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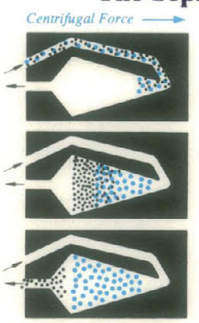

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SCIENCE

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COVER

Male locust, *Valanga irregularis*. The turnover of photoreceptor membrane is shown to be controlled locally within individual ommatidia of the compound eye of this animal. Body length of animal is 80 millimeters; width of the eye is 4 millimeters. See page 898. [Kerrie Ruth, Neurobiology Department, Australian National University, Canberra 2601]

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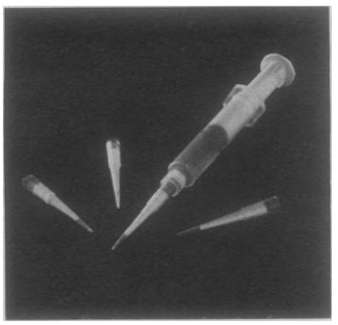

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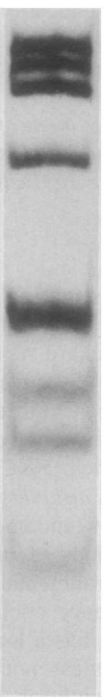

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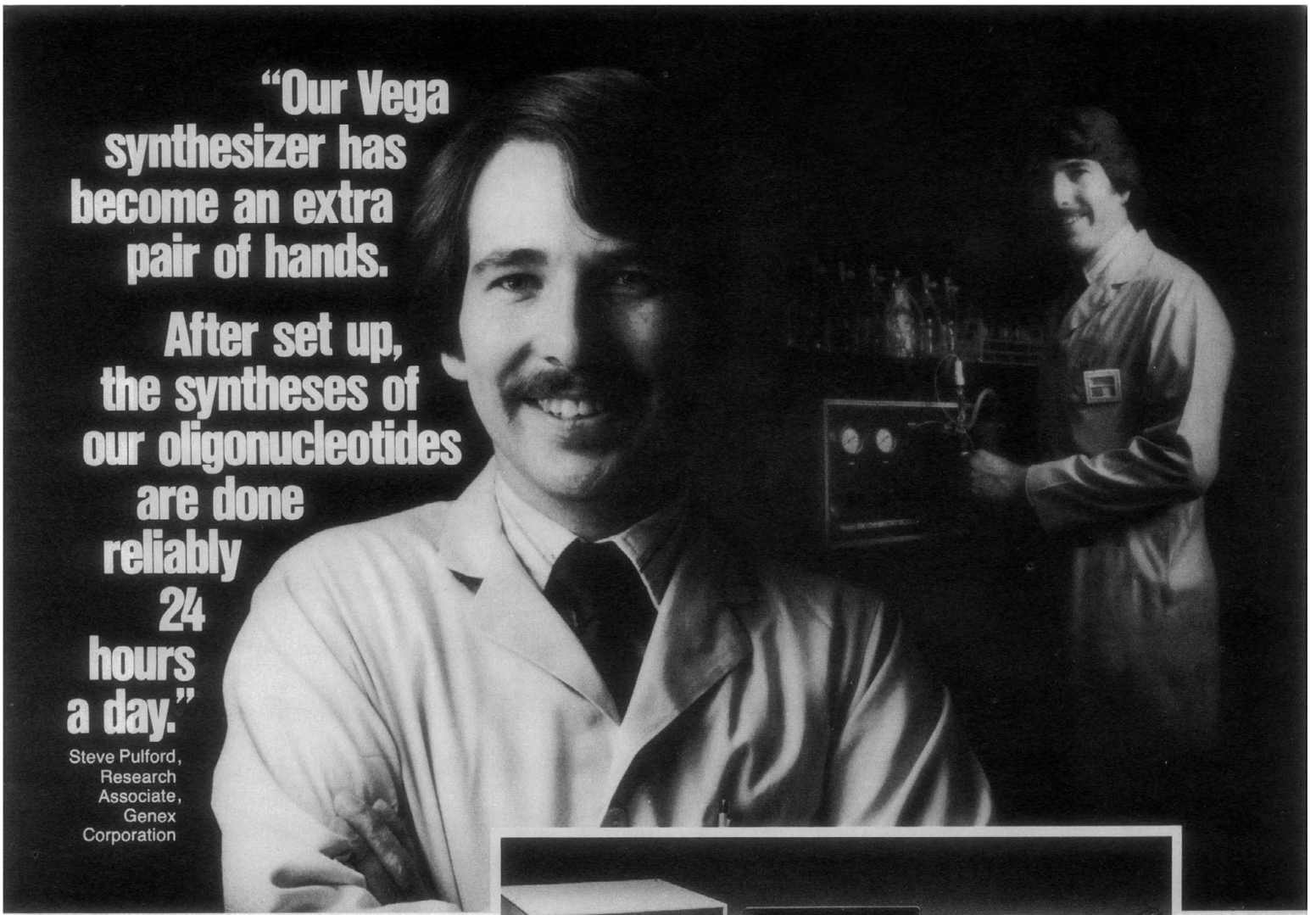

