total employment	Full-time				Post-doctorates	Part-time positions
		Total faculty	Senior faculty	Junior faculty	Non-faculty		
Thousands							
1973.....	118,000	103,300	74,000	29,300	7,600	4,200	3,000
1975.....	134,100	116,400	84,300	32,100	8,300	6,200	3,300
1977.....	145,500	125,600	90,700	34,900	8,800	7,600	3,400
1979.....	155,400	131,200	97,200	34,000	11,400	8,100	4,600
1981.....	167,200	142,000	107,400	34,600	12,600	8,500	4,000
1983.....	176,200	148,400	115,600	32,800	13,400	8,300	6,100
1985.....	190,300	156,900	119,800	37,200	18,100	8,700	6,600
1987.....	196,000	164,500	127,300	37,200	16,400	9,300	5,700
1989.....	206,800	169,800	131,100	38,700	19,200	11,500	6,300
1991.....	210,600	173,100	133,000	40,100	20,200	9,900	7,400
1993.....	213,800	172,400	128,600	43,800	22,200	13,300	5,900
1995.....	217,500	171,400	127,300	44,000	23,900	16,800	5,500

**NOTES:** Senior faculty includes full and associate professor; junior faculty includes assistant professor plus instructor. Nonfaculty includes research and teaching associates, adjunct faculty, lecturers, administrators, and others. Survey changes in 1991 and 1993 render these data not directly comparable to earlier years. Estimates rounded to nearest hundred.

**SOURCE:** NSF/SRS, Survey of Doctorate Recipients, unpublished tabulations.

<sup>1</sup>Survey changes in 1991 and 1993 affect the direct comparability of the data, but rough trend analyses appear possible, provided small differences are treated with caution, as has been done here.

<sup>2</sup> Faculty are defined here to include full, associate, and assistant professors plus instructors.

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they face questions about replacement hiring, the role of part-time faculty, and a variety of other appointment alternatives.

**What is happening to full-time faculty?**

The roughly steady numbers for full-time S&E faculty do not hold for all ranks. Since 1991, the number of senior faculty has fallen by 4 percent (about 5,700), with full professors dropping by 6 percent. In contrast, faculty in junior ranks—assistant professors and instructors combined—has increased by 10 percent (figure 1).

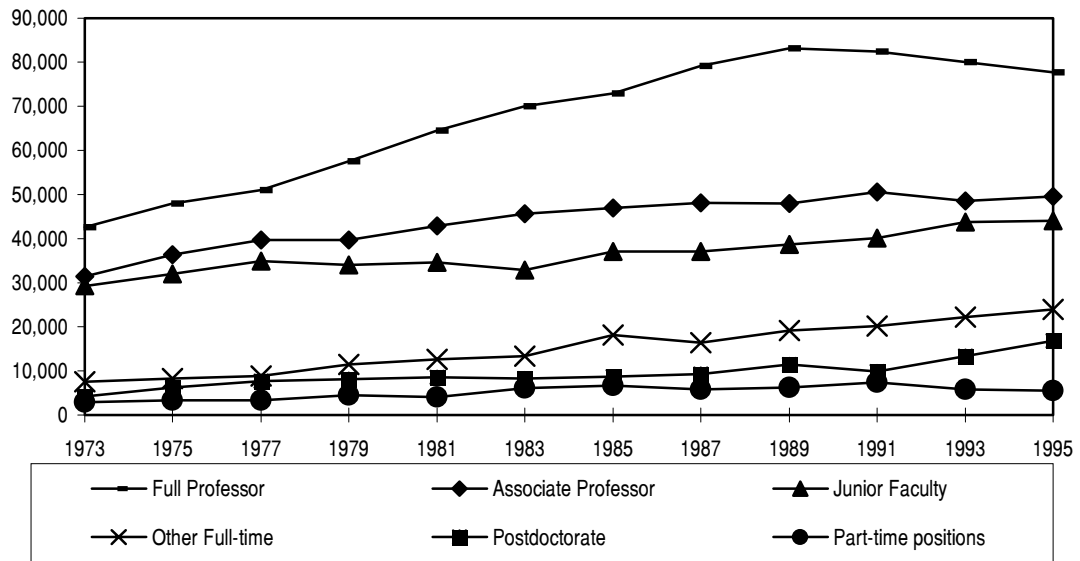
did not fully balance out the overall decline among senior faculty. Junior faculty rose by an estimated 3,900, compared to estimated losses of about 6,700 among senior faculty in all S&E fields combined (save computer science which gained about 800) (table 2).

**Robust growth outside the faculty ranks**

Academic employment of doctoral scientists and engineers outside the full-time faculty ranks expanded at a robust pace, from 37,500 in 1991 to 46,200 in 1995. This growth was driven

Since 1991, the number of full professors has declined by 6 percent; but full-time junior faculty members have increased by 10 percent.

