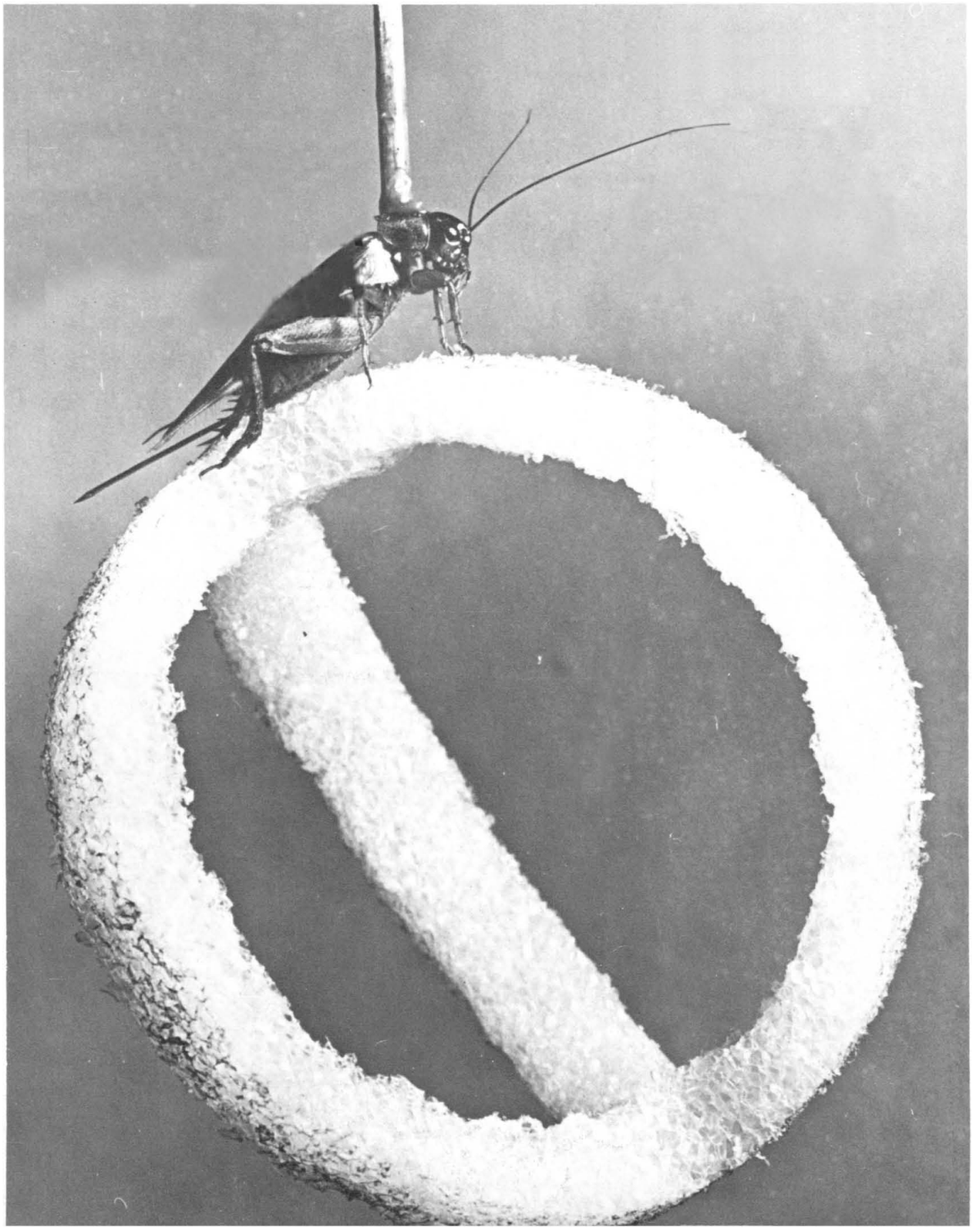
SCIENCE

6 April 1973

Vol. 180, No. 4081

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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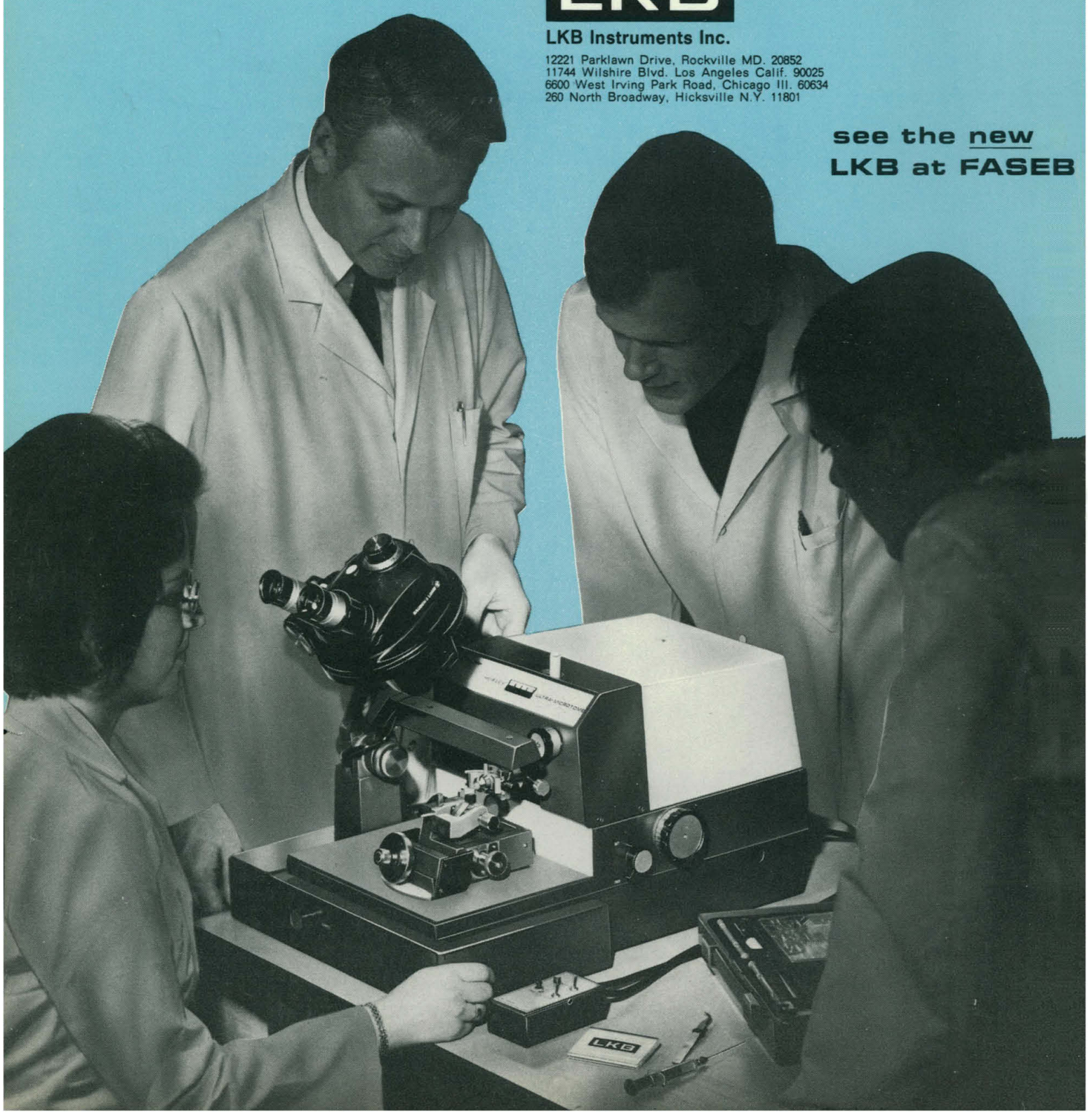

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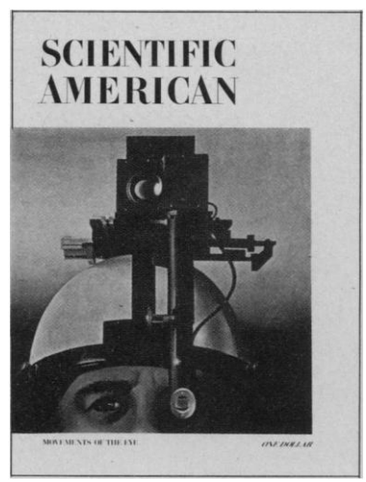

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Female crickets are drawn to males of the same species by the male's calling song. By placing a tethered female upon a Y-maze and placing loudspeakers on her right and left, her responsiveness to various songs can be directly measured (actual size of cricket, 1 inch in length). See page 82. [C. Walcott, Biology Department, State University of New York, Stony Brook]

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tertainment (whatever happened to rouge and powder!).

