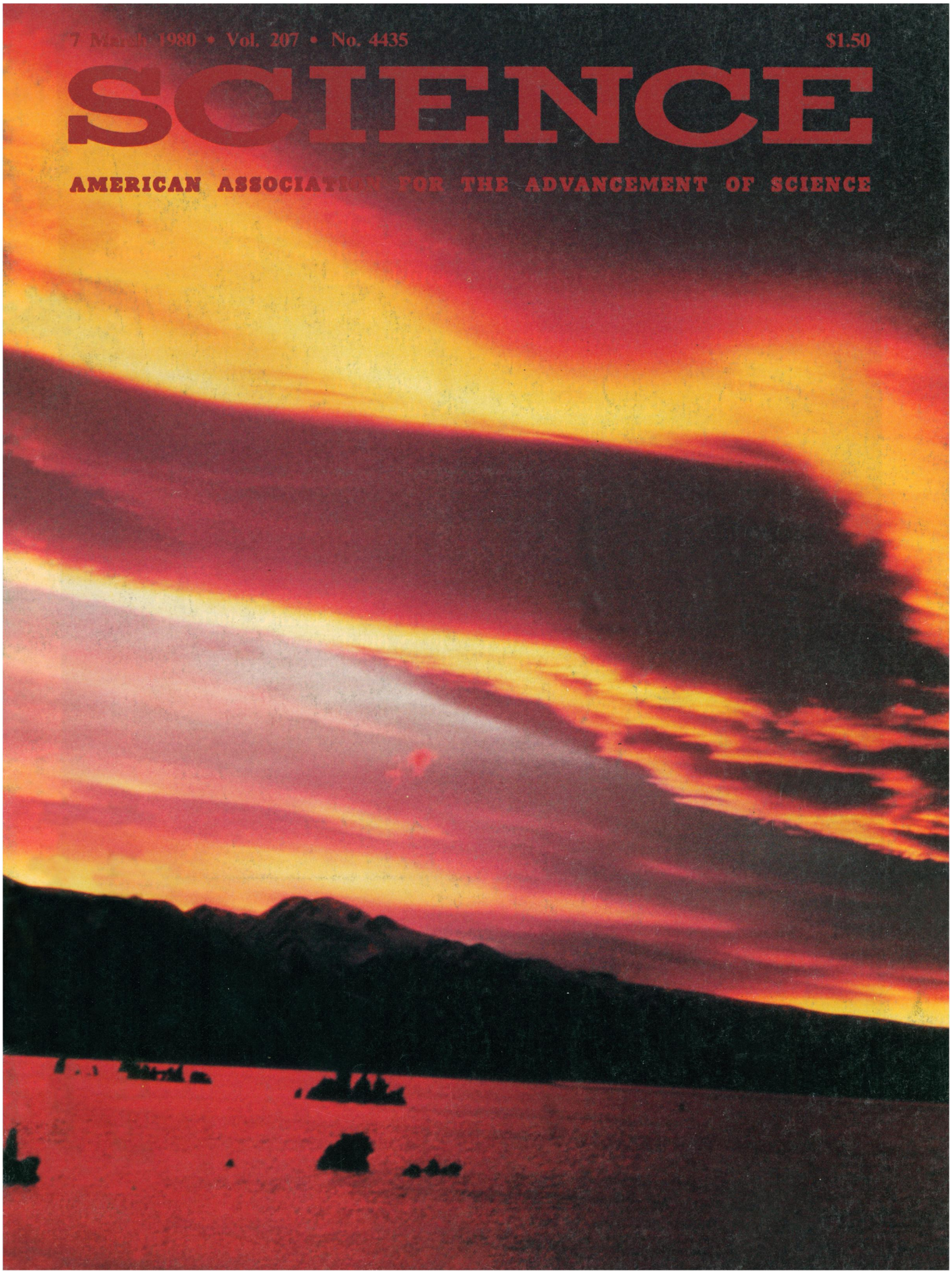
7 March 1980 • Vol. 207 • No. 4435 $1.50

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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**Advanced Analysis with the Sharp 5100 Scientific Calculator* by J.M. Smith. Published by John Wiley.

