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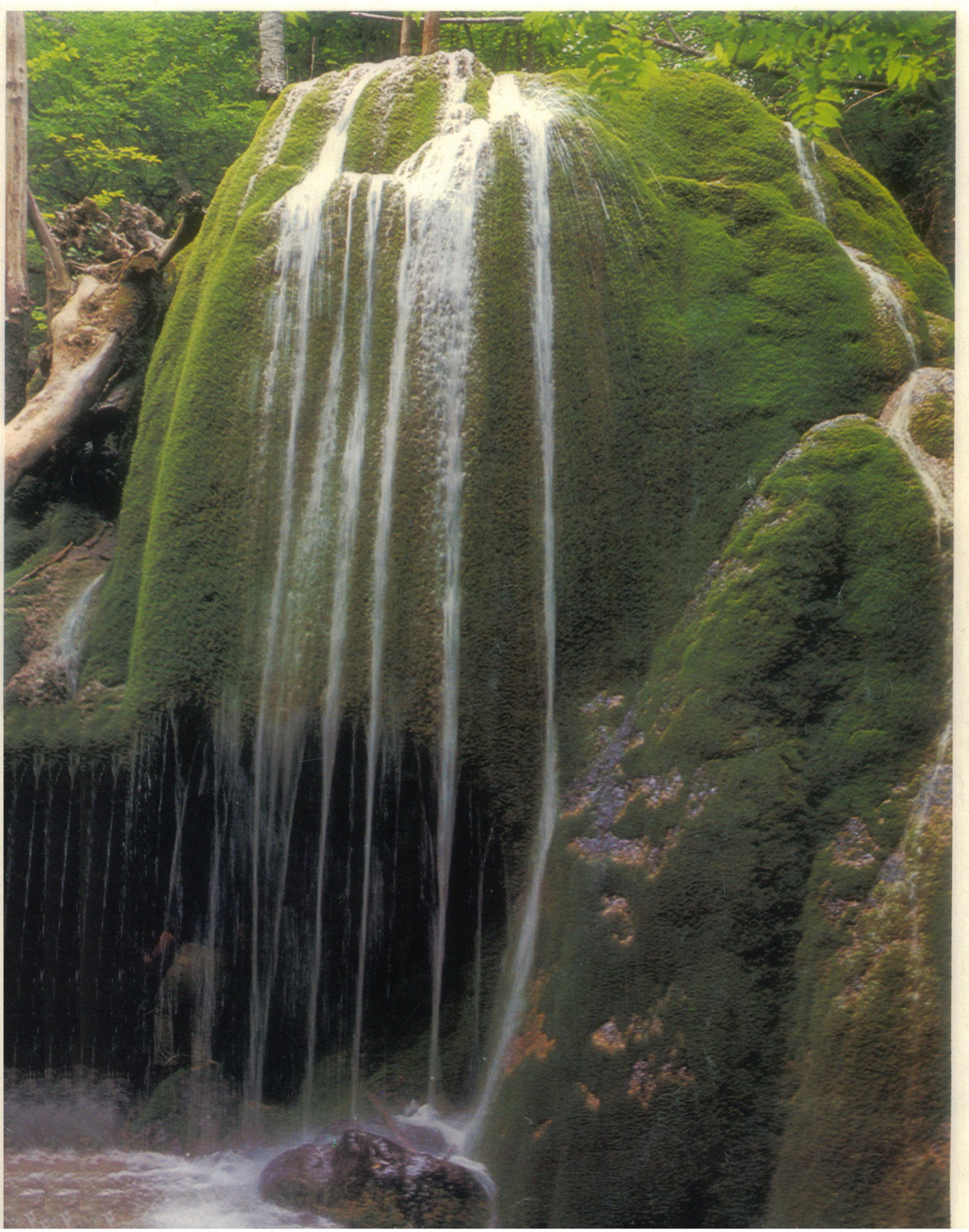

