SCIENCE
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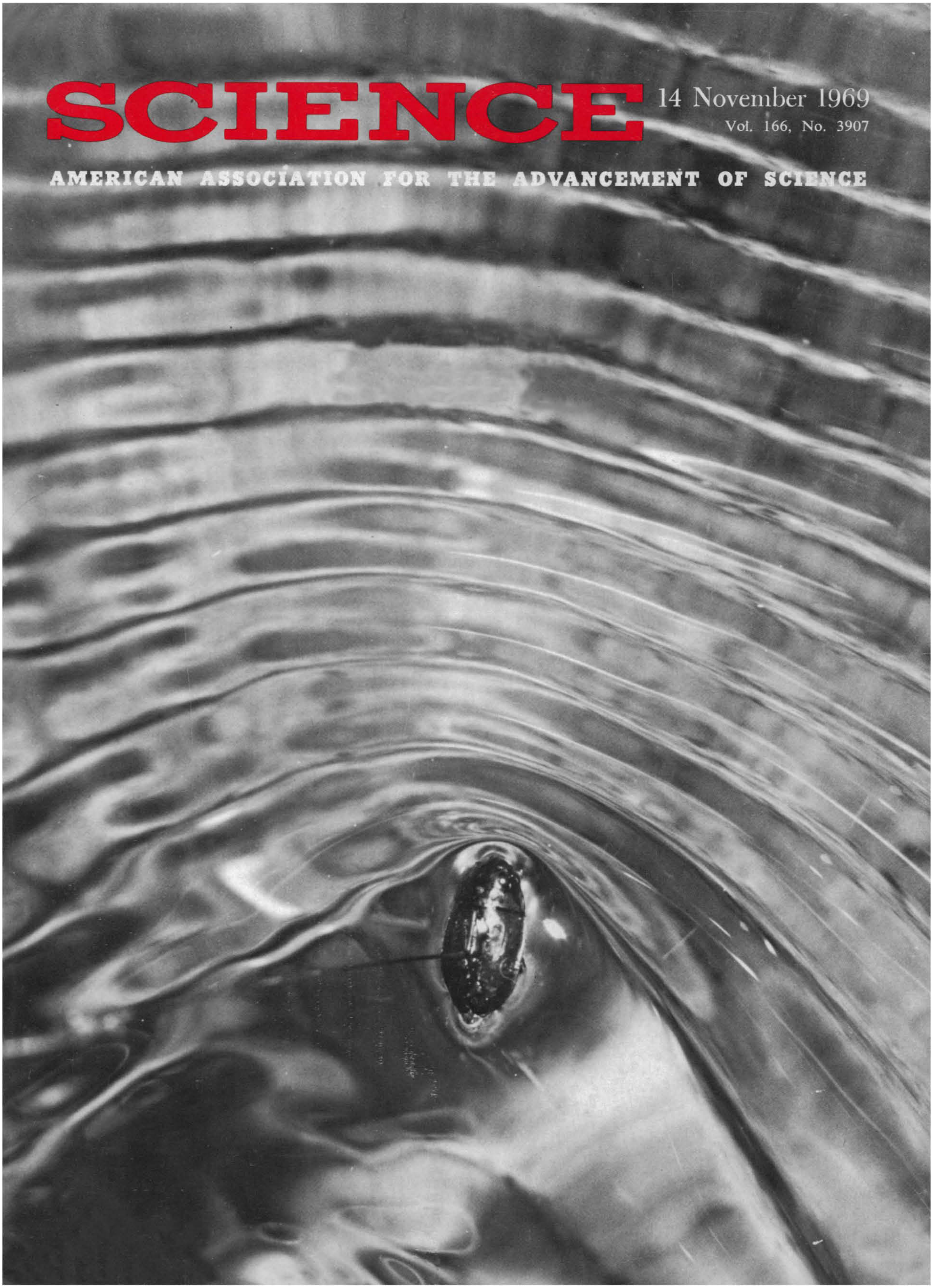
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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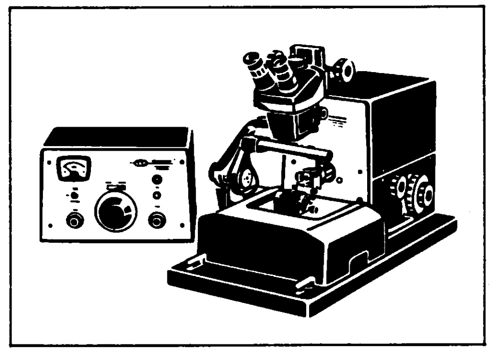