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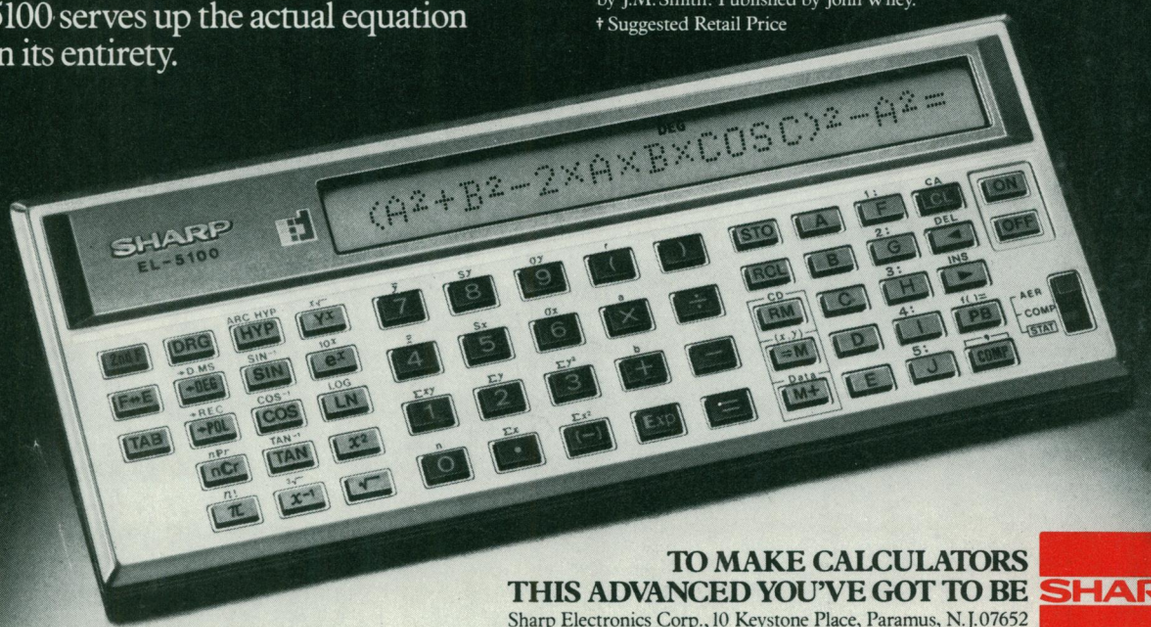

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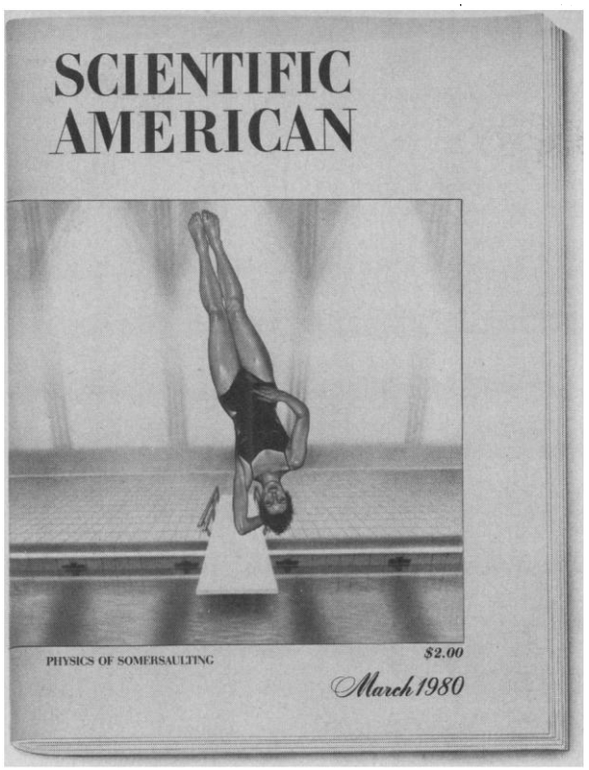

Do divers and gymnasts violate the law?

