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ABSTRACT

Major findings of a survey of 188 universities and colleges that constitute the universe of higher education institutions with doctoral-level programs in neuroscience are highlighted and discussed in this brief report. Areas considered included graduate students, doctoral recipients, postdoctoral trainees, principal areas of concentration, administrative/organizational structure, faculty, and employment outlook. Among the findings reported are those indicating: that activities in the field of neuroscience accelerated during the seventies; that the numbers of graduate students and postdoctoral trainees were expected to level off in 1982; that although the leveling off was expected, doctoral production (which reflects enrollments in earlier years) was expected to continue to rise, at least in the short run; that over one-half of the institutions indicated a moderate surplus of job applications compared to openings in 1981/82, with one-fifth reporting a severe surplus; that the growth in the number of full-time faculty also appears to have slowed; and that of the 188 institutions surveyed, only 5 reported having a separate department of neuroscience. (JN)

SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D.C. 20550 JULY 20, 1983 NSF 83-314

Growth in Neuroscience May Be Leveling Off

This publication presents the major findings of a survey of 188 universities and colleges that constitute the universe of higher education institutions with doctoral-level programs in neuroscience. The survey, supported by the National Science Foundation, was conducted during the summer of 1982 by the American Council on Education through the Higher Education Panel. Responses were obtained from 93 percent of those surveyed and were weighted to represent the 188 institutions in the universe.[1]

Highlights

- Activities in the field of neuroscience accelerated during the seventies. The pace of growth in this newly developing discipline generated the need for more complete information to assist in the formulation of Federal funding and training policies. A special survey, undertaken to fill some of these information needs, revealed a slowing of that growth trend.

- The numbers of neuroscience graduate students and postdoctoral trainees were expected by university officials to level off in 1982. There were about 2,570 graduate students in fall 1981, 4.5 percent more than in fall 1980, and no change was expected between 1981 and 1982. Postdoctoral trainees increased by 5 percent from fall 1980 to about 1,290 in 1981, but were expected to decline slightly in fall 1982.

- Although a leveling off was expected in the number of graduate students and postdoctoral trainees, Ph. D. production—which reflects enrollments in earlier years—was expected to continue to rise, at least in the short run. About 500 Ph. D.'s were awarded in neuroscience programs in 1980/81 and 1981/82. About 600 Ph. D.'s were expected by university officials for 1982/83.

- Opinions of university officials about the market for full-time employment in neuroscience, following completion of postdoctoral training, provided additional indications of slowing growth in this field. Over one-half the institutions reported a moderate surplus of job applicants compared to openings in 1981/82, and one-fifth reported a severe surplus.

- The growth in the number of full-time faculty in neuroscience also appears to have slowed. The number increased 8 percent from fall 1980 to about 3,420 in fall 1981, and was expected to rise by only 1 percent by 1982. About two-thirds of the neuroscience faculty had tenure in fall 1981 and there were also 140 faculty vacancies in neuroscience programs at that time.

- Of the 188 institutions surveyed, only 5 reported having a separate department of neuroscience. Almost three-fifths of the institutions utilize traditional departments to offer Ph. D. training in traditional disciplines with specialization in neuroscience, and another one-third rely on interdepartmental structured programs.

Introduction

It is known that the number of neuroscientists has grown rapidly in the past decade. For instance, studies based on dissertation titles indicate a 150-percent increase in earned higher degrees in this field from 1970 to 1980, compared to an 11-percent growth in the number of doctorates awarded in biological sciences.[2] Also, membership in the Society for Neuroscience grew from a few hundred in the early seventies to more than 8,000. The rapid growth of this newly developing discipline generated a need for more complete information to assist in the formulation of Federal and non-Federal research and training policies. The complex and multidisciplinary nature of this field, however, makes it difficult to measure and assess its activities with any single indicator. This analysis, therefore, looks at academic neuroscience activities in terms of data on faculty, graduate students, postdoctorates, and the administrative/organizational structure of the programs.

For the purpose of this study, neuroscience was defined to include those subject areas and disciplines which have, as a primary goal, the understanding of the structure and functions of nervous systems. The survey was limited to institutions which have a Ph. D. training program in neuroscience.

