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Office of Science Education Programs

SCIENCE EDUCATION PROGRAMS BRIEF

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U.S. Department of Energy Student Research Participation Program Profile and Follow-Up Study of 1985 Participants

SUMMARY

The Student Research Participation (SRP) program sponsored by the U.S. Department of Energy (DOE) is designed to provide ten-week summer research appointments to science and engineering undergraduate students. Profile data were collected at the time of participation for all 782 participants in the 1985 SRP program. In 1993, follow-up survey forms were mailed to former participants for whom addresses were available, and 279 former participants returned forms. In addition, a group of 14 former participants met as a special focus group to provide detailed information about their program experiences and the impact of program participation on their subsequent educational accomplishments and career aspirations.

- Almost 38 percent of the participants in the 1985 SRP program were female. Fifteen percent of the 1985 participants represented minorities; 9 percent were from racial or ethnic groups traditionally underrepresented in science and engineering.

- Over 30 percent of the 1985 SRP follow-up respondents received undergraduate degrees in physical sciences, compared to 8 percent of a national group of similar bachelor's graduates in the natural sciences and engineering (NS&E).

- Approximately 5 or 6 years after receiving their bachelor's degrees, more than two-thirds of the 1985 SRP respondents had attained graduate degrees, with 27 percent earning Ph.D.s and 14 percent earning professional (primarily medical) degrees. About 40 percent of the respondents expected to earn degrees beyond those already attained.

- Compared to a similar group of NS&E graduates, almost twice as many 1985 SRP respondents who were employed full-time reported that their primary work activity was research and development (48 percent versus 25 percent).

- The 1985 SRP respondents' overall satisfaction with the SRP program was decidedly positive. The areas on which the program had the greatest influence were current and past research activities, area of specialization, and whether to attend graduate school.

- The program characteristics that tended to be most closely associated with higher overall satisfaction with the SRP program were the following: formal series of lectures or seminars; working as part of a research team; use of sophisticated equipment; making a formal research presentation; and frequent interaction with supervisor/ mentor, both during and after participation.

Influence of 1985 SRP Program on Follow-Up Respondents

The extent to which participation influenced decision on the following:	Percentage Distribution			
	Large Extent	Some Extent	Small Extent	Not at All
Whether to attend graduate school	21%	30%	16%	33%
Choice of graduate school	5	12	18	65
Area of specialization	19	37	23	21
Level of final degree	15	30	25	30
Current occupation	17	29	25	29
Current employer	7	10	22	61
Current and past research activities	19	32	27	22

Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993, n's ranged from 268 to 276.

INTRODUCTION

In recognition of the important role that hands-on research experience plays in the career development of undergraduate science students, the U.S. Department of Energy (DOE) Student Research Participation (SRP) program was instituted in 1962 to encourage undergraduate students to seek advanced degrees in scientific areas of interest to DOE. The SRP program provides undergraduate students with hands-on training in energy-related research areas under the guidance of a DOE facility senior staff member.

This brief program report summarizes the results of a follow-up assessment of the 1985 SRP program in which 782 students participated in research at 35 DOE sites. The major sources of quantitative data are program operating data collected by lab contractors for the 1985 SRP program and a 1993 follow-up survey, which investigated long-term program effects. In October 1993, qualitative data were collected through focus group interviews of 14 former participants from the 1985 SRP program.

PROFILE DATA

Information on 782 participants in the 1985 SRP program was collected at the time of the appointments. Although there were more males than females (62 percent versus 38 percent) represented in the 1985 SRP program, the representation of females is greater than the proportion of females (about 31 percent) earning natural sciences and engineering bachelor's degrees in the year 1987.

Race/Ethnicity

While the majority of the SRP participants were Caucasian, 15 percent of the participants were minorities. More significantly, 9 percent were minorities traditionally underrepresented in natural sciences and engineering. This percentage is the same as the proportion of underrepresented minorities attaining bachelor's degrees in natural sciences and engineering in 1987.

Educational Characteristics

Representing 346 college and university campuses, the 1985 SRP participants were predominantly undergraduate juniors and seniors (82 percent). The largest proportion of the students were majoring in physical sciences, followed by biological sciences and engineering.