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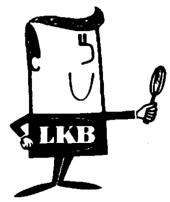

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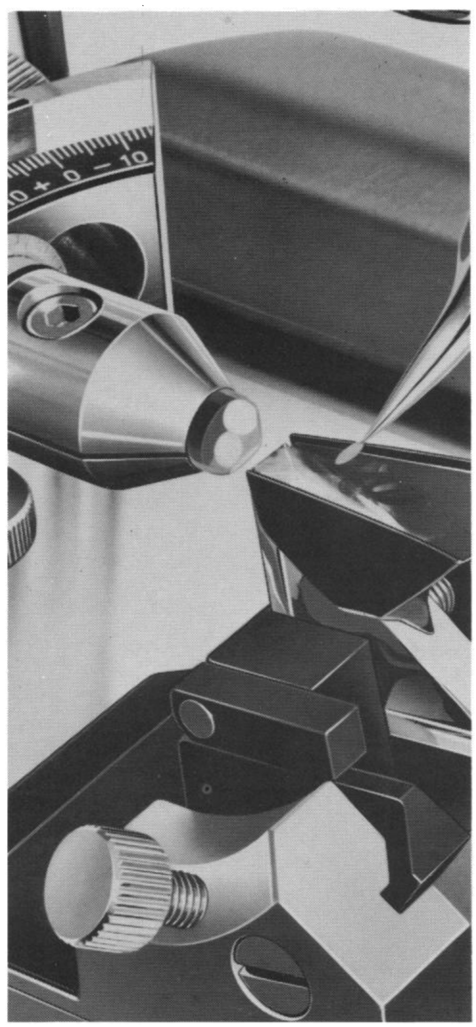

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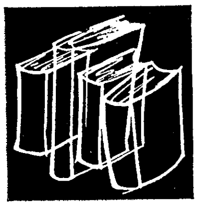

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COVER

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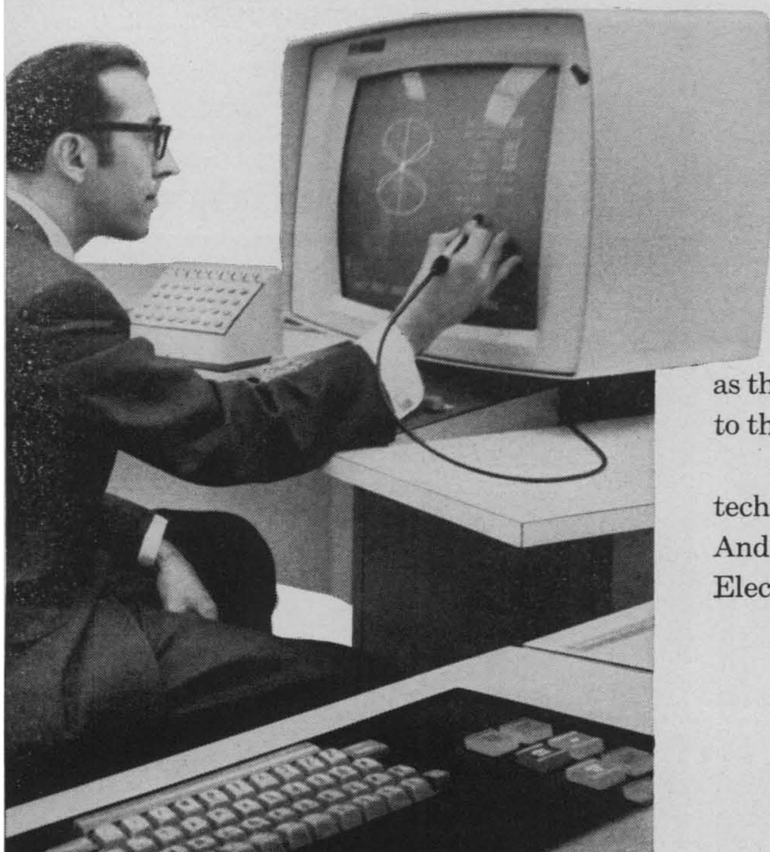