These programs are found in a variety of institutional settings. To better understand the organizational characteristics of academic neuroscience programs, the data were analyzed using three different classifications of institutions—control (i.e., public or private), comprehensiveness of institution,

[1] For more complete detail on the American Council on Education survey, see American Council on Education, "Neuroscience Personnel and Training," *Higher Education Panel Report*, No. 57 (Washington, D.C., 1983).

[2] Unpublished report by Louise H. Marshall (Los Angeles, Calif.: Brain Research Institute, Univ. of Calif.-Los Angeles, School of Medicine).

Prepared in the Supply and Education Analysis Group, Division of Science Resources Studies

and relative rank in terms of research and development (R&D) funds.[3]

Graduate Students

One of the best descriptors of the magnitude of a graduate training program is its number of full-time graduate students. There were almost 2,600 graduate students in fall 1981, 4.5 percent more than in 1980. The 1981 number represented 7.4 percent of all full-time biological sciences graduate students in doctorate-granting institutions, up from 7.0 percent in 1980.[4] Estimates for fall 1982, however, indicate at least a temporary leveling in the number of neuroscience graduate students (chart 1).

The distribution of full-time neuroscience graduate students differed among the various types of institutions. Graduate-only schools enrolled 47 percent; comprehensive institutions, 41 percent; and medical schools, 12 percent. In terms of federally funded R&D expenditures in biological sciences, the top 50 institutions enrolled 44 percent of students.

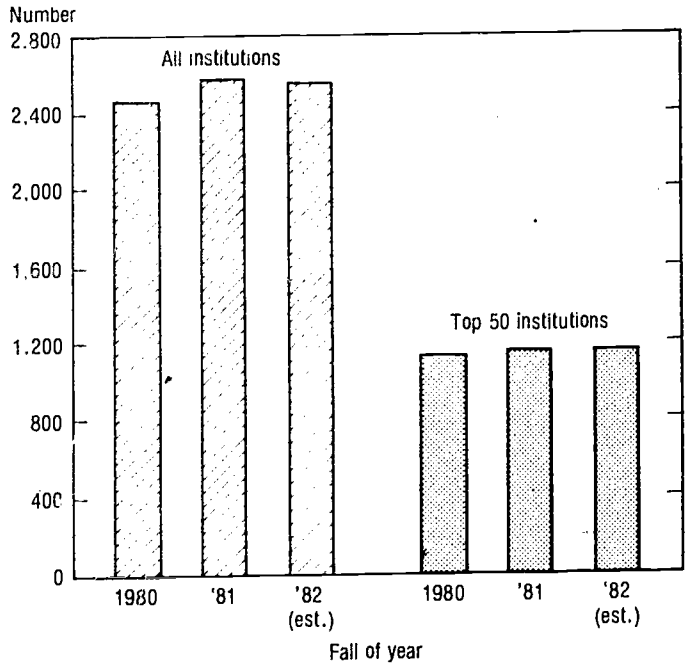
Neuroscience attracted relatively fewer foreign students than biological sciences. Only 9 percent of the neuroscience graduate students were foreign citizens on temporary visas in fall 1981 compared to an overall figure of 13 percent for biological sciences graduate students.[5]

[3]The organization classifications are (1) independent or separate medical schools, (2) graduate-only institutions (that do not include a medical school), and (3) comprehensive institutions which include both a graduate and a medical school. The research categories are (1) the "top 50" institutions (ranked according to their federally funded R&D expenditures in biological sciences in 1980), and (2) all other institutions (i.e., the remaining 138).

[4]National Science Foundation. *Academic Science/Engineering: Graduate Enrollment and Support, Fall 1981* (Detailed Statistical Tables) (NSF 83-305) (Washington, D.C., 1983).

[5]*Ibid.*

Chart 1. Graduate students in neuroscience



SOURCES: National Science Foundation and American Council on Education

Sixty-three percent of the institutions reported that the average or typical length of full-time study for completion of the neuroscience Ph.D. was five years. In comparison, the typical doctorate in the biological sciences takes six years to complete. There has been some tendency towards an increase in the length of neuroscience training since 1977.