The evening's entertainment was provided by a guitar rock band that used electricity instead of fingers, and by painting signs protesting the thermal pollution from the proposed new power facility on the north edge of the lake. (The thermal pollution from such a facility would be about the equivalent of that which my daughters and their friends contribute to the lake getting ready for a night out with their bathing, hair-washing, and clothes-washing.)

With more girls at home there should be an offset in power use. A few more things could be washed in one cycle. However, there is often a last-minute, second cycle of consumption by one of the others of some forgotten unmentionables. I can shower in 3 minutes with a few gallons of water. One of my daughters needs at least 20 minutes and at least 70 gallons of water for a bath or shower or whatever she does up there. I see little hope of retarding the growth of the residential power demand until scientists can apply highly skilled analysis to the female and the particular, unanalyzable, unscientific, uncontrolled phenomena of their power consumption. (I never hear them running the power lawn mower.)

Philosophically and financially I hope the authors are right that the "crisis" has been overestimated, but I hold out no hope whatsoever.

R. H. SHANNON
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Frog Health

Science has appropriately alerted its readers to the poor health of frogs available for research (see T. H. Maugh, Research News, 27 Oct. 1972, p. 387) and noted that septicemia and malnutrition are the predominant causes of death. Gibbs *et al.* (*1*) demonstrated how simple treatment with tetracycline and food was sufficient to eliminate these causes of death. Following their suggestion, we have treated frogs received from large midwestern and eastern suppliers by injections of tetracycline [5 percent, weight to volume, in water; 0.5 milliliter per frog (weight, 100 to 150 grams)] via soft polyethylene tubing (PE 90) into the stomach once or twice per day. Ninety percent survival is the routine result. In addition, if investigators refused to pay for frogs received dead, suppliers might investigate simple modes of treatment in the housing ponds to avoid the loss of captured stock.

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References

1. E. L. Gibbs, T. J. Gibbs, P. C. Van Dyke, *Lab. Anim. Care* **16**, 142 (1966).

Latin American Development

In the last year, several *Science* editorials have dealt with Latin American development. Two of them by Philip Abelson (9 June 1972, p. 1077; and 6 Oct. 1972, p. 13) merit some comment.

As a Latin American, I cannot help noting the widespread misunderstanding of American engineers and scientists about the social, political, economic, and scientific problems of Latin American countries. I do not blame them, but rather find they have great difficulty understanding what underdevelopment really means. As Abelson correctly observes, "If the poorer countries are to develop, they must do so largely by their own efforts." Although in many of these countries the state has played a strategic role in promoting the development of the industrialized sector, internal structural conditions have oriented the production of goods to satisfy the consumption of the middle and upper classes. Moreover, as a new form of economic domination—the multinational corporation—is spreading throughout the world, the planning, decision-making, and financial, scientific, and technological knowledge are located in the industrialized countries (*1*). The result is a new form of the well-known "center-periphery" model (*2*), in which manufacturing activities are concentrated in industrial (center) countries, while the peripheral ones specialize in those products needed by the former for their economic expansion.

Abelson suggests that "The Latin American countries might try to utilize the bounteous resources of scientists and engineers in developed countries,"

although he also notes that there are 50,000 Latin American scientists and engineers not effectively employed in industry. What he probably ignores is that Latin American professionals "have no opportunities to use their knowledge in the established industries and even less chance to exercise their ability to invent, create and use their research qualifications to improve techniques and manufactured products. . . . The designs, the projects and the plans for manufacture of industrial goods in local subsidiaries arrive already fashioned from headquarters" (*3*).

In his editorial of 9 June 1972, Abelson refers to Brazil as an example of rapid economic change in recent years. Brazil is, in fact, an excellent example of a model of growth for the sake of some multinational corporations and for the benefit of a small minority (5 percent) of the population (*4*). Abelson does not refer to countries like Chile, Peru, and Cuba, which are trying, in spite of all sorts of difficulties, to change the economic and social structure of their societies in order to distribute the benefits of development to the majority.