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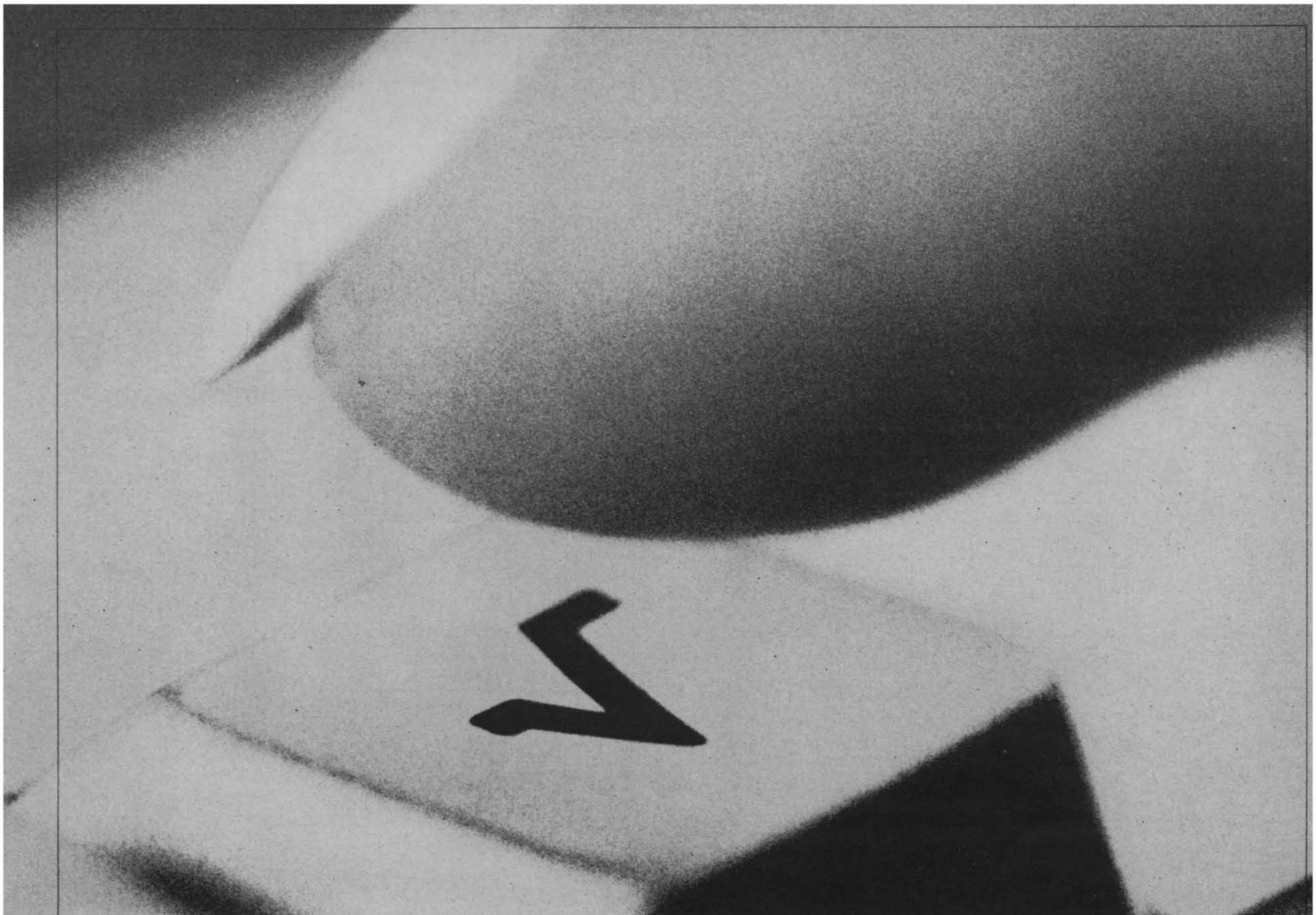

