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COVER

Tephra-laden plume (3.5 kilometers in height) being vented from Mount St. Helens' lava dome on 9 June 1982, as seen from a ridge 7 kilometers to the north. A series of spectacular gas/ash emissions in May and June 1982 was probably driven by snowmelt percolating into the shallow feeder system; gases believed to have migrated from a depth of 9 to 11 kilometers earlier in 1982 may also have contributed to the forcing mechanism. See page 1391. [James Zollweg, University of Washington Geophysics Program, Seattle 98195]

30 September 1983, Volume 221, Number 4618 **SCIENCE**

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Women in Science: Lack of Full Participation

Despite dramatically increased participation, women have not yet achieved full equality in the scientific research community. Compared to their male peers, they are still inadequately rewarded with salary, promotion, and tenure. Less visible, but no less real, are constraints on women's informal participation in science. Opportunities to form mentor and collaborative relationships with men and occasions to enhance professional reputations are limited. This may contribute to lower research productivity and slower professional advancement. Effective change requires a better understanding of why people choose science as a career, how science functions as a social system, and how science rewards participation.

These conclusions were reached by scientists, educators, and administrators at a two-day symposium on women in academic science.* After reviewing the current situation, participants discussed meaningful interventions and activities to increase career opportunities for women in science.

Women have made great advances in higher education and science since 1970. Over the decade, the percentage of women receiving undergraduate degrees increased by half in physical sciences, doubled in computer science, and tripled in engineering. Moreover, in most scientific fields women holding the bachelor's degree are now as likely as men to go on to the Ph.D. In the early 1970's, women received 14 percent of new Ph.D.'s, but by the end of the decade they received 26 percent. Between 1967 and 1972, women constituted 17 percent of newly hired faculty, compared to 25 percent between 1975 and 1980. At the top 50 universities, as ranked by R & D expenditures, women accounted for all net growth in science faculty at the assistant professor rank. Finally, men and women scientists with similar training tend to be in academic departments of equal prestige both 7 and 13 years after receiving the Ph.D.

But much remains unchanged. Similarities in training and first job experience do not result in comparable careers for men and women. Although men and women have similar affiliations, their positions within academic departments are vastly different. A 1981 survey of 1970–1974 doctoral recipients showed that 17.2 percent of the men versus 9.2 percent of the women were full professors, 50.8 versus 38.2 percent were associate professors, and 17.3 versus 31.7 percent were assistant professors. For this same group, 13.3 percent of the men under 35 compared to 9.4 percent of the women were tenured. For those aged 36 to 45, 80.8 percent of the men versus 62.7 percent of the women were tenured or on the tenure track.

Clearly, the tenure impasse and how men and women deal with career development and setbacks are not understood at present. Another finding is that women publish less than men. Many studies have shown a significant productivity gap, but there is little agreement about its causes.

Most of what is known about women in science is based on studies of Ph.D.'s. But studying only the survivors will not answer some key questions. More attention must be given to secondary and even primary education as well as to the effects of societal differentiations. We cannot expect to affect the choices of girls and women toward appropriate precollegiate studies or science careers if we do not understand how choices are made by most people, which factors are most influential, or whether men and women utilize the factors differently to reach career decisions. Methods of sociology, psychology, and history should be brought to bear on all these questions in order to provide appropriate guidance for both men and women in preparing for and managing careers in science.

The apparent discrepancy between the success rates of women and men in science is a tragedy for women and a loss of intellectual power for the nation. Effective remedies require better information and a commitment to act on that information to improve women's status in science.—JOHN T. BRUER, *Josiah Macy, Jr. Foundation, 44 East 64 Street, New York 10021*

*Symposium on Women in Science, sponsored by the Josiah Macy, Jr. Foundation and held at the Center for Research on Women, Stanford University, 26 and 27 January 1983.

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