

lish, recounting how lousy American students are at math, how low they rank internationally. But the media, a notoriously innumerate bunch according to Paulos, rarely discuss the problems inherent in such surveys.

A 1990 article in *Phi Delta Kappan* by Iris C. Rotberg, who was then program director at the National Science Foundation, outlines just a few of the problems. For instance, the decline of scores on the Scholastic Aptitude Test (SAT) can be attributed largely to the fact that more students are taking the SAT and attending college. Moreover, state rankings of SAT scores reflect the proportion of students who take the test. The states with the highest proportion of students taking the SAT tend to have the lowest average SAT scores. Rotberg is concerned that the focus on test scores deflects attention from our real problems: the large proportion of our students who live below the poverty line, vast disparities in education expenditures between rich and poor school districts, and the rising costs of higher education—and what that does to student motivation.

When U.S. test scores are compared to other countries, say Japan and Switzerland, the United States usually ranks behind them. The results, however, can be skewed. Internationally, not all countries emphasize the same subjects. In many countries, virtually all advanced mathematics students take calculus, while in the United States, only about one-fifth of students taking twelfth-grade math study calculus. Not surprisingly, those who don't take calculus, which is included on the test, generally score lower. Rotberg notes that while there is room for debate about whether a higher proportion of U.S. high-school students should take calculus, this issue cannot be resolved on the basis of test scores of students who have never taken the subject. The geographic and socioeconomic composition of a sample can vary tremendously and also factor into test results.

In many countries, only the highest-achieving students go to upper-secondary academic schools. How this affects results is shown most blatantly in what Rotberg calls "reversals." In one math assessment test that included students of Hungary and England, Hungary ranked near the top in the eighth-grade comparisons but fell to the bottom in twelfth-grade comparisons. England's ranking was the opposite: low in eighth grade, high in twelfth. Hungary, however, has more students studying math in the twelfth grade, while only a select group of students in England, presumably those who will go on to

study the sciences at universities, take math in the twelfth grade. Only those students were tested.

The tests can be damaging themselves, according to Monty Neill of FairTest, a Cambridge, Massachusetts, organization that promotes fair and open testing for students and workers. American students may take up to ten standardized multiple-choice tests a year, Neill says, with the most typically given in poor urban school systems. Over 100 million tests are given nationwide during the school year. Most school districts use the tests for tracking; some are required by state law. But FairTest contends that the tests are not accurate enough to base decisions such as denying a student a diploma. And in many cases, the tests can be biased by race, class, and gender.

Gender bias has been particularly prevalent in math and science. Historically, men supposedly are more inclined toward the sciences. But girls in elementary school traditionally test as well, or better, than boys, according to Paulos, and only start to fall behind in junior high. The myths lead to a gender acquiescence, in a sense, with women who shy from the sciences locking themselves out of higher-paying fields. "I've seen too many bright women go into sociology and too many dull men go into business," Paulos writes in *Innumeracy*, "the only difference between them being that the men managed to scrape through a couple of college math courses."

The myth is so ingrained in our society that Mattel, which no doubt has more product consultants than you can count on your hands and toes, made the gender faux pas of the year last fall when it introduced a Barbie who said, "Math class is tough."

Mathematicians in the Ivory Cylinder

Paulos dreams of a day when the world is not so divided into numerates and innumerates, and he calls his profession to task for perpetuating the myths about the inaccessibility of math. But professional mathematicians, he points out, are caught in a culture that simultaneously exalts them for their expertise and dismisses them as impractical whizzes. Senior mathematicians, engineers, or scientists wooed by industry often find themselves in subordinate positions to young MBAs. According to Paulos, it's not surprising that mathematicians perpetuate myths about the inaccessibility of math.

"Some people think math is sort of handed down by the gods," Paulos says, "that it wasn't something created or discovered by our species." Mathe-

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