An Imperative Need:
NSF's Program for Persons with Disabilities

Who has a Disability?

Historically, the National Science Foundation (NSF) has used a definition of *disability* patterned after one developed for a survey of individuals with disabilities by the Census Bureau (DoC, 1994). This measure was based on asking individuals, "What is the usual degree of difficulty you have with (specific tasks involving seeing, hearing, walking, and lifting)?"[1] Respondents were given five choices for each item, ranging from "none" to "unable to do," where having a disability is defined as having at least moderate difficulty in performing one or more of these tasks. Although this definition was designed to provide a relatively objective measure of disability, it is important to note that it does not capture all disabilities. For example, learning disabilities and behavioral disorders—which may comprise significant proportions of the total population potentially considered as possessing a disability—are not included.

Reported Trends—Persons with Disabilities in Science, Technology, Engineering, and Mathematics

The representation of persons with disabilities in the science and engineering population can be estimated by comparing the results of the NSF National Survey of College Graduates with similar results from the Bureau of the Census' Survey of Income and Program Participation (NSF, 1996). Comparisons of the two survey results indicate that persons with significant sensory-motor disabilities are underrepresented among scientists and engineers. As representative excerpts from the series, *Women, Minorities, and Persons with Disabilities in Science and Engineering ¾ Statistical Reports on U.S. Science*, we note[2]—

[1] The full wording of these alternatives in the survey forms is "SEEING words or letters in ordinary newsprint (with glasses/contact lenses if you usually wear them)", "HEARING what is normally said in conversation with another person (with hearing aid, if you usually wear one)", "WALKING without assistance (human or mechanical) or using stairs", "LIFTING or carrying something as heavy as 10 pounds, such as a bag of groceries."

[2] Data and text for this section are reproduced from *Women, Minorities, and Persons with Disabilities in Science and Engineering ¾ Statistical Reports on U.S. Science* (NSF 1996, 1998, 2000), a congressionally mandated, biennial series published by the National Science Foundation.

- "Persons with disabilities are a smaller proportion of the science and engineering labor force than they are of the labor force in general. About 20 percent of the population has some form of disability; about 10 percent have a severe disability (McNeil, 1993). Persons with disabilities are 13 percent of all employed persons (DoC, 1994) and about 5 percent of the science and engineering labor force." (NSF, 1996, p.84).
- "Unlike women and minorities, persons with disabilities are not particularly concentrated in certain fields, although a somewhat higher fraction of those with doctorate degrees in the social sciences have disabilities (6.6 percent) than is true of those with doctorate degrees in science and engineering as a whole (5 percent)." (NSF, 1996, p.84).
- "The proportion of scientists and engineers with disabilities increases with age. More than half became disabled at age 30 or older. Only 7 percent had been disabled since birth, and 30 percent had been disabled before the age of 20" (NSF, 1998, p. 115).
- "Scientists and engineers with disabilities do not differ in educational background from those without disabilities: 13 percent of both have the doctorate as their highest degree. ... Scientists and engineers with disabilities are less likely than those without disabilities to be employed in for-profit business or industry ... Faculty who have disabilities are more likely than those without disabilities to be full professors and to be tenured. These differences in rank and tenure between persons with or without disabilities, as was noted in the discussions of women and minorities, can be explained by differences in age. Because incidence of disability increases with age, scientists and engineers with disabilities tend to be older and to have greater years of professional work experience than those without disabilities." (NSF, 1998, p. 117).
- "Persons with disabilities also make up only a small percentage of those in science and engineering occupations. In 1997, they were 6 percent of the scientists and engineers in the labor force; this was about the same as in 1993." (NSF, 2000, p. 52).
- "Although age accounts for some of the tendency for persons with disabilities to be out of the labor force, chronic illness or permanent disability is also a factor. The primary reason for not working for both persons with and without disabilities was retirement (78 and 62 percent, respectively), but 19 percent of persons with disabilities and 2 percent of those without cited chronic illness or permanent disability." (NSF, 2000, p. 57).
- "Scientists and engineers with disabilities were less likely than those without to be employed in for-profit business or industry: 53 versus 60 percent in 1997. They were also somewhat less likely to be employed in academia than their counterparts without disabilities: 18 versus 20 percent." (NSF, 2000, p. 59).