Ph. D. Recipients[6]

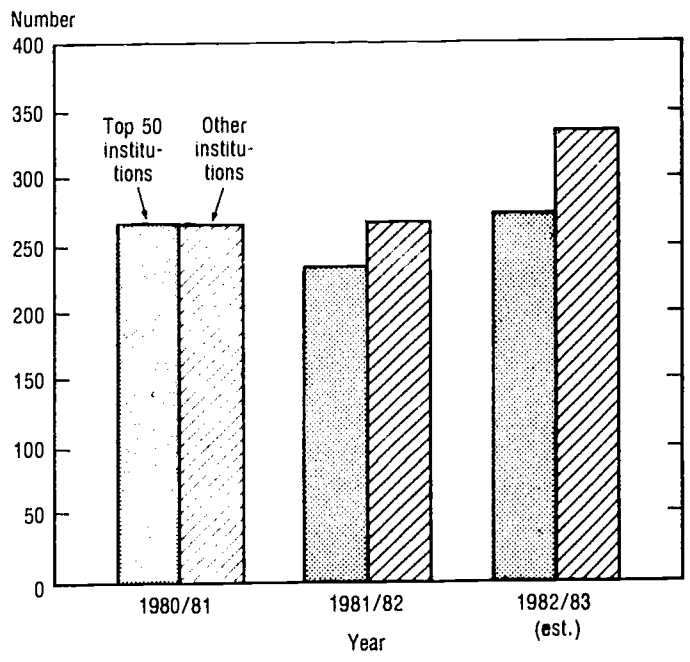
Recent fluctuations in the annual numbers of neuroscience Ph.D.'s make it difficult to perceive a clear trend. About 490 Ph.D.'s were awarded in 1981/82, almost 13 percent of the biological science degrees awarded in that year. The 1981/82 neuroscience degree production was 5 percent less than in the previous year (chart 2). Respondents expected, however, a substantial 22-percent increase in neuroscience doctorates for 1982/83. The estimates were based on the number of candidates who could possibly complete their doctoral work during the ensuing year. These figures may prove somewhat optimistic, however, in that they may not give sufficient weight to the difficulties encountered by individual students in completing degree requirements and because limited postdoctoral training opportunities may lead some students to delay completion of their graduate work. The 1982/83 increases are expected to occur primarily in the graduate-only institutions (29 percent), and in institutions ranked below the top 50 (27 percent).

Postdoctoral Trainees

The number of postdoctorates changed little from 1980 to 1981 and university officials did not expect it to change much in 1982. There were about 1,270 postdoctorates in the

[6]The degrees reported here include Ph.D.'s in neuroscience and degrees in traditional disciplines, such as physiology and anatomy, with specialization in neuroscience.

Chart 2. Ph. D.'s awarded in neuroscience



SOURCES: National Science Foundation and American Council on Education

fall of 1982. There is limited evidence that these traineeships may currently be acting as a buffer against adverse trends in job opportunities for new doctorates in this field. Thus, almost one-fourth of the institutions reported increases in the length of time for postdoctorate training citing the lack of full-time jobs in the field as the primary factor. Postdoctorates were more highly concentrated than graduate students in the top 50 institutions (65 percent) and in the comprehensive institutions (58 percent).

Neuroscience attracted proportionately fewer foreign students at the postdoctorate level (about one-fifth) than biological sciences (over three-tenths).[7] There was a higher fraction at this level, however, than at the graduate level.

Principal Areas of Concentration

Five major subject areas or disciplines characterize the areas of concentration in neuroscience training and research over the last five years: Physiology, psychology/behavioral science, anatomy, pharmacology, and chemistry/biochemistry. Physiology and psychology/behavioral science ranked first or second among faculty and graduate students. Physiology and anatomy were the principal areas of concentration among postdoctorates.

Anatomy was identified as the principal area for students by 44 percent of the medical schools. Anatomy, physiology, and psychology/behavioral sciences were each rated as the principal training area at one-fifth of the top 50 institutions, but psychology/behavioral sciences were rated as the principal area in three-tenths of the institutions ranked below the top 50.

Administrative/Organizational Structure

In part, because of the newness of the field, there are very few formal departments of neuroscience in universities, and most neuroscientists are based in departments of anatomy, pharmacology, physiology, biochemistry, biology, and psychology. Many institutions have more than one locus for neuroscience training programs.