We are accustomed to seeing divers and gymnasts begin to twist and somersault long after they have left the springboard or the floor. Indeed, in order to win gold medals divers need to perform such complex feats in midair as the forward two-and-a-half somersault with two twists. But, you may ask, doesn't this violate the law of conservation of angular momentum? It postulates: *In the absence of torques, or rotational forces, the angular momentum of a body is conserved.* In the March SCIENTIFIC AMERICAN you will see how this paradox is resolved. You may be relieved to learn that divers and gymnasts (and free-falling cats, too) perform their midair rotations without violating any laws of physics. Moreover, the underlying physics is the same for the astronauts in space who need to control their body orientation in a weightless environment.

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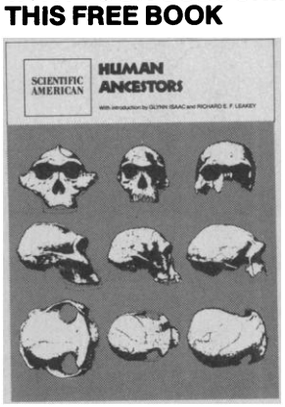

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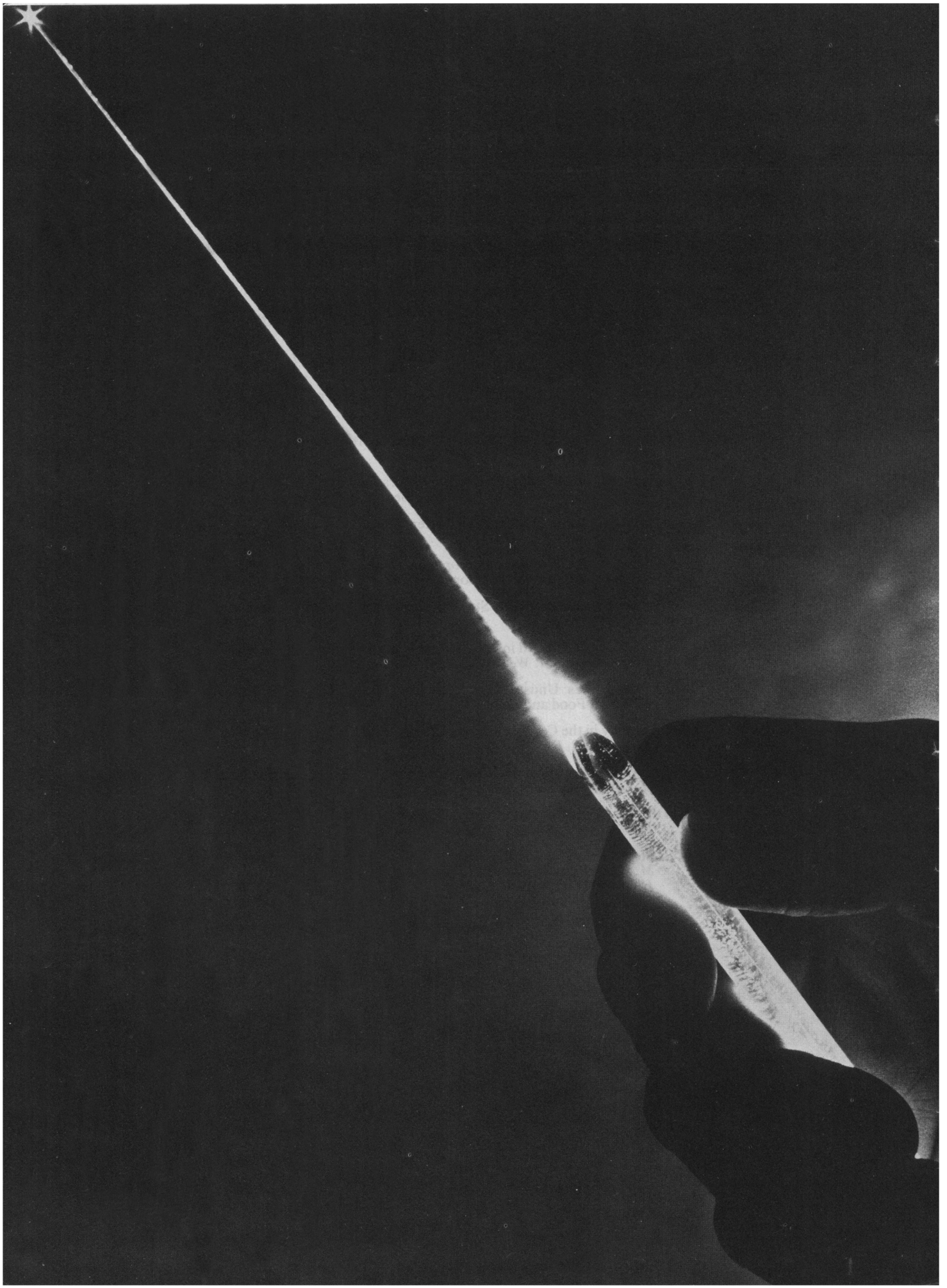
COVER