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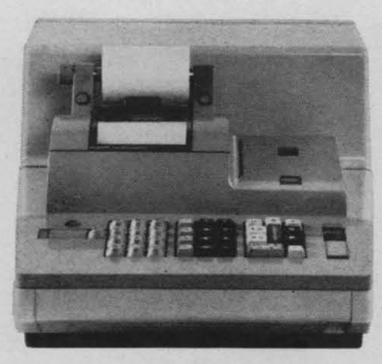

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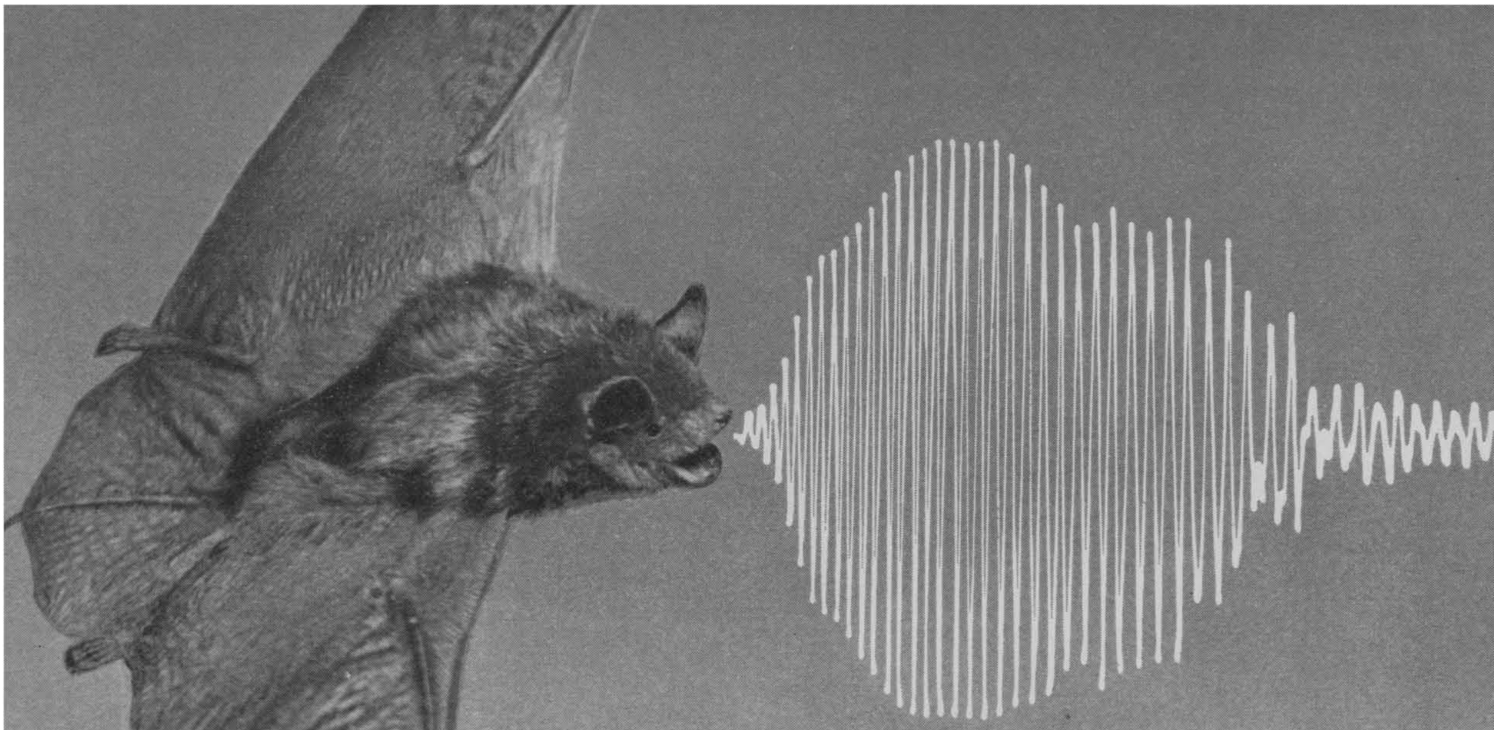