With respect to organizational structure, a majority of the institutions, 57 percent, conduct neuroscience programs through traditional departments, and award the Ph.D. in traditional disciplines with specialization in neuroscience. These programs typically are smaller and are located in less research-intensive institutions (i.e., those other than the top 50) and in the less complex institutions (graduate-only institutions). Twenty percent of the institutions rely primarily on interdepartmental programs and award the Ph.D. in a traditional discipline with specialization in neuroscience. These programs tend to be larger and are less likely to be located in the smaller and the graduate-only schools. The largest programs are more likely to be interdepartmental in nature and award the Ph.D. in neuroscience. Eleven percent of the institutions have this program structure and they tend to be in medical and comprehensive schools and in the top 50 group. The five institutions that have separate neuroscience departments are comprehensive in terms of organization and are in the top 50.

[7]National Science Foundation, *Academic Science/Engineering: Graduate Enrollment and Support, Fall 1981*, op. cit.

Faculty

The trend toward slower growth rates was also evident among neuroscience faculty. Their numbers had increased by 8 percent in fall 1981 from about 3,170 in fall 1980, but slower growth, about 1 percent, was projected for fall 1982 (chart 3). The highest 1980-82 rate of increase in faculty was expected by respondents from institutions ranked below the top 50, with a 14-percent increase as against an average increase of 9 percent in all institutions.

About 50 percent of the faculty were in comprehensive institutions and 27 percent in graduate-only schools. Only 46 percent of the faculty were in the top 50 institutions. Two-thirds of the faculty had tenure in fall 1981, only a little less than the tenure level of biological sciences faculty in fall 1980.[8] There were 140 faculty vacancies in fall 1981, about 4 percent of the total. The vacancy rates were lowest at the comprehensive and the top 50 institutions. Retirements were expected to be very low—about 1 percent—in the year preceding the fall term 1983, possibly reflecting the youthfulness of faculty in this emerging field.

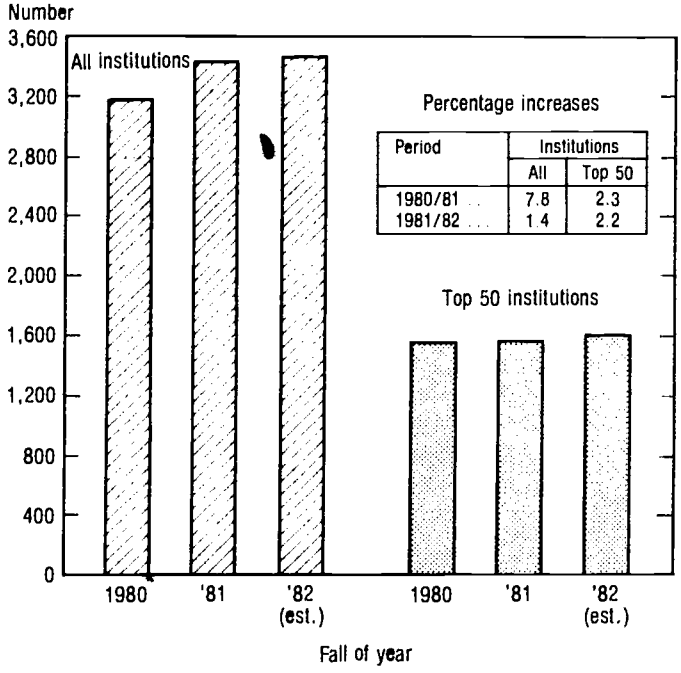
The neuroscience staff included 400 nonfaculty research doctorates in addition to the faculty. Nonfaculty research doctorates tend to be more concentrated in the top 50 institutions.

Employment Outlook

Neuroscientists usually undergo a period of postdoctoral training before entering full-time employment. Their per-

[8]National Science Foundation, *Young and Senior Science and Engineering Faculty, 1980* (NSF 81-319) (Washington, D.C., 1981).