Inception of the Program

Although about 20 percent of the population in the United States possesses some kind of disability, the number of persons with any particular disability may only number in the thousands or tens of thousands. This gives such persons the dubious distinction of small, specialized audiences often overlooked by codified academic, corporate, and legislative consideration. In the late 1980s, NSF convened a task force to address similar indicators that had been collected from academe and the national science, technology, engineering, and mathematics (STEM) workforce. The recommendations from these advisors, in part, led to the establishment of the Program for Persons with Disabilities.

The final report of the National Task Force on Women, Minorities, and the Handicapped in Science and Technology (1987-1990) indicated that the number of people with disabilities was seriously underrepresented in science and technology careers in the country. The Task Force—consisting of 20 members from industry and 20 members from governmental agencies appointed by the President's Science Advisor—recommended that the U.S. Government should establish and operate targeted programs to recruit, train, and retain people with disabilities for careers in these disciplines. During 1989, when the National Task Force report was under development, the NSF Committee on Equal Opportunities in Science and Engineering (CEOSE), a congressionally mandated oversight committee, created an Internal Task Force on People with Disabilities in Science and Engineering. The Internal Task Force report included a lengthy series of recommendations to the NSF Director regarding how NSF could increase participation of people with disabilities in the Nation's science and engineering enterprise.

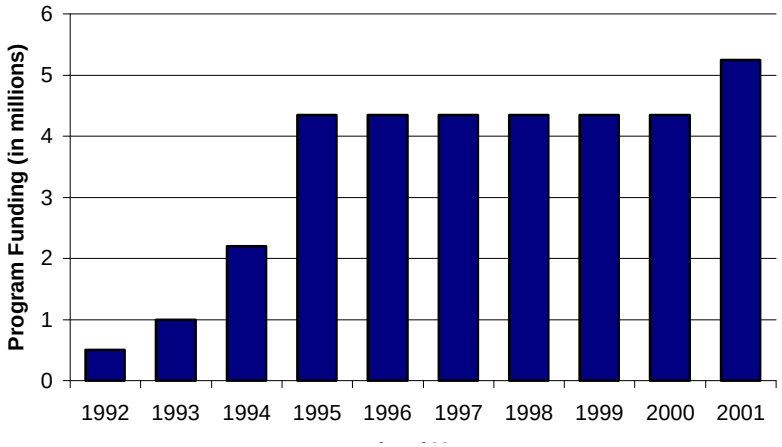
Following the completion of the National Task Force in 1990, the NSF Director appointed Lawrence Scadden to be a member of CEOSE. During the following year, CEOSE promoted implementation of the Internal Task Force report to the Director and to the National Science Board. In 1991, Luther Williams, then Assistant Director of NSF's Directorate for Education and Human Resources, asked Dr. Scadden to form an advisory group of national leaders in the education of

students with disabilities and to set priorities for NSF from the CEOSE Internal Task Force on Disabilities. The advisory group made its report to Dr. Williams in September of 1991 (CEOSE, 1991). The first priority related to establishing a Program for Persons with Disabilities in Science, Engineering, and Mathematics that would support innovative projects designed to encourage and advance students with disabilities into graduate training and careers in these disciplines. NSF officially established the Program for Persons with Disabilities (PPD) late in 1991 and the Directorate for Education and Human Resources put PPD into its funding plans for Fiscal Year 1994—the earliest possible year to receive a congressional line item for the new program. The first award administered by PPD staff began in late 1992 and the first program announcement for PPD was published in 1993.

Levels of Funding and Program Administration

Initially, program directors in NSF's Directorate for Education and Human Resource Development allocated approximately $500,000 and $1 million to PPD awards and activities in Fiscal Year (FY) 1992 and FY 1993, respectively. For FY 1994, PPD was allocated approximately $2.2 million. Beginning in FY 1995, the program's budget was increased to $4.35 million, where it remained level until FY 2001. Currently, the program's budget is approximately $5.25 million.

PPD Funding, FY 1992 - 2001



Source: NSF Division of Human Resource Development.

Dr. Lawrence A. Scadden

"An institution is but the lengthened shadow of one man."
—Ralph Waldo Emerson

The following is excerpted and paraphrased from "Let Their Expectations Soar: The Life Story of Dr. Larry Scadden," by Libby G. Cohen, edited by Robert G. Atkinson, published in the Journal of Science Education for Students with Disabilities (D. Caseau and J. Marshall, eds.), Volume 8, Winter 2000.