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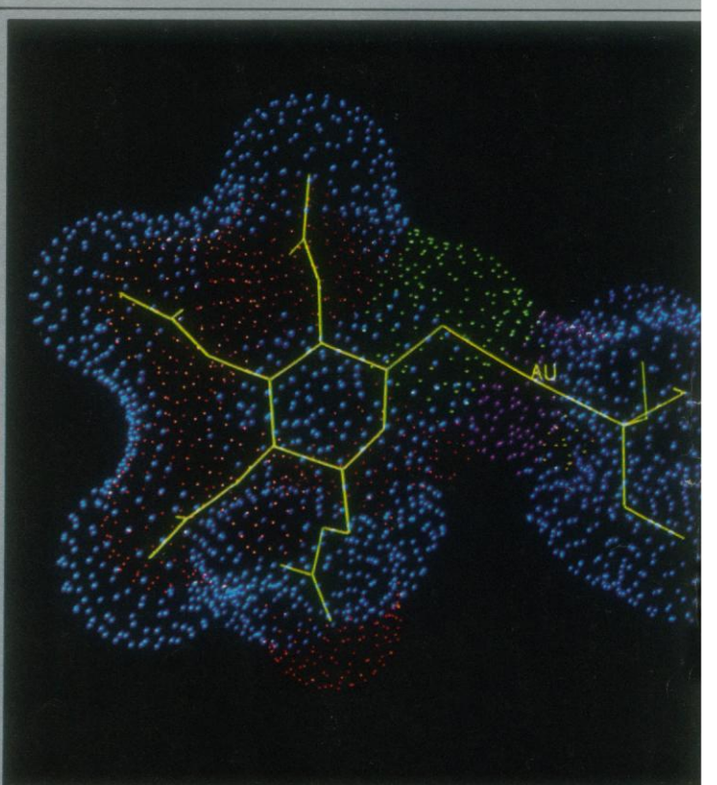

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Immunology and Therapeutics. The SmithKline research program that yielded our promising oral gold agent now under investigation (above, a computer model of the auranofin molecule) has been extended to study on the molecular level how the body's immune system operates and how changes in immunity may affect autoimmune diseases and alter susceptibility to infection.

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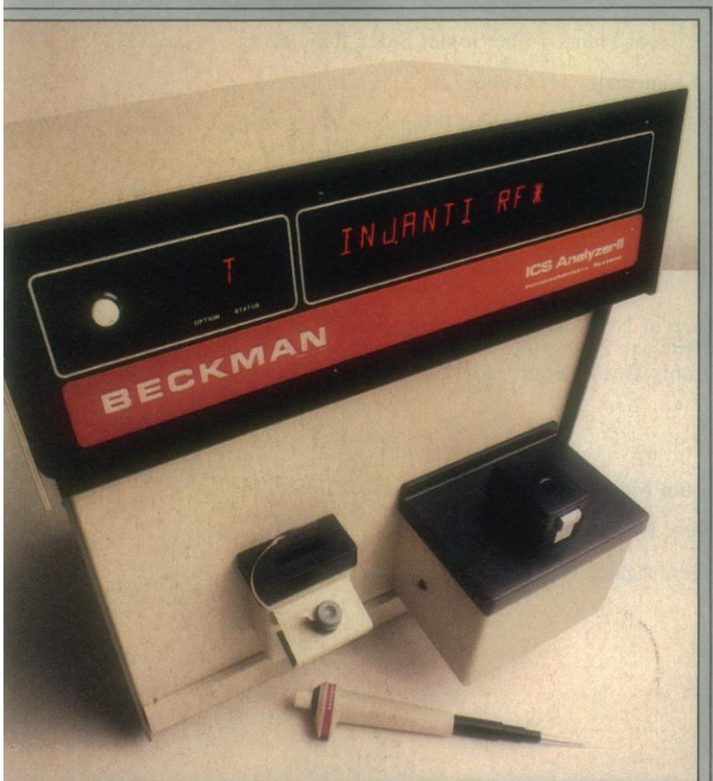

cellular and molecular biology, we are also investigating new aspects of gene regulation and function to develop new therapeutic agents targeted to key cellular macromolecules.