FOLLOW-UP SURVEY

For the follow-up effort, information was provided by 279 participants in the 1985 SRP program who responded to a follow-up survey administered in the summer of 1993. The questionnaire items were based on previously tested questions used in surveys of similar DOE student programs and in large national surveys of college graduates to facilitate comparisons of the SRP students with these groups.

Thus, statistics on SRP respondents to the follow-up survey can be compared to national statistics from the National Science Board publication, *Science and Engineering Indicators-1993*, and to the group of 1985 bachelor's graduates from the 1990 National Science Foundation New Entrants Survey. The complete report contains a more detailed discussion of these comparison groups.

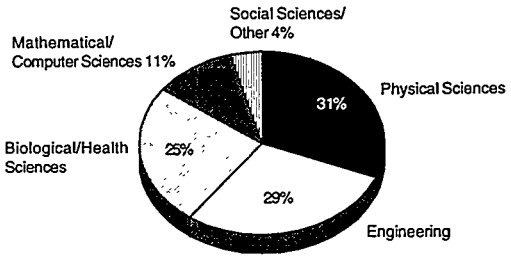
The former SRP participants who responded to the 1993 follow-up survey ranged in age from 26 to 42 years, with a mean age of 30. The male/female representation among respondents was the same as in the 1985 program, with 62 percent male and 38 percent female.

In comparison with the race/ethnicity distribution of the 1985 SRP participants, a larger percentage of the respondents were Caucasian (92 percent versus 85 percent) and a smaller percentage were African American (1 percent versus 7 percent). Very similar proportions of Asians and Hispanics responded to the follow-up as participated in the 1985 SRP program.

Educational Attainment

Educational attainment is an important indicator of positive benefits of DOE's student research

Undergraduate Degree Field for 1985 SRP Follow-Up Respondents



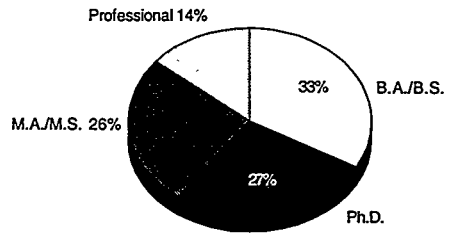
Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993, n=277.

programs. The results of the follow-up assessment on the 1985 SRP program were very positive, with large proportions of respondents reporting degrees in science and engineering and attainment of graduate degrees.

Almost all of the respondents reported undergraduate degrees in the natural sciences and engineering (NS&E). The largest proportion of the degrees were in the physical sciences (31 percent), followed by engineering (29 percent). In comparison with national statistics for degrees in natural sciences and engineering, the notable contrast is the high percentage of degrees in physical sciences reported by the follow-up respondents; only about 8 percent of all natural science and engineering bachelor's degrees earned in 1987 were in the physical sciences (NSB, 1993).

When asked to report the level of their highest degree attained, about two-thirds of the follow-up respondents indicated they had attained a graduate degree. The largest proportion of the master's degrees were in engineering (34 percent), followed by the physical sciences (30 percent). More than one-fourth of the respondents held Ph.D.s, with an additional 14 percent reporting professional degrees, primarily medical degrees. Overall, the reported highest degrees were received from more than 150 different college and university campuses.

Level of Highest Degree for 1985 SRP Follow-Up Respondents



Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993, n=279.

The proportion of Ph.D.s earned by 1985 SRP respondents (27 percent) is much higher than the 8 percent rate calculated from national statistics. In examining the degree field reported by 74 Ph.D. recipients from the 1985 SRP program, 47 percent held degrees in physical sciences, followed by biological/ health sciences and engineering. This is in contrast with national statistics for Ph.D.s granted in natural sciences and engineering in 1991, in which 21 percent were in physical sciences.