Mono Lake (California), an alkaline lake located east of Yosemite Valley, was the site of pioneering geological work by I. C. Russell and visits by Samuel Clemens during the 19th century. Calcium carbonate structures, formed as calcium precipitated from freshwater springs debouching beneath the surface, are now exposed as a result of declining lake levels after extensive tributary diversions to Los Angeles since the 1940's. See page 1071. [H. J. Simpson, Lamont-Doherty Geological Observatory, Palisades, New York]



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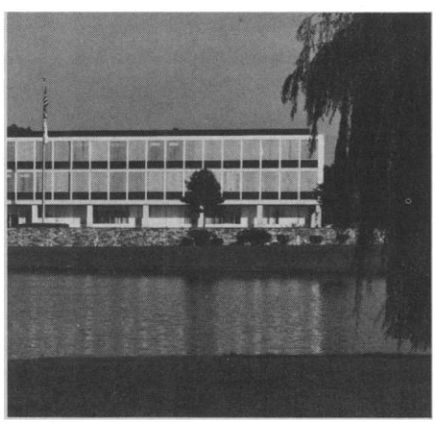

For example, while Bell Labs scientists were inventing new glass fibers, Western Electric engineers and scientists were tackling the manufacturing problems involved.

The fibers had to be drawn from molten glass at high speeds, with less than a 1% deviation in diameter.

But how do you control a "thread" of glass being spun at rates up to 15 feet per second?

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process itself. Coverage by someone other than the patient (i) promotes dependency; (ii) interferes with the recognition of patients who are inadequately motivated to do the work of therapy; (iii) beclouds the reasons for breaking through resistances to therapy, since a waste of time is no longer a waste of money; (iv) obviates some of the best opportunities for showing the patient how to deal with anger, which is the emotion behind most neuroses; and (v) takes away from the therapist's ability to serve as a convincing example of the value of independent functioning.

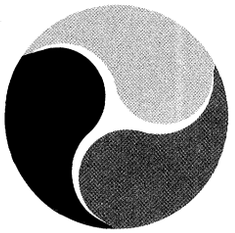
An analogy might illustrate these points more clearly. If the government or insurance paid for skiing lessons, many people would start taking lessons just for the fun of it. Since more teachers would be needed, the poorer teachers would not be weeded out. A number of seriously dedicated teachers faced with large numbers of uncaring students would give up their dedication to teaching efficiently. The people who really wanted to learn serious skiing wouldn't be able to differentiate between good and fair instructors any longer, so they would go outside the country to where the whole thing is taken more seriously.