Immunochemistry and Diagnostics. The capabilities of the Beckman rate-nephelometric Immunochemistry System (above) now include precise analysis of the RF protein marker correlative with rheumatoid arthritis.

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Technologies

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SCIENCE

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COVER

"Green Waterfall," a small stream cascading over and through limestone rocks deep in an oak forest about 3 kilometers southeast of Sokolinoye and 12 kilometers west of Yalta, Crimea, U.S.S.R. The green effect is due to a dense growth of the moss *Fissidens* on the limestone. See page 19. [Thomas S. Elias, New York Botanical Garden, Cary Aboretum, Millbrook, New York 12545]

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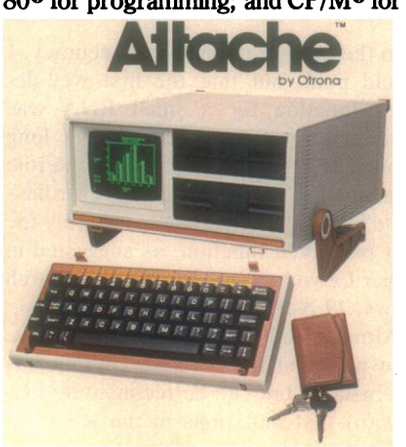

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of semiarid regions where tsetse fly eradication programs have allowed the livestock biomass to exceed the carrying capacity of the rangeland environment, and habitat alterations that have resulted from conventional ranching practices have contributed significantly to the general plight of native African wildlife resources (*2*, *5*, *6*).

The presence of the tsetse fly has frequently prevented overstocking of livestock over much of semiarid Africa and in large part has been responsible for the establishment and present existence of many of Africa's sizable savanna reserves or national parks (*5*). These protected areas currently play an essential role in the conservation of the world's most unique and diverse assemblage of mammalian fauna, and any proposition for the use of trypano-tolerant cattle in regions of Africa infested by the tsetse fly should be tempered by these considerations.

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Small RNA

In the interest of historical accuracy, I would point out that the first well-defined function for a small RNA was described by Sidney Altman (*1*) long enough ago that the detection of the role of a small RNA in secretion, regardless of its biological importance, is hardly the first perceived function, as suggested in Roger Lewin's recent remarks (Research News, 19 Nov., p. 777).

Altman and his collaborators have shown (i) that the separate components are inactive but can be reconstituted (*2*) and (ii) that mutations in the RNA sequence affect its function in vivo (*3*). In addition, Altman and his colleagues have fully sequenced the gene and have shown that it contains a five-nucleotide sequence in the bend of a hairpin complementary to the invariant nucleotides of the TψCG loop of all *Escherichia coli* transfer RNA's.

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Natural Gas Exploration

In his editorial "Methane: A motor fuel" (12 Nov., p. 641), Philip H. Abelson states that methane can be obtained from biomass and from coal, that the American Gas Association is confident that much more natural gas will be discovered and produced, and "Thus, the nation has an answer to a prolonged attenuation of oil imports."

The maximum probable rate of methane production from biomass and coal in the next several decades is a small fraction of the approximately 20 trillion cubic feet per year that our nation currently consumes.

The American Gas Association for decades has expressed confidence that much more natural gas will be discovered, but such confidence has not prevented a 25 percent decrease in our nation's proved reserves of natural gas during the last 10 years, in spite of tremendous growth in rates of exploration for it. Drilling records reveal that the amount of gas discovered per million feet of exploratory drilling has continued to decline for 25 years. Is the American Gas Association telling us that we have saved our best prospects to drill last of all?

Geology, well drilling records, and oil and gas field discovery and production histories suggest that the probability of long-term increase in U.S. production of natural gas is very similar to that for oil.