**Figure 1. Academic doctoral scientists and engineers by type of position: 1973-95**



**NOTES:** Junior faculty includes assistant professors plus instructors. Survey changes in 1991 and 1993 make these data not strictly comparable to earlier years.

**SOURCE:** NSF/SRS, Survey of Doctorate Recipients, unpublished tabulations.

There were field differences as well. The 1991-95 decline in the number of senior faculty was about 8 percent in the social sciences and 5 percent in psychology, while the number in the life sciences remained nearly stable. Computer sciences was the exception: the number of senior faculty almost doubled, but from a low base—from roughly 900 to 1,700.

Despite large percentage increases in full-time junior faculty, their absolute numerical increases

by a steep increase in the number of postdoctorates, which rose from about 10,000 to 16,800. Others with full-time academic appointments but no faculty rank—research and teaching associates, postdocs, persons with administrative responsibilities, etc.—rose from 20,200 to 23,900. Those holding part-time positions actually declined from 7,400 to 5,500 (table 1).

Again, there were field differences in this non-

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faculty employment growth. Postdoctoral positions in the life and physical sciences, psychology, and engineering all rose robustly; the first three of these fields also added other full-time personnel outside the faculty ranks.

These changes in the composition of academic employment from 1991-95 may provide some clues to its future structure. They suggest a relative shift away from full-time senior faculty and

towards employment outside the traditional faculty ranks. But it is too early to tell whether these patterns represent temporary adjustments or a more enduring shift.

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**Table 2. Changes in the number of academic doctoral scientists and engineers in faculty and other types of positions, by field: 1991-95**

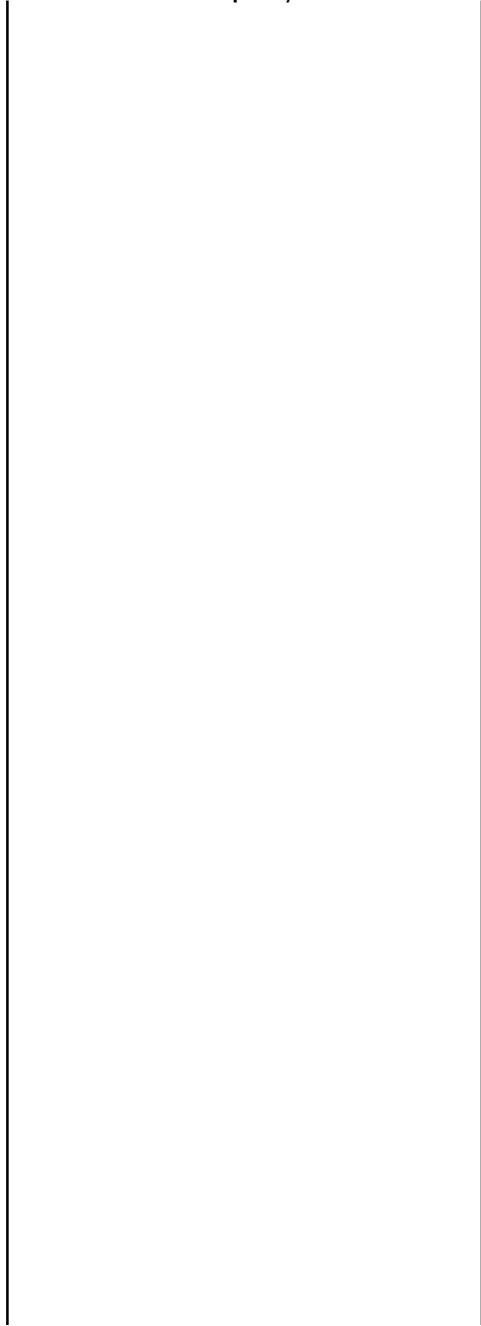
Field	Total employment	Full-time				Post-doctorates	Part-time positions
		Total faculty	Senior faculty	Junior faculty	Non-faculty		
Total science and engineering.....	6,900	-1,800	-5,700	3,900	3,600	7,000	-1,900
Total sciences.....	5,900	-1,700	-5,200	3,400	3,300	6,200	-1,900
Physical sciences.....	1,700	-800	-1,200	400	600	2,100	-200
Mathematics.....	-600	-1,200	-1,200	0	0	400	200
Computer science.....	1,200	1,000	800	200	100	100	0
Environmental sciences....	400	200	0	200	200	100	-100
Life sciences.....	4,700	1,700	-300	2,000	1,200	2,800	-1,100
Psychology.....	1,000	-700	-800	100	1,100	600	-100
Social sciences.....	-2,300	-1,900	-2,500	600	100	100	-700
Engineering.....	1,000	0	-500	500	400	700	-100

**NOTES:** Senior faculty includes full and associate professor; junior faculty includes assistant professor plus instructor.

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**SOURCE:** NSF/SRS, Survey of Doctorate Recipients, unpublished tabulations.

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