In most Latin American countries, any attempt to tackle the problem of underdevelopment constitutes a threat to the state of economic dependence under which those countries are being allowed to grow; this sort of "economic growth" is a mischievous fraud. Most Latin American scholars are not even free to discuss in their own countries the problems related to the impact of science and technology on an underdeveloped society, as the universities which are the place to do so are forbidden to them (*5*).

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References

1. O. Sunkel, *Hum. Relat.* **24**, 1 (1970).
2. R. Prebisch, *Bol. Econ. Amér. Lat.* **6**, 1 (1961).
3. J. L. Lopes, as quoted by O. Sunkel, *Cad. Brasil.* **52**, 32 (1969).
4. C. Furtado, *Análise do "Modelo" Brasileiro* (Editôra Civilização Brasileira, Rio de Janeiro, 1972).
5. J. L. Lopes, *Sci. World* **3**, 8 (1972).

The efforts of Brazil's Executive Commission for the Economic Recuperation of the Cacao Region (CEPLAC) fit the "legitimate aspirations" mentioned in Abelson's editorial of 6 October 1972. Funded through a 10 percent tax on exported cocoa, CEPLAC is charged with the development of agriculture and the improvement of living standards in Bahia, where cocoa grows.

Logically, first priority goes to increasing the tonnage and quality of the cocoa crop for export through a traditional agricultural research and extension approach, but CEPLAC does not stop there. To get the crop to market, bridges and roads are built where needed, and dock facilities are nearing completion at the port city of Ilheus. CEPLAC is using cocoa money in a program of agricultural diversification aimed at changing the prevailing monoculture. Through CEPLAC, schools have been built and staffed, medicine bought, and rural towns have sewage systems and potable water for the first time. In June 1972, a new research laboratory was dedicated. Located within the CEPLAC compound near Itabuna, this facility ranks as one of the most complete and potentially productive centers devoted to tropical agricultural research.

Abelson comments about the small number of scientists and engineers in Latin America. He suggests that the "bounteous resources" of technical talent in developed countries fill the breach, but that this would require, among other things, "a willingness [by Latin Americans] to provide conditions that would permit effective tackling of problems." Such conditions prevail at CEPLAC, especially in the case of biological sciences. The forests and fields abound with exciting and intellectually stimulating challenges; and, with the new laboratory nearby, discoveries of great practical importance are now possible.

The Brazilians will eventually make it on their own. But CEPLAC is the type of indigenous organization mentioned in Abelson's editorial, where an infusion of scientific talent from abroad, in this case on a small scale, could accelerate the development process. CEPLAC is no ragtag outfit. It has forceful and effective leadership and the resources to get the job done.

As a postscript to all overburdened scientists who would like to get away from it all: at Itabuna the mail service is impossible, so there are no letters to answer; telephones work only about as far as you can shout; and the beach—well, it can be all yours, with nothing but sand and more sand, surf, and palm trees as far as the eye can perceive.

P. G. KEENEY
Division of Food Science and Industry, Pennsylvania State University, University Park 16802

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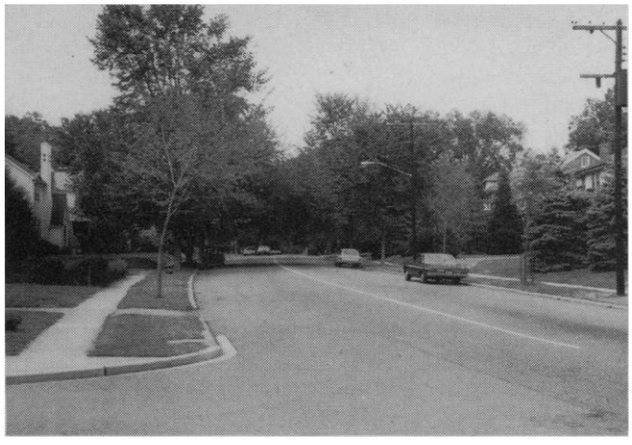
A cure for gobbledygook?

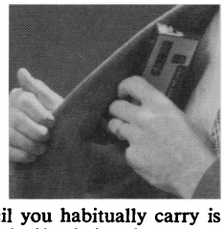


Condition 1

Condition 2

Condition 3

Condition 4



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In fact, this particular set of pictures is actually used in the streets of the nation's capital as a guide to keep track of trends in cleanliness with numbers that say more than the rubbish tonnage picked up or the dollars spent doing so.*

More and more agencies on various levels of government are acquiring quantities of inexpensive Kodak Instamatic® cameras to place in hands that would otherwise be generating mighty torrents of little-understood words in the discharge of important responsibilities.