Employment

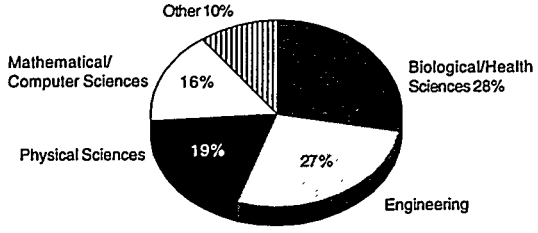
To facilitate comparison of the 1985 SRP respondents with a large national sample of similar students, several of the items in the follow-up survey were based on employment questions from the National Science Foundation's large national survey, the Survey of Natural and Social Science and Engineering Graduates (commonly referred to as the New Entrants Survey). As a comparison to the 1985 SRPs, most of whom graduated in 1986 or 1987 and were surveyed 6 to 7 years after graduation, data from the 1990 NSF New Entrants Survey were used: i.e., the group of bachelor's graduates who obtained degrees in natural sciences and engineering (NS&E) in 1985.

Regarding current principal employment, the largest proportion of the SRP respondents indicated their field of work to be engineering (27 percent), followed by physical sciences (19 percent), health sciences (15 percent), and biological sciences (12 percent).

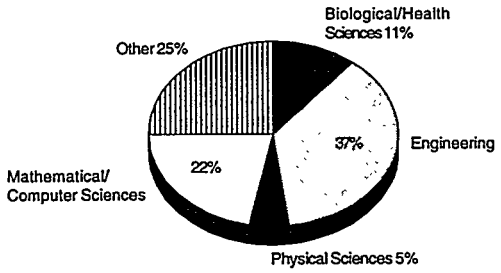
More than one-third of the SRP respondents indicated their current principal employment was in

Employment Field for 1985 SRP Follow-Up Respondents and 1985 NS&E Bachelor's Graduates

SRP Follow-up Respondents

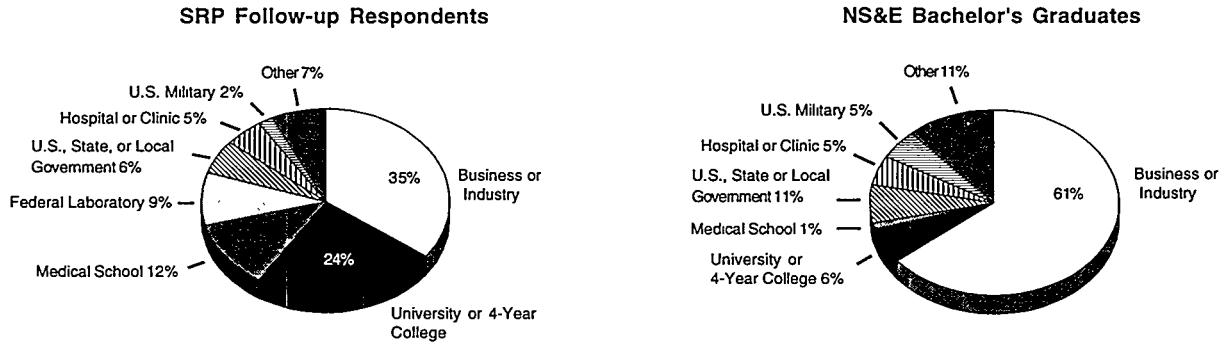


NS&E Bachelor's Graduates



Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993, n=247; National Science Foundation 1990 New Entrants Survey.

Employer Type for 1985 SRP Follow-Up Respondents and 1985 NS&E Bachelor's Graduates



Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993, n=259; National Science Foundation 1990 New Entrants Survey.

business/industry, followed by about one-fourth employed by a 4-year college or university. Additionally, about 12 percent were employed by a medical school and 9 percent by a federal laboratory. For the 1985 NS&E bachelor's graduates, the majority chose business/industry.

It should be noted that "federal laboratory" was not a response option on the 1990 New Entrants Survey; therefore, other categories, such as business, university, or U.S. Government may be slightly inflated for the bachelor's graduates in comparison with the SRP respondents. Despite this difference in response options, it seems noteworthy that much larger proportions of the 1985 SRP respondents were employed by 4-year colleges/universities or medical schools, which is consistent with their degree attainment at the time of the follow-up survey.

Basic research was chosen by the largest proportion of the respondents as their primary work activity with 20 percent, followed by 16 percent of the respondents in applied research and 11 percent in development activities. Since the encouragement of student interest in research and development is consistent with the goals of the SRP program, it is significant that almost one-half of the respondents were involved in these types of activities.