Chart 3. Neuroscience faculty



SOURCES: National Science Foundation and American Council on Education

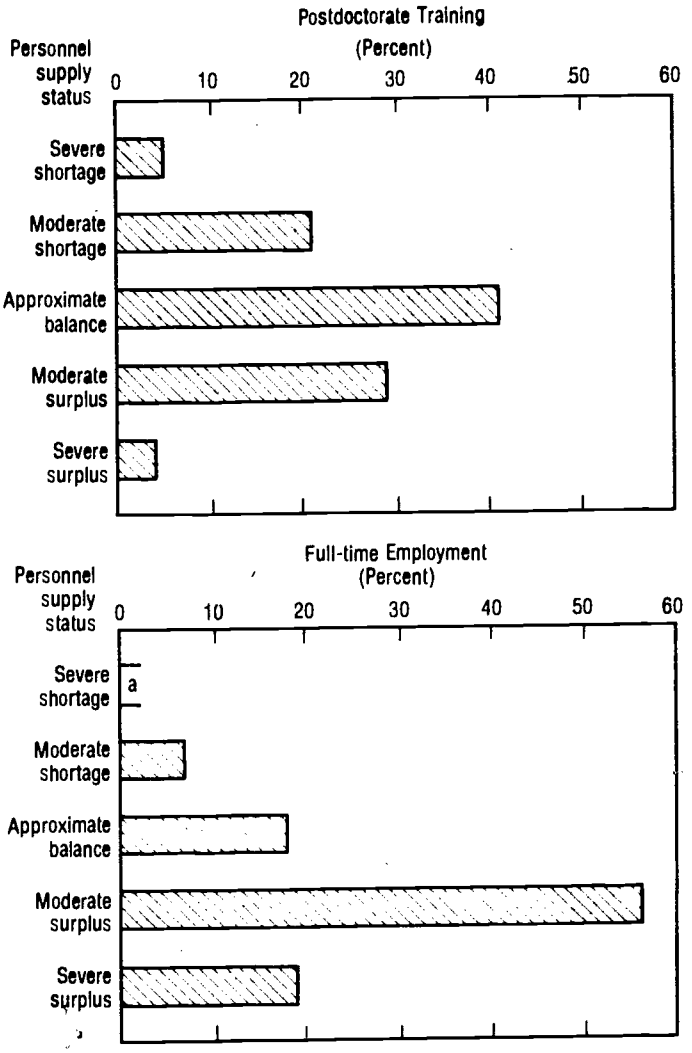
ception of opportunities for postdoctoral training or subsequent employment in neuroscience may be expected to influence near-term trends at each stage of career development. Indications of a slowing of growth in neuroscience were reflected in the opinions of the institutional respondents about the 1981/82 markets for postdoctoral training and employment (chart 4).

Postdoctoral training opportunities. A balance between the numbers of postdoctoral candidates and postdoctoral appointments available was reported by two-fifths of the institutions.[9] One-third of the institutions perceived a moderate or severe surplus of personnel seeking appointments, and only one-fourth reported a moderate or severe shortage. The situation was generally similar at all institutions, regardless of the R&D rank except that none of the top 50 institutions reported a severe surplus of postdoctoral candidates.

Employment opportunities (after postdoctoral training). In 1981/82, those who had completed postdoctoral training in neuroscience had less encouraging prospects of obtaining full-time employment than did the new Ph.D. recipients who were seeking postdoctoral appointments. Less than one-fifth of the institutions reported a balance between the numbers of personnel completing postdoctoral training and full-time employment opportunities in neuroscience. Over one-half of the institutions reported a moderate surplus and one-fifth reported a severe surplus. The lack of full-time employment opportunities was most serious for postdoctorates at comprehensive institutions. Both the top 50 and all other institutions reported similar situations.

[9]The respondents were asked to characterize the market for postdoctoral training in neuroscience and for full-time employment in neuroscience following completion of postdoctoral training by making one of the following choices: (1) Critical shortage of personnel, (2) moderate shortage of personnel, (3) market balance between personnel and positions, (4) moderate surplus of personnel, and (5) critical surplus of personnel.

Chart 4. Neuroscience personnel supply in relation to opportunities: 1981/82



[a]No institutions reported severe shortage of personnel for full-time employment

SOURCES: National Science Foundation and American Council on Education

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