CRAIG BOND HATFIELD
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Erratum. The illustration that accompanied the review by C. C. Albritton, Jr., of W. H. Goetzmann and K. Sloan's *Looking Far North* (Viking, New York, 1982) in the issue of 10 December, page 1109, should have been credited to the Bancroft Library, University of California, Berkeley, as well as to the book under review.

7 January 1983, Volume 219, Number 4580 **SCIENCE**

Leadership in Computer Technology

At a recent conference on computers in science about 40 leading experts presented lectures on developments in microelectronics and computers in their applications to various scientific fields.* The speakers were optimistic that exponential increases in the power and usefulness of computers would continue for another decade. In the future it will be feasible to handle problems of great complexity such as those encountered in geophysics. Superb graphics are in being and will be applied widely in such fields as biology, medicine, chemistry, and engineering. Artificial intelligence and particularly expert systems have entered an extremely useful phase. However, the spirit of optimism was tempered by concern about the eroding position of the United States with respect to foreign competition, particularly from Japan.

The Japanese have publicized their hope and expectation of becoming the world's leader in computer technology. They have announced two major efforts: The National Superspeed Computer Project and the Fifth-Generation Computer Project.† At the conference some doubts were expressed about the Japanese reaching their goals. But there was general agreement that the two new efforts would lead to substantially enhanced capabilities.

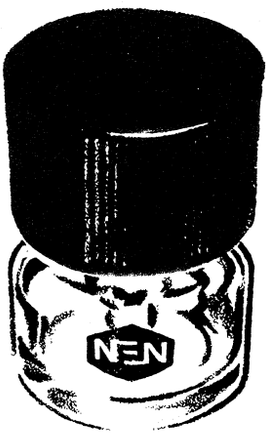
The Japanese have come a long way in microelectronics and computers during the past 10 years. Their success in capturing leadership in the world market for random access memories (RAM's) is impressive. In 1970 they were no factor. By 1974 they had obtained a 5 percent share of the market for 4k RAM's. In 1978 they shocked Silicon Valley by capturing 45 percent of the sales of 16k RAM's. For a time in 1982 they obtained as much as 70 percent of the world market for 64k RAM's. The Japanese claim to have computers that are faster than American models, including the Cray 1 and Cyber 205. However, the claim has not been verified.

Microelectronics and computers are dynamic sectors of the economy and will probably continue to be for another decade or more. Loss of leadership in this field would have serious consequences for this nation's economy and defense. In their efforts to attain world leadership Japanese companies enjoy advantages. Their government helps rather than hinders them. They can obtain financing at much lower rates than U.S. companies can. They find it feasible to engage in ventures where the payoff is many years distant. The futuristic projects will enjoy substantial government subsidies. Through direct and indirect mechanisms the Japanese are freed from unwelcome imports of competing goods. Their educational system emphasizes mathematics and science in the secondary schools, and the universities produce twice as many engineers as ours do.

One area in which the Japanese seem particularly eager to excel is artificial intelligence. In this field the computer deals in symbols rather than numbers. Professor Edward Feigenbaum of Stanford believes that we are at the beginning of a second computer revolution and that ultimately applications of artificial intelligence will become more important than number-crunching. Calling to mind Pearl Harbor he said, "At dawn we slept."

The comment is almost, but not quite, true. Repeatedly U.S. companies that have not pursued vigorous R & D programs have been sitting battleships. But companies that have implemented vigorous programs have fared reasonably well. Our strength has been in imaginative leaps. To capitalize on our strength we must among other things increase the flow of computer scientists from the present level of about 250 Ph.D.'s per year. Recently, many companies have acted to be helpful in doing this. Moreover, at seven universities costly facilities have become available for research on very large scale integrated circuits. These moves are helpful, but there is no occasion for complacency.—PHILIP H. ABELSON

*"The First Annual Conference on Computers in Science," sponsored by *Science* in cooperation with Scherago Associates and organized by Dennis Smith and Peter Friedland, was held in Chicago on 7 to 9 December 1982. †See B. L. Buzbee, R. H. Ewald, W. J. Worlton, *Science* **218**, 1189 (1982).



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