ASSESSMENT OF 1985 SRP PROGRAM BY FOLLOW-UP RESPONDENTS

In addition to questions about education and employment, the follow-up survey of 1985 SRP participants asked former participants to rate the 1985 summer research program and to assess the program's influence on their decisions about school and career.

Satisfaction with 1985 SRP Program

Overall, there was a high level of satisfaction with the program. More than three-fourths of the respondents rated the program an 8, 9, or 10 on a scale of 1 to 10, with 10 representing very satisfied. The mean response for satisfaction was 8.2.

Primary Work Activity of 1985 SRP Follow-Up Respondents and 1985 NS&E Bachelor's Graduates

Activity	SRP Respondents	NS&E Bachelor's Graduates
Applied Research	16%	5%
Basic Research	20	4
Development—Product/Process/Technology	11	13
Management of R&D	1	3
Subtotal of R&D	*48%*	*25%*
Clinical Diagnosis	9%	2%
Computer Applications	5	12
Consulting	5	6
Design of Equipment/Processes/Models	3	7
Management—Non R&D	6	10
Operations	5	10
Teaching	8	5
Other	11	23

Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993; National Science Foundation, 1990 New Entrants Survey.

Influence of 1985 SRP Program on Follow-Up Respondents

The respondents were also asked to indicate the extent to which their participation in the 1985 SRP program influenced various decisions such as attending graduate school, occupation, major, or employer. The program appeared to have the least influence on the choice of graduate school and current employer. However, on current and past research activities, area of specialization, and whether to attend graduate school, more than one-half of the respondents said the program had some or a large influence.

Effects of Delivery Systems on 1985 SRP Respondents

The 1985 SRP programs were held at 35 DOE facilities. Individual programs used various delivery systems to try to accomplish the goals of the program. To measure the effectiveness of the delivery systems used in the 1985 SRP program, the overall satisfaction rating was used as an indicator of program success. For each delivery system (for example, formal series of lectures, training in use of sophisticated equipment), the respondents were divided into two groups based on whether or not this particular delivery system was a component of their experience in the 1985 SRP program. The mean overall satisfaction rating for the two groups for each delivery system was compared, and the differences between means were tested for statistical significance.

Overall Satisfaction with 1985 SRP Program as Related to Delivery Systems

Delivery Systems for 1985 SRP Program	Overall Satisfaction Ratings for SRP Respondents Indicating System Was: Part of Program	Not Part of Program
** Assistance with housing arrangements	7.9	8.4
* Opportunity to meet other participants on a regular basis	8.3	7.9
Organized social activities for SRP program participants	8.3	8.1
** A formal series of lectures or seminars	8.5	8.0
* Participation in an ongoing research project	8.2	7.7
** Opportunity to work as part of a research team	8.5	7.4
** Training in the use of sophisticated equipment/instrumentation	8.4	7.8
** A formal presentation of your research to laboratory staff	8.9	7.9
Preparation of a paper based on your research	8.3	8.1
Academic credit for participation	8.6	8.1
** Frequent interaction with your supervisor/mentor	8.4	7.0
** Contact with supervisor/research colleagues maintained after program	9.0	7.7

Source: U.S. Department of Energy, Student Research Participation program, follow-up study of 1985 participants, 1993.

Notes: Respondents rated the SRP program on a scale of 1 to 10, with 1 representing very dissatisfied and 10 very satisfied.
*Two-tailed t-test significant at .10 level.
**Two-tailed t-test significant at .05 level.

CONCLUSION

The results of this assessment of the SRP program strongly suggest that the program is meeting its primary objectives. The participants' successes in science and research careers are illustrated by the follow-up data collected. Furthermore, the majority of respondents indicate a high level of satisfaction with the program and acknowledge the influence of the program on their educational attainment and research activities.

Note: For the complete report, see *U.S. Department of Energy Student Research Participation Program: Profile and Survey of 1985 Participants*, September 1994.

This report results from collaboration between the Division of Educational Programs at Argonne National Laboratory and the Science/Engineering Education Division at Oak Ridge Institute for Science and Education.

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