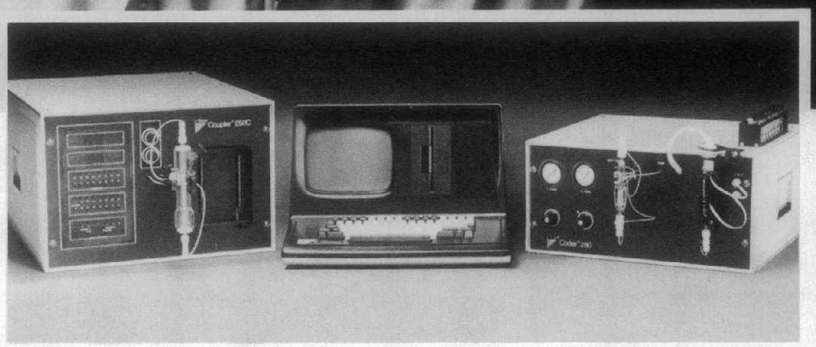

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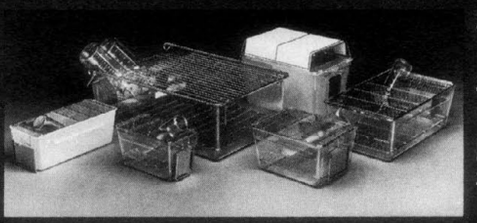

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26 November 1982, Volume 218, Number 4575

SCIENCE

Liberal Education in a Technological Age

Our technological illiteracy, as it has been called, is a major problem, even a national scandal. Many educated, intelligent, inquisitive citizens are unable consistently to bring informed judgment to questions connected to science and technology—questions often vital to each of us and indeed to the future of the world. Liberal education is and will continue to be a failed idea as long as our students are shut out from, or only superficially acquainted with, knowledge of the kinds of questions science can answer and those it cannot. Nor can liberal education be a success as long as students are unable to evaluate the evidence of their own experience. I do not suggest that the goal should be to teach liberal arts students the practical side of science—science as a skill—or to offer them watered-down versions of regular science courses. Instead, I suggest an approach that is at once more modest and more ambitious than that—a course of study incorporating the following characteristics.

First, students should be helped to understand the nature of physical laws: what they are and what they are not, what they can tell us about the physical world and what they cannot, how they are arrived at, and in what sense they are true. Second, students should have some grounding in the laws of probability and chance, and thus some understanding that in a world as complex as ours both statistical fluctuations and the accidental coincidence of unrelated events happen all the time. Third, the idea should be conveyed that science is not a collection of isolated facts but a highly unified and consistent view of the world. We also need to make clear why it is that scientists can make with reasonable confidence assertions that seem to ignore anecdotal evidence that so many others find persuasive. Our students should understand, for example, why physicists accept relativity and not precognition, why they regard attempts to describe the first 3 minutes of the universe as sense and not nonsense. The reason, of course, is that science has a foundation of large general laws that link together various observations about the physical world and provide a framework within which various potentialities, facts, and theories can be evaluated.

It should be possible to convey to students both the power and the limits of general scientific laws and why we can, in the light of both, draw reliable conclusions from those laws. It will not be possible to give all students a thorough grounding in mathematics and the sciences in the course of a liberal education, but for liberal arts students the sort of scheme I have outlined should be an attainable goal.

Educating students for life in a technological society is enormously difficult. What can be accomplished will depend on the kind and number of people who get involved, on the resources available, and on the kinds of programs that already exist. We have two different sets of institutions within which to address the problem in as serious, thoughtful, and detailed a way as it deserves. Research universities are staffed with faculty who are engaged in enlarging our knowledge and understanding of nature; liberal arts colleges have faculty members who are deeply committed to the idea and the ideal of a liberal education. We need to take advantage of both sets of interests, to experiment with and learn from each.

I have tried to connect science as an intellectual activity to the same wellsprings that motivate us to study the liberal arts. If the ability to distinguish sense from nonsense is an indispensable aspect of a liberal education, and I believe that it is, then in a technological society science is an indispensable part of the liberal arts curriculum. The study of science and the study of the liberal arts have for too long been considered separate and separable activities. They are not, and at bottom they never were. It is time to bring them together.—DAVID S. SAXON, *President, University of California, Berkeley 94720*

Adapted from an address presented at the Conference on Science and Technology Education for Civic and Professional Life—The Undergraduate Years, Racine, Wisconsin, 1 June 1982. The complete address will appear in a forthcoming issue of the *American Journal of Physics*.