Finally it is the conflict between the paying bureaucracies and the therapists which serves to destroy the efficacy of psychotherapy. As the numbers of patients and therapists grow, the government and the insurance companies try harder and harder to economize. They begin demanding more and more qualifications, forms to be filled out, justifications for therapy to be delineated, reviews, and so forth. They begin to see the benefits of delaying and of making errors. In order to get paid, therapists must spend more and more time and creative effort on this fight. Eventually the struggle for money commands more attention than the therapeutic outcome. The patient is the one who loses.

I have no doubt that psychotherapy is frequently very helpful. Its destruction would be a great loss to our society. Why not let the consumers choose the type of therapy they want and decide whether the pain of their symptoms warrants the outlay of their money, time, and effort on the chance that therapy might work? I'm sure the price would then come down.

HAROLD ZECKEL
800 Massachusetts Avenue,
Arlington, Massachusetts 02174

Erratum: In the photograph on page 626 accompanying the article "A new call for abolishing the NRC" (News and Comment, 8 Feb., p. 624), the official shown with Mitchell Rogovin was Lee V. Gossick, the Nuclear Regulatory Commission's executive director for operations, not John F. Ahearne, the commission chairman.



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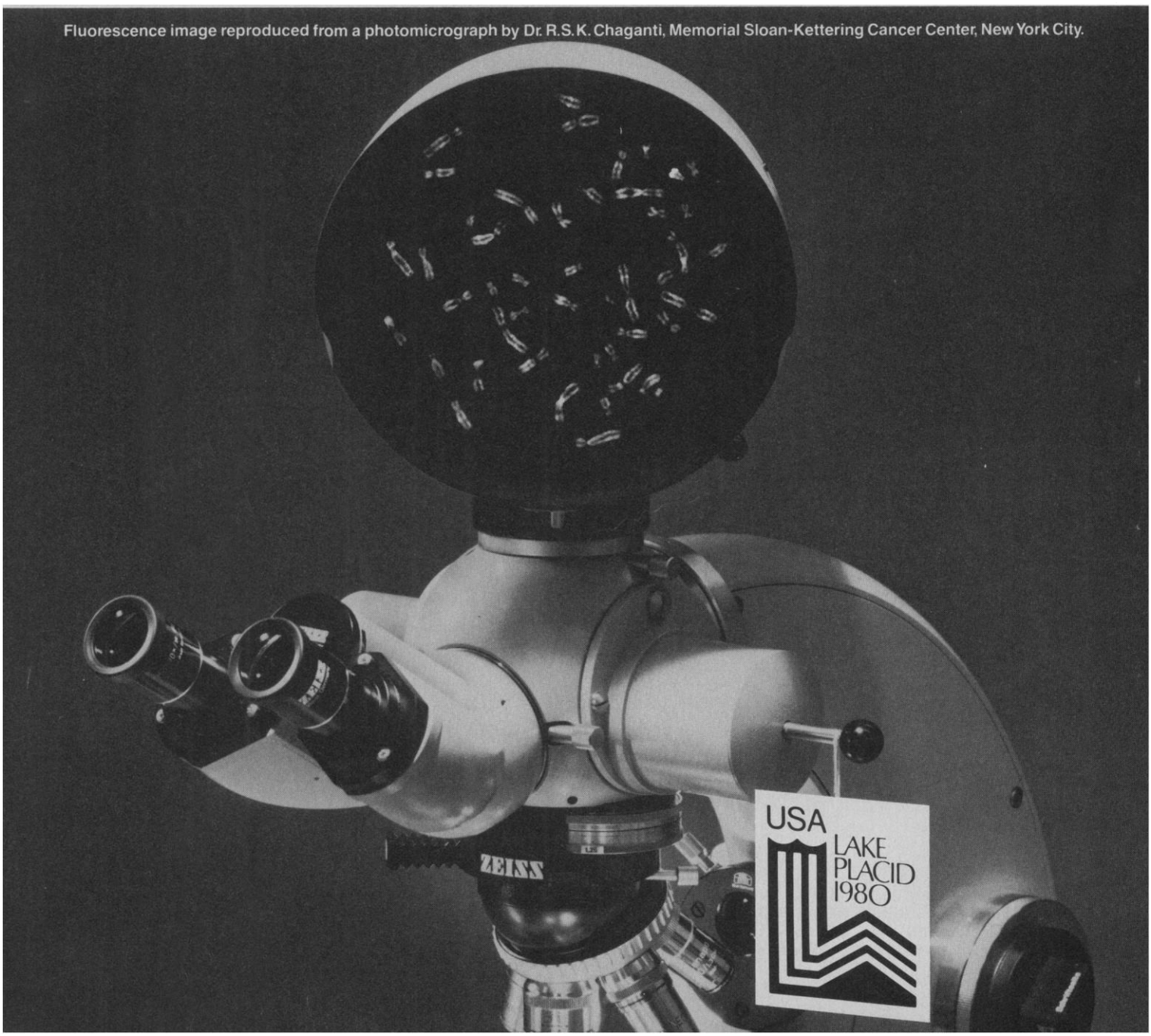

