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## Sex and Mathematics

On 12 December 1980, the President signed the National Science Foundation Authorization and Equal Opportunities in Science and Technology Act, which sets aside \$30 million for projects designed to increase the participation of women and girls in science and to provide better opportunities for women scientists. Senator Edward Kennedy, the Senate Subcommittee on Health and Scientific Research, and a coalition of women scientists worked hard for over 3 years to get this law passed.

Among those active in this work were members of the Association for Women in Mathematics and the Joint Committee on Women in Mathematics. Due in large part to the work of these two groups, the past decade has seen evidence of progress in opportunities for women in mathematics. There have been two women vice-presidents of the American Mathematical Society (AMS); the Mathematical Association of America (MAA) has its first woman president; the number of women on mathematics faculties of universities has been rising slowly; women are giving invited talks at AMS and MAA meetings; and the percentage of doctoral degrees in mathematics awarded to women has risen from approximately 6 percent in 1970 to approximately 14 percent in the last 2 years.

The 12 December issue of this magazine reported a study\* which showed that the mean Scholastic Aptitude Test (SAT) mathematics score of boys in the top 2 to 5 percent of a group of seventh graders was consistently higher than that of girls in the same group. On that basis the investigators hypothesized that sex differences in achievement in and attitudes toward mathematics result from superior male mathematical ability. There are at least two problems with this hypothesis. First, environmental and cultural factors have not been ruled out. Anyone who thinks that seventh graders are free from environmental influences can hardly be living in the real world. While the formal training of all students may be essentially the same, the issues of who helps with mathematics homework, of what sort of toys and games children are exposed to, of what the expectations of parents and teachers are, and of a multitude of other factors cannot lightly be set aside. Second, it is not clear that SAT mathematics scores are a good measure of inherent mathematical ability. In the *Harvard Educational Review*, August 1980, Rex Jackson of the Educational Testing Service wrote that "the developers of the SAT do not view it as a measure of fixed capacities," but instead, "The test is intended to measure aspects of developed ability." Certainly there is no evidence that SAT scores are good predictors of creative ability in mathematics. Not a single student identified by the study as mathematically precocious—boy or girl—has gone on to do graduate work in mathematics, although a number are in or have completed graduate school in other fields.

The study has, of course, attracted the attention of the press, which largely ignored the cautionary statements that the data were consistent with numerous alternative hypotheses. It is virtually impossible to undo the harm that the sensationalized coverage has done. The proponents of the Equal Opportunities in Science and Technology Act do not deserve to hear from those who have consistently opposed the legislation that it is a waste of money because women are genetically inferior when it comes to mathematics. More research may well be needed on whether girls respond differently than do boys to various stimuli in their learning of mathematics and whether different approaches to teaching might be effective. Certainly, more research is needed on how to identify and nurture the truly creative. More importantly, however, work is needed by everyone on changing the environmental factors which are barriers to the full realization of the potential of women and girls.—ALICE T. SCHAFER, *Professor of Mathematics, Wellesley College, Wellesley, Massachusetts 02181*, and MARY W. GRAY, *Professor and Chair, Department of Mathematics, Statistics and Computer Science, American University, Washington, D.C. 20016*†

\*C. P. Benbow and J. C. Stanley, *Science*, 12 December 1980, p. 1262. †Dr. Schafer is retiring chairperson and Dr. Gray is incoming chairperson of the Joint Committee on Women in Mathematics of the AMS, MAA, National Council of Teachers of Mathematics, and Society for Industrial and Applied Mathematics.