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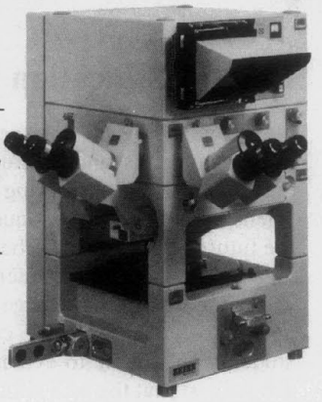

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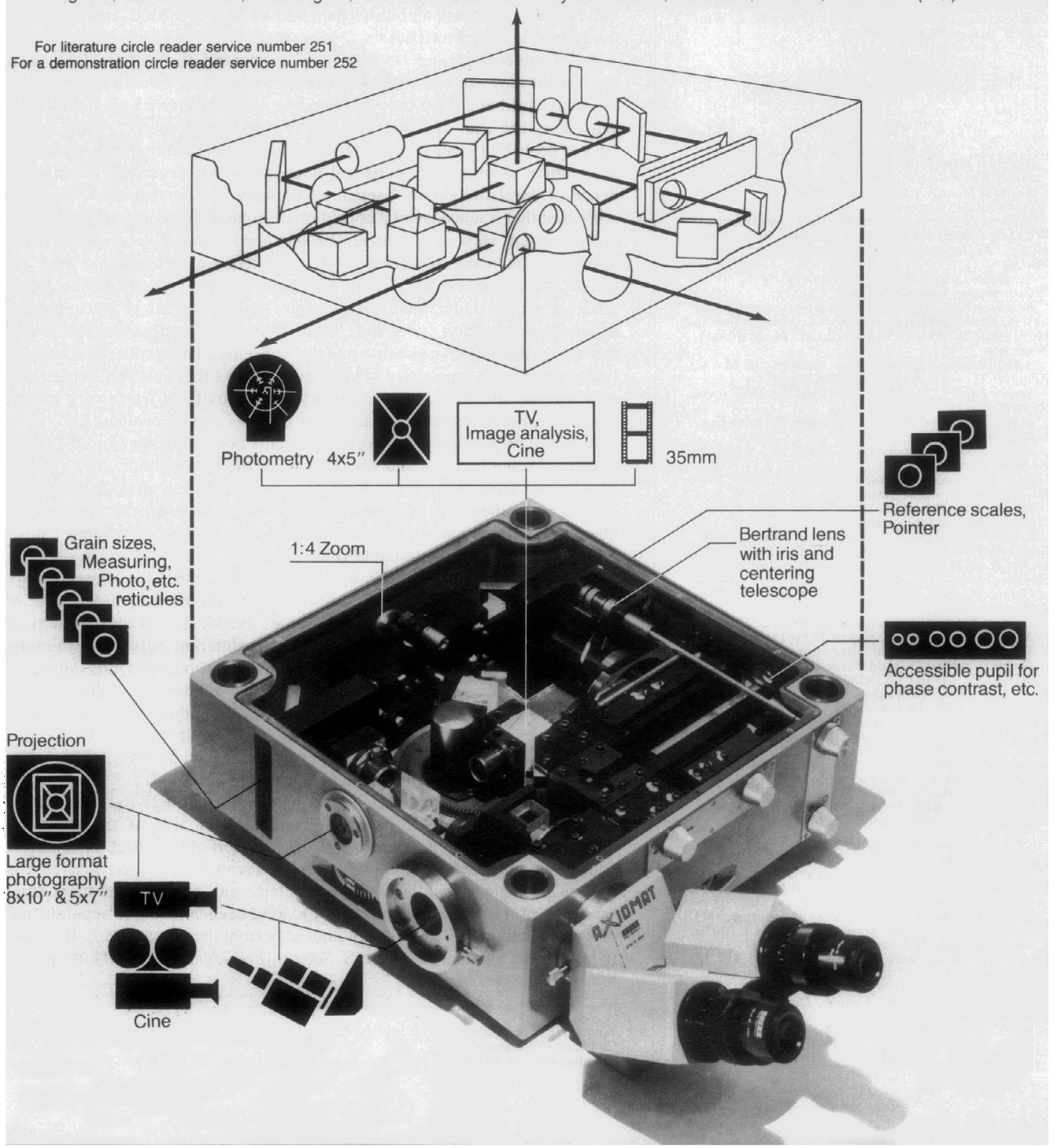

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