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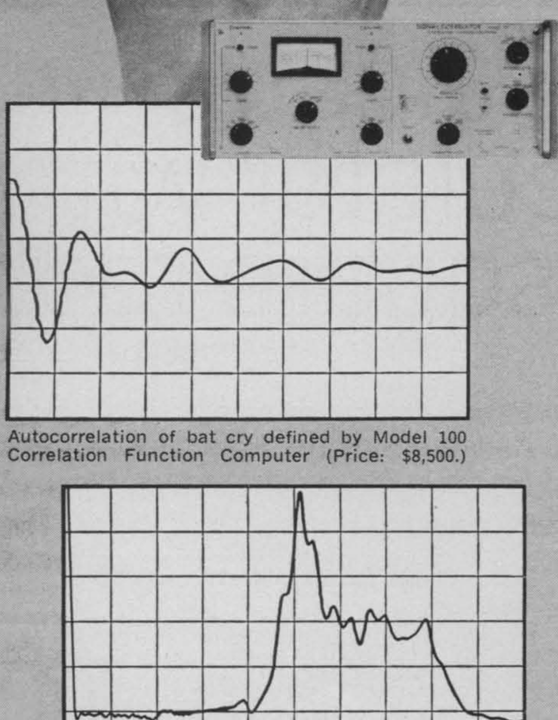
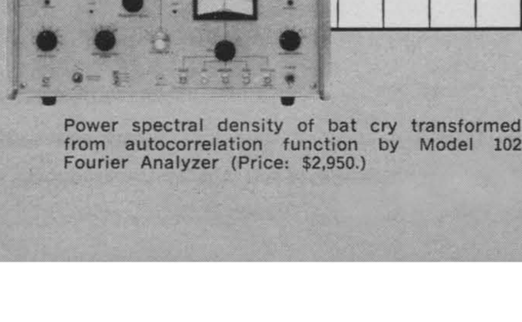


Autocorrelation of bat cry defined by Model 100 Correlation Function Computer (Price: $8,500.)



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try is taken to task for being caught in an equivalent situation and criticized as ". . . complacent, and slow to adopt the basic oxygen furnace." In fact, the problem of growing imports of steel and ethylene have practically nothing to do with technology but everything to do with economics. Wages in the steel industry in the United States in 1967 were two and one-half times greater than those in Europe and four times greater than those in Japan. Those ratios may be even higher today. With equivalent technology and equipment, and roughly equivalent raw material costs, the competitive advantage to the foreigners is obvious. The high cost of labor may be a factor in the ethylene problem, but it applies even more significantly to the steel industry, where labor makes up a larger ingredient of the finished product. The very newest steel plants, constructed with the finest technology now available (including not only the basic oxygen furnace but many other innovations not so widely publicized) still can't cope with prices quoted from abroad —primarily because of the labor factor. In addition, some foreign governments make it even harder to compete by providing their steel and chemical industries with much more liberal tax laws and depreciation allowances, sometimes even subsidies, while they tax heavily or completely bar imports from the United States.