This does a favor for all. Gobbledygook is as hard to write as it is to read.

*Details are explained in "How Clean Is Our City?" available from Publications Office, The Urban Institute, 2100 M Street, N.W., Washington, D.C. 20037 for $1.95. It doesn't tell what camera made the pictures and we haven't asked.

Kodak

When words fail

6 April 1973, Volume 180, Number 4081

SCIENCE

Blow-Hot, Blow-Cold Educational Policies

The phasing-out of the training grants and fellowship program at the National Institutes of Health will sharply curtail the government's direct support of predoctoral and postdoctoral education in the sciences. Some training will continue in connection with research grants, but the number of students supported will be a minor fraction of those who had received stipends earlier. The dismantling of the government's fellowship program liquidates some excesses but, on balance, is a destructive move, and it comes at a time when the need for some kinds of scientists and engineers is actually growing.

After Sputnik was launched, this nation engaged in a frantic effort to expand its scientific capabilities. For a number of years government funds available for research in the physical and biomedical sciences increased rapidly. At the same time, the Apollo program was implemented. These developments created a shortage of scientists and engineers. The government responded by initiating and expanding support of many kinds of fellowships and training programs. To meet the opportunities of the times, universities expanded their faculties, thus increasing opportunities for employment. Industry found it difficult to attract qualified personnel. Demand for scientists seemed insatiable. Help-wanted ads in the *New York Times* and other publications reached record numbers. An index of employment opportunities, based on such evidence, peaked in 1966 at 190 percent of 1961 levels. When government support ceased to grow, demand for scientists began to drop. Universities no longer needed to expand their faculties, industry began an era of retrenchment. The Apollo program entered its final phases. Suddenly there were unemployed scientists and engineers, and the index of employment opportunities dropped below 40 in 1971. During the peak years, it was common for top-quality graduates and Ph.D.'s to receive dozens of job offers. In 1971, the best students often had only two or three opportunities, and some graduates had no jobs for months.

The most dramatic unemployment problem was in the aerospace industry. When activities were cut back, severe local unemployment resulted. A picture of an engineer driving a taxi created a profound and lingering impression.

Those in government who wished to dismantle the fellowship programs had a useful excuse. Why train scientists when there were scientists unemployed? To a substantial extent, the unemployment argument is no longer valid. The index of employment opportunities has climbed above 100. In some regions there already are shortages of engineers.

Influenced by current antitechnology talk and by reports of unemployment, first-year college students have been shunning engineering. Beginning enrollment is down more than 30 percent from 2 years ago. Students often leave engineering courses; they rarely enter them after the freshman year. Thus, a severe shortage of young engineers may now be projected 4 years hence. This is likely to come at a time when this nation will be engaged in frantic "crash" programs to solve the energy crisis—an effort that will involve a tremendous construction program and large numbers of engineers.

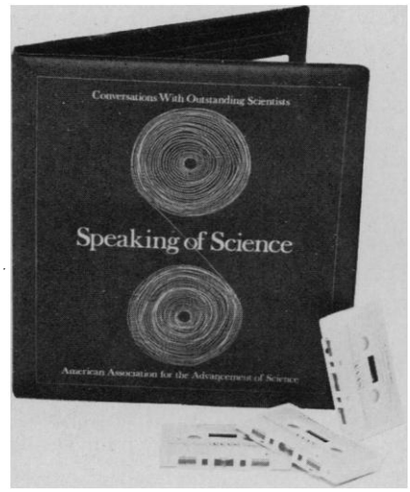
In the years ahead, this nation will encounter many unexpected problems requiring the skills of scientists and engineers. We may well come to regret bitterly the fact that we have been unable to do better than follow destructive blow-hot, blow-cold educational policies. We should adopt the more realistic assumption that this nation must have good science, good medicine, and good engineering, and we should make it possible for the top students, regardless of financial ability, to participate.

—PHILIP H. ABELSON

"The eternal mystery of the world is its comprehensibility."

– Einstein

Speaking of Science



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