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**COVER:** The Voyager 1 spacecraft's flight past Saturn last November provided the first close looks at several of the planet's satellites, which represent a previously unstudied category of "intermediate-sized" moons. Now the photos have been used to produce preliminary maps of several of the satellite surfaces. Shown is the north polar region of Rhea, second largest of the group, with one unphotographed section left blank. Preliminary maps of Dione, Tethys and Mimas will appear in subsequent issues of Science News. For more of Rhea, see p. 108. (Map: U.S. Geological Survey Branch of Astrogeologic Studies)

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# LETTERS

## Math study anxiety

It was disturbing to see the report of a study on sex differences in mathematical ability as the lead story of the week (SN: 12/13/80, p. 372). It was even more disturbing to hear the study by Benbow and Stanley (SCIENCE, Vol. 210, No. 4475) hailed as a major study on this question, because the study is in fact trivial (although the sample size is impressively large) and the conclusions flawed by a gross logical error.

To put this matter in perspective, Benbow and Stanley were able to show that sex differences in the math portion of the SAT were not related to differences in the number of previous math courses. It is important to emphasize that this is *all* their study shows. Their study does not in any way deal with the question of genetic differences in mathematical ability. However, this has not prevented Benbow and Stanley from drawing a false conclusion about genetic differences, and this is where they commit a serious logical error.

Eliminating one source of environmental differences (such as the number of previous math courses) does not provide evidence for a genetic factor. The study of Benbow and Stanley provides no more evidence for genetic determination of math ability than a study reporting differences in math ability are not related to length of hair. It is a gross logical error to argue that elimination of one hypothesis from a non-exhaustive set selectively increases the likelihood of any other hypothesis remaining in the set. But this is exactly what has been argued in this case.

This raises questions of extreme social import. Why do otherwise competent scientists go beyond their data and violate principles of scientific reasoning? Why does a major journal like SCIENCE publish a study whose conclusion does not follow from the reported data? Why is the study so quickly reported by the popular press? Is this a case of science (or what passes for science) in service of political ends? Are we facing the beginning of another wave of scientific racism and sexism? We can do our part to insure that this does not happen by challenging the results and conclusions of studies like Benbow and Stanley's, and SCIENCE NEWS can do its part by critically evaluating the findings and social significance of the works it presents as "major studies."

Arnold Grossblatt  
Wooster, Ohio

Your recent lead article "Mathematical Sex Differences: It's in the Numbers" reported on data obtained by Benbow and Stanley from their Study of Mathematically Precocious Youth, indicating that "the environment argument is not sufficient to explain observed sex differences in mathematical ability." What they neglected to tell you is that the hypothesis they

were testing (differential course-taking by high school boys and girls) was invented only to explain why girls fail to achieve in accordance with their tested aptitude. It was never intended as an explanation for the preponderance of boys among the small number of mathematically precocious children, whose learning is seldom confined to standard course materials.

The main "environmental argument" is still that the observed differences in ability and course enrollment are both due to effective variables such as girls' expectation that higher mathematics would not be personally useful to them, lack of confidence in their ability to learn math, and lack of encouragement by parents and teachers. This argument has in no way been disproved by Benbow and Stanley's data, and I regret that their demolition of an argument that was never made should have been given billing as "Science News of the Week."

George Fergus  
Schaumburg, Ill.

The article "Mathematical Sex Differences" observes that "... it may be necessary to look even earlier than 7th grade to completely rule out such [environmental] influences ..." on boys and girls. This observation brings to mind an image of the captain of the *Titanic* saying, "It may be necessary to look even deeper than the tip of the iceberg." Twelve years of sexual differences renders the "major" study from Johns Hopkins University utterly inconclusive.

John Blethen  
San Francisco, Calif.

## Going by the numbers

I always read with interest any new information concerning the production of useful energy via a renewable resource. All too often, however, those who write about and tout the virtues of various processes for producing energy fail to provide quantitative information to enable the reader to make some evaluation of the practicality of the process.

Not so, in the case of the item entitled "Bacterial blubber: Fueling the future?" (SN: 1/17/81, p. 40). Your writer puts it right on the line — a potential for production equivalent to 50,000 barrels of crude oil per year per hectare from the biological system discovered by Morris Wayman and his colleagues.

With a production yield rate like that who cares if we use some of our very best cropland to produce energy?

Is it possible that a recheck of your writer's notes will reveal that it takes a thousand hectares to produce the equivalent of 50,000 barrels of oil per year by this method?

Marvin E. Baldwin  
Butlerville, Ind.

("A number of people have picked on those numbers," Wayman recently told SCIENCE NEWS. "I'm not giving out any more figures on productivity until I rerun the experiments on which those figures are based." Wayman expects the results of those experiments within a year.—Ed.)

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