The problem is difficult. I'm afraid it's going to get worse before it gets better. Textiles, glass, electronics, steel, and now petro-chemicals are facing it. Soon the automotive industry will hurt even more. As foreign plant facilities continue to improve, who knows where it will end? As long as the wide wage discrepancy exists, and as long as our government refuses to provide suitable protection for our basic industries which make these high wages and our enviable standard of living possible, the "foundations of prosperity" will surely continue to crumble.

STEWART G. FLETCHER

7 Saxman Drive,
Latrobe, Pennsylvania 15650

Impoverished Latin American Science

As a scientist who has worked to improve Latin American science, I would like to reaffirm Nussenzveig's concern ("Migration of scientists from Latin America," 26 Sept., p. 1328). In addi-

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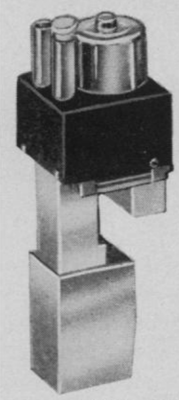

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tion to the short-range solutions he suggests, some thought should be given to upgrading the almost nonexistent science education in the elementary and secondary schools in many of the countries of Latin America. In most of these, elementary and secondary school teachers are not educated at the national universities but at normal schools which are directly under control of the office of the Minister of Education. The science teachers at many of these normal schools are often ill-trained and out of the mainstream of what is going on in world science education. Although Nussenzveig mentions the "archaic structure" of Latin American universities, more emphasis should be placed on departmentalizing the basic science disciplines.

The first chemistry department to serve as the central body of the university charged with the teaching of basic chemistry to all faculties was established at the University of Concepción in Chile in 1960. This archaic structure basically sets the misconstrued pattern that fundamental science is nothing more than a tool to medicine, dentistry, pharmacy, and civil engineering. Latin American projects supported by the United States and the Organization of American States were making contributions to the improvement of science education but with the current budget cutbacks in Washington, it will require a tremendous effort to recover lost ground, not to mention ever moving ahead.

DONALD SCHWARTZ
Department of Chemistry,
Memphis State University,
Memphis, Tennessee 38111

Perils of Flying

I continue to read with great interest your news items on the hazards and discontinuation of the use of DDT. Why is it then that on our recent return flight from Europe the stewardess walked along the aisle spraying us all —according to a government regulation —with what she told me was DDT?

Even without the concern over DDT, I would like to know the supposed rationale of such an obviously ineffective but irritating ritual.

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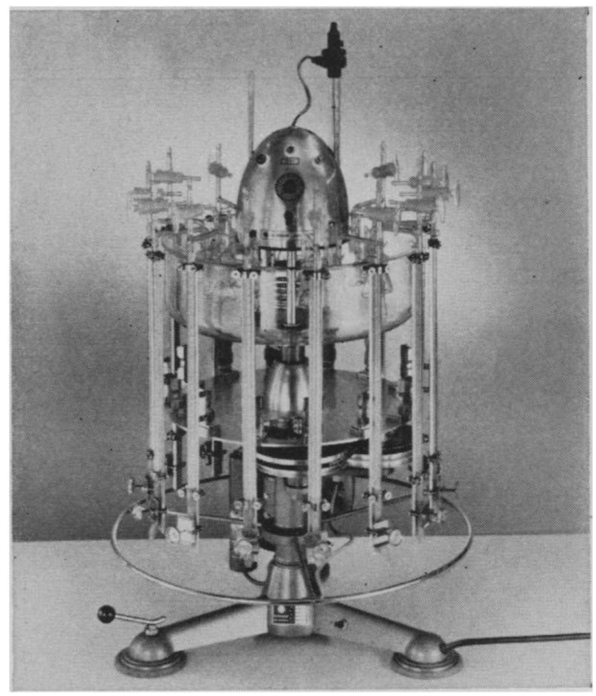