Larry Scadden has served as a guide, advocate, pioneer, leader, and mentor to thousands of persons around the world. His warmth, gentleness, vision, and integrity have enabled him to provide national and international leadership on issues relating to science, engineering, and mathematics for persons with disabilities. [Born in California in 1939, Scadden was blinded by a household accident in 1943. He greatly missed reading and by the age of six resolved to learn Braille. Overcoming the stereotypes regarding blind persons of the era, he was inspired by his third-grade teacher who recognized his intellectual skills and advised that he should carry his education through to a Ph.D. Scadden has always possessed a great fondness for music and a knack for mathematics. In high school he demonstrated a passion for science and technology. He wanted to go into engineering but was steered away from it. Eventually he found an interest and a niche in experimental psychology. He went on to get his Master's Degree from the University of the Pacific in 1966 and, in 1971, received a Ph.D. in Medical Sciences from San Francisco's Pacific Medical Center where he also established the rehabilitation engineering research center. His extensive experience in product evaluation, including the first optical character recognition reading machine, led to his serving as a consultant to the House Committee on Science and Technology and his role in establishing what is now the National Institute on Disability and Rehabilitation Research within the United States. In 1992 Scadden came to NSF as Senior Program Director for the Program for Persons with Disabilities.]

"I recognized that technology represents tools and everyone uses tools to increase their abilities, to decrease their limitations, to speed up their performance, and to decrease the energy they use. So, all we are talking about in technology for people with disabilities is providing them with the tools that allow them to overcome their limitations." ... "The projects that [NSF is] now supporting around the country differ significantly from one another. We have three different emphases. One relates to research and development to make information more accessible. We also have information dissemination projects aimed at teachers and counselors to help reduce the negative attitudes towards the capacity of people with disabilities working in the field of science. Then we have projects that I call enrichment projects that really provide students who have disabilities with hands-on experiences in science."

"All people have limitations. If people could write as fast as they want, they wouldn't be using a computer, and before that a typewriter. The computer has made a tremendous difference in my life, and I am fully convinced that the computer is valuable to virtually everybody, but there is no group that computers help more than people with disabilities because of the level of independence computers provide." ... "I spend a lot of time now working on the issues of diversity and equity of minorities, women, and people with disabilities. In talking to people, I know from the other two underrepresented groups in science, virtually all successful people tell me about the mentors or support they received from peers or something of that kind. When I talk to my colleagues who are successful scientists and engineers who have disabilities, we all agree we didn't have many mentors and we recognize how important this is. Most of us who succeeded fought against the gradients of sometimes discrimination, sometimes prejudice, sometimes this mythology that disabled people can't do science."

"The primary thing has to do with abilities. People who have disabilities also have *abilities* and their life should be focused around where their interests and abilities lay. Their disabilities can be reduced through the use of tools. We are getting better and better tools to reduce the number of limitations they have. All people should be allowed to rise to their own desired goals, and should be provided with the kinds of tools that they need to accomplish the education and function they want. That doesn't mean you just give something to somebody. You allow them to work for it and allow them to achieve. In my talks to disabled populations, I always just tell them to let their expectations soar, and the people around them should let their expectations soar for someone with a disability, and give them the opportunity to succeed."

PPD Goals and Objectives

In accordance with the program's goals, successful PPD proposals are those that investigate innovative techniques in STEM education and apply such innovations to promoting the successful participation of students with disabilities. Proposals submitted to PPD are initially reviewed by panels of experts familiar with the fields of research and education involving persons with disabilities. The number of reviewers selected to provide a balanced and knowledgeable evaluation of proposals depends upon the number of proposals submitted. Proposals are then reviewed for their to intellectual merit, the broader impacts of the proposed activity, and other program-specific criteria. As stated in the most recent program solicitations (NSF 01-67, NSF 02-25), the specific goals of PPD are to—

- Develop new methods of teaching science and mathematics;
- Increase the awareness and recognition of the needs and capabilities of students with disabilities;
- Promote the accessibility and appropriateness of instructional materials and learning technologies; and
- Increase the availability of mentoring resources.

With program objectives to—

- Bring about needed changes in academic and professional climates leading to increased participation of people with disabilities in science, technology, engineering, and mathematics;
- Increase the awareness and recognition of the needs and capabilities of students with disabilities;
- Promote the accessibility and appropriateness of instructional materials, media, and educational technologies; and
- Increase the availability of student enrichment resources including mentoring activities.

While NSF encourages all of its programs to support education and research activities accessible for all students, including those with disabilities, the explicit focus of PPD is to improve the access to quality education, special learning requirements, and appropriate mentoring of persons with disabilities. PPD remains unique in this regard and for this mission in the entire Federal government.