7 March 1980, Volume 207, Number 4435 **SCIENCE**

Science and Technology: A Five-Year Outlook

A 544-page book prepared under the auspices of the National Research Council and published in December 1979 is an especially informative, readable yet authoritative survey of much of science and technology.* It was prepared through the well-coordinated efforts of nearly 100 scientists and engineers. The book consists of 11 chapters, three of which are devoted to science—the planet Earth, the living state, and the structure of matter. Another three are devoted to technology—computers and communications, energy, and materials. Five chapters bearing on social matters are placed under the heading Science and the United States.

This document is part of a more comprehensive report that will be released shortly by the National Science Foundation (NSF) in response to a congressional mandate which directed the Office of Science and Technology Policy to prepare periodically a Five-Year Outlook on Science and Technology. The intent of Congress seems to have been to charge Frank Press, the President's science adviser, with the work. The task was far too large for his tiny staff, however, and Press transferred it to the NSF. In turn, the Foundation asked the National Academy of Sciences to do part of the job by providing a report describing the current state of research in significant areas and pointing out issues within those areas that could be relevant within the 5-year period.

In this task the most important ingredient for a useful result was judgment. For example, scientific research and technological development are being conducted on thousands of different frontiers. What are the most significant? How much attention should be devoted to each? The audience for the report is ostensibly Congress or perhaps members of its staff. At what level should the material be prepared to convey information readily while maintaining authenticity? The task force of the National Research Council came up with reasonable answers to these questions. A key factor was the administrative skill and effort of Ralph Gomory of International Business Machines Corporation who was the study chairman. Each chapter of the report was the responsibility of a chapter coordinator, who dealt with the individual scientists and engineers who prepared parts of the chapter. When these contributions were received, they were usually found to be much too long, uneven in content, and full of jargon; it was necessary to have competent editors smooth the rough spots. Each chapter was then sent to as many as 20 reviewers, whose comments led to deletions, shortening, simplification, and occasional additions. This process involved the study chairman, the chapter coordinator, and the editor. With authenticity and a balanced selection of content assured, further efforts were devoted to simplification based on suggestions from two groups—the assembled chapter coordinators and the governing board of the National Research Council.

There are some pages of limited comprehensibility, but most of the report can be read with profit by persons holding a bachelor's degree in science or engineering and by university juniors and seniors who are taking such courses. Of particular value and quality are the chapters on the planet Earth, the living state, and materials.

In order to limit the size of the report it was necessary to omit a number of important fields such as chemistry, economics, and mathematics. Chemists have a particular right to be unhappy with this omission. The major chapter in the report that bears closely on chemistry is one on toxic substances, and it does little to lighten the dark picture painted by detractors of chemistry. It is unfortunate that only such an image is presented to Congress.

This situation will in part be ameliorated in the second report in the series. In that volume, which is now in the beginning stages of preparation, two chapters will be devoted to chemistry. If the second outlook report matches the first one, it will be worth looking forward to.—PHILIP H. ABELSON

**Science and Technology: A Five-Year Outlook* (Freeman, San Francisco, 1979; paperback, $9.95).