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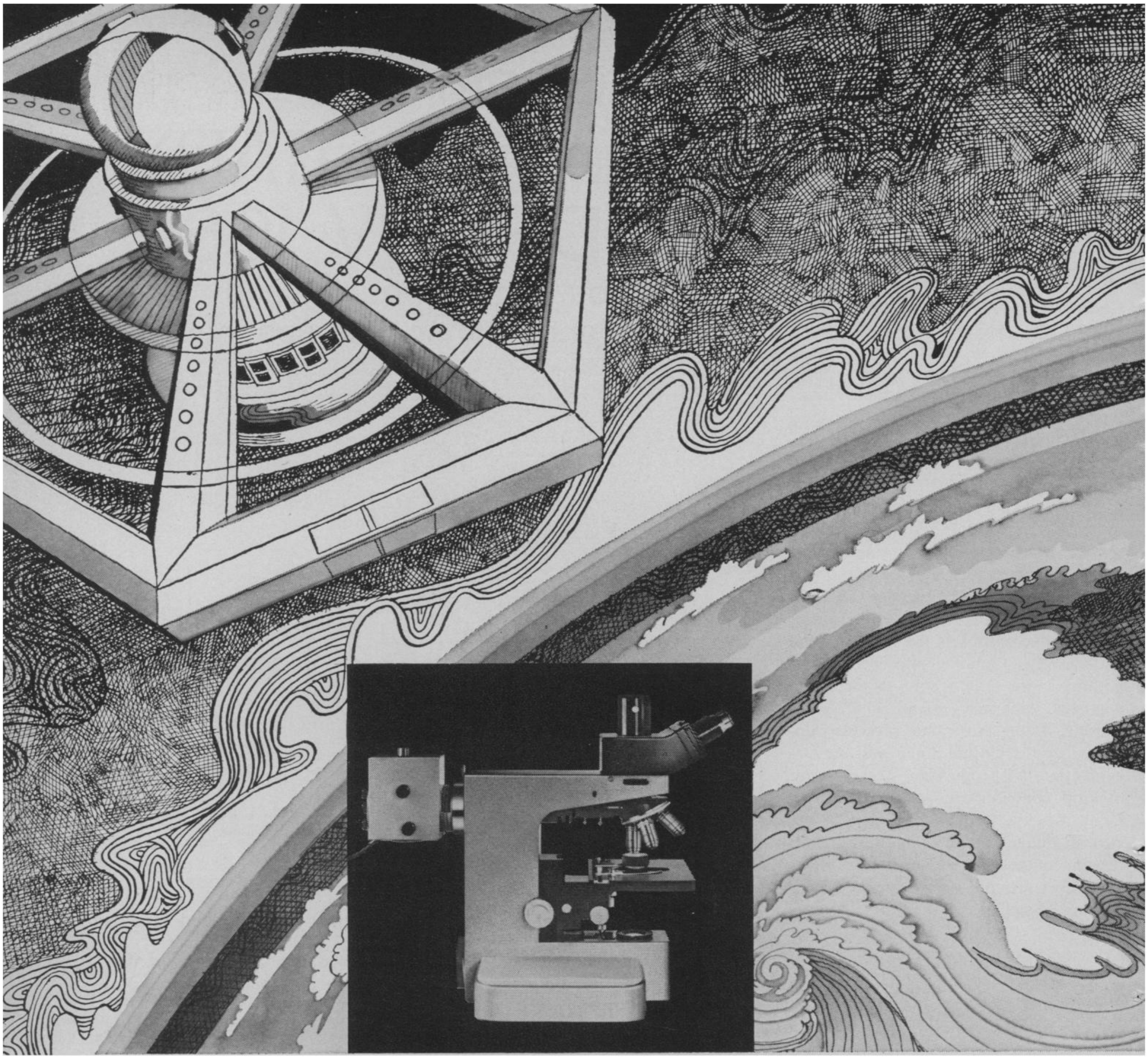

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A Social Design for Science

It appears that industrial societies can continue producing more and more of everything, for larger and larger numbers of persons, as they have done at an increasing rate during the past two centuries. And yet, I believe that, despite appearances, the kind of quantitative expansion of the economy which has been so characteristic of the 19th and 20th centuries will soon come to an end and that we shall witness within a very few decades a reorientation of the scientific and technologic enterprise.

All ecological systems, whether man-made or natural, must in the long run achieve a state of equilibrium and be self-regenerating with regard to both energy and materials. The ecology of highly industrialized nations has been in a state of disequilibrium for several decades. Furthermore, ecological instability is increasing at such an accelerated rate that disasters are inevitable if the trend continues. We cannot afford to delay much longer the development of a nearly "closed" system in which materials will retain their value throughout the system, by being recycled instead of discarded.

The ecological constraints on population and technological growth will inevitably lead to social and economic systems different from the ones in which we live today. In order to survive, mankind will have to develop what might be called a steady state. The steady state formula is so different from the philosophy of endless quantitative growth, which has so far governed Western civilization, that it may cause widespread public alarm. Many persons will mistakenly assume that the world is entering a period of stagnation, leading eventually to decadence. Yet, a steady state is compatible with creative changes. In fact, change within a closed system will probably offer intellectual (and, in particular, scientific) possibilities much more challenging than those offered by the kind of rampant growth that has prevailed during the past century. The steady state might in the end generate a scientific renaissance. But this will not happen without a conscious, and probably difficult, effort on the part of the scientific establishment.

So far, universities and research institutes have largely remained aloof from the problems that the world will face in an acute form before this century is over. But the pressure of public opinion will soon force scientists out of this aloofness. Scientists will have to redirect their thoughts and skill away from the problems in which they are now interested, toward problems of larger social significance. Rapid and profound shifts in areas of emphasis will therefore occur with regard to theoretical science and to technology.

New scientific concepts emerge from science itself, either as products of its own internal logic or through accidental discoveries which present some analogies to the mutations of the biological world. This aspect of the advancement of knowledge might be called the internal history of science. Equally important is the external history of science, because the development of a new concept, and especially its conversion into a form which is meaningful for society at large, is profoundly influenced by the social milieu. In this sense, many discoveries have been a function of the conditioning scientists receive as members of society. The constraints inherent in the world of the immediate future make ideas concerned with design, rather than accumulation of facts related to growth, the dominant needs in the advancement of science and of technology.—RENE DUBOS, *Rockefeller University*

This editorial is adapted from a speech delivered on 14 November at the dedication of the new science building at Barnard College of Columbia University.

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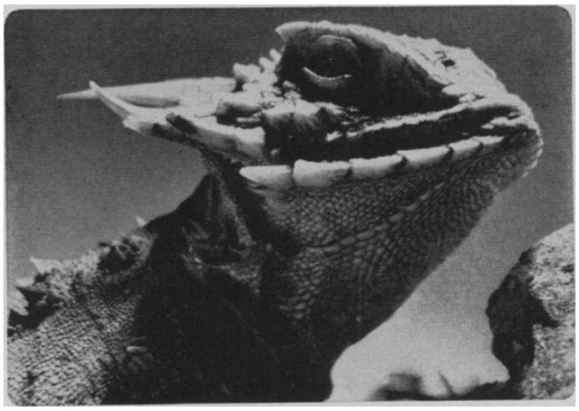

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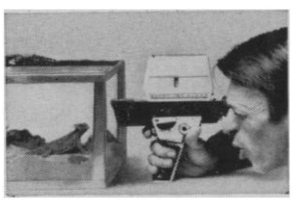

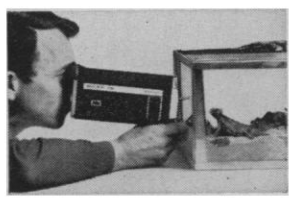

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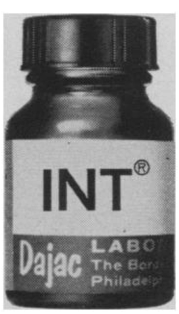

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