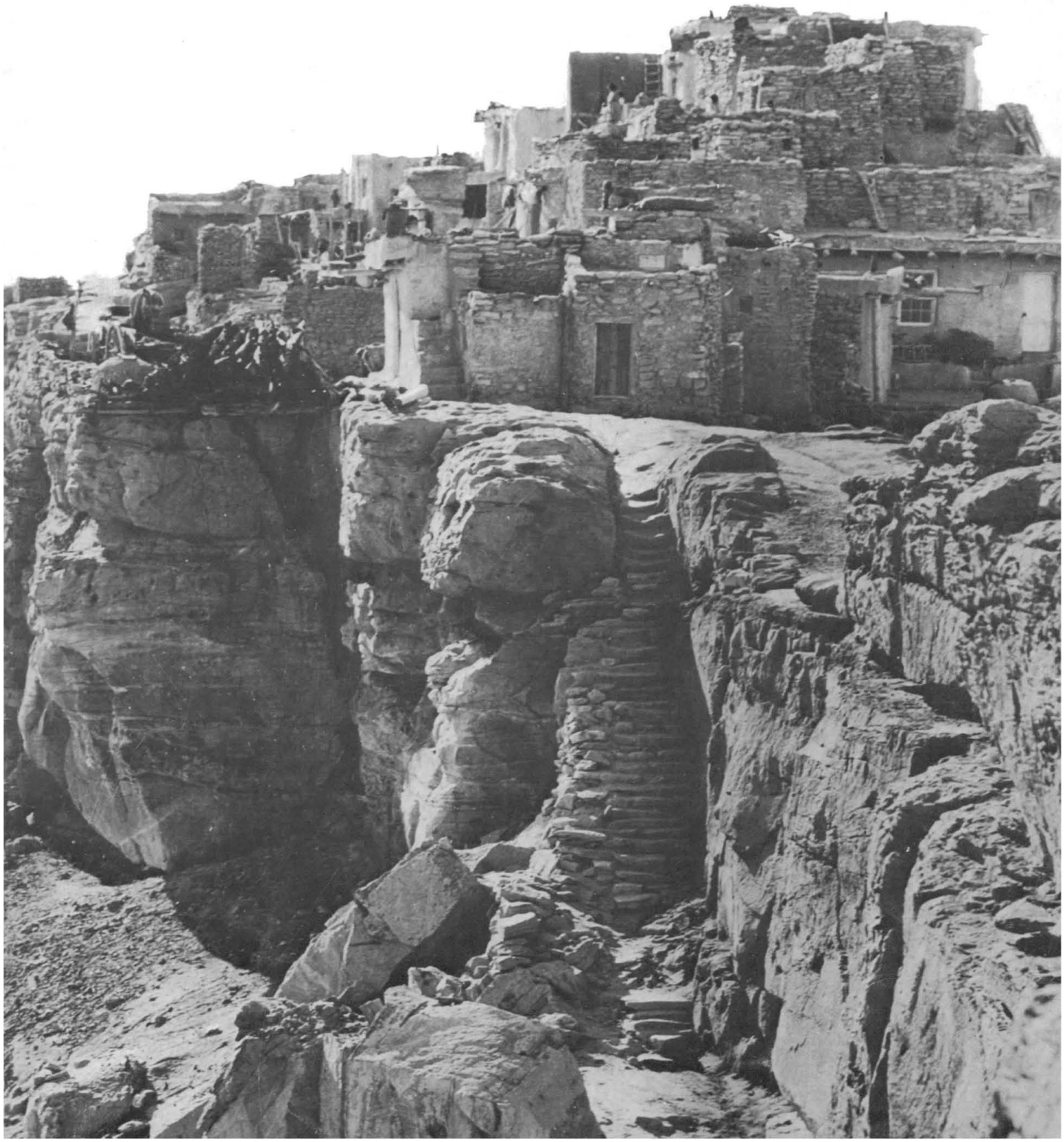
SCIENCE

10 January 1969
Vol. 163, No. 3863

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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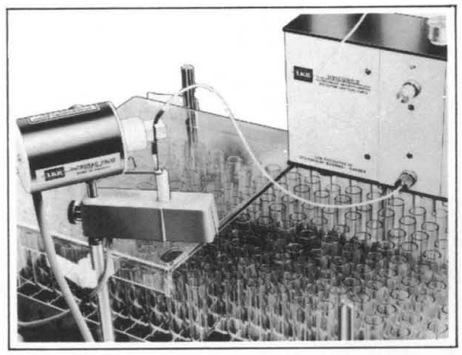

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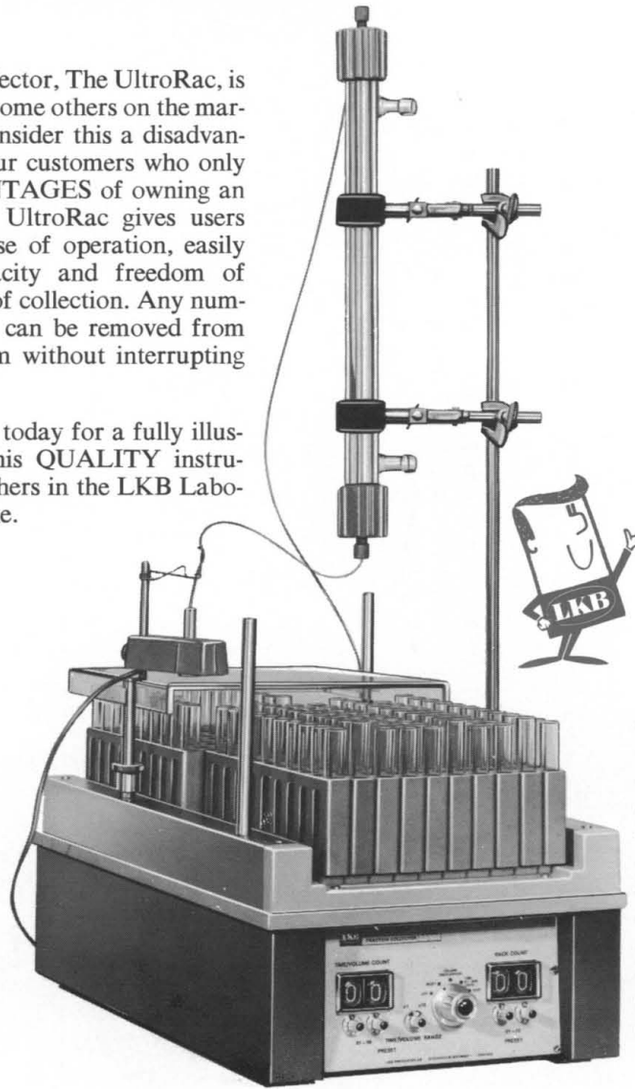

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SCIENCE

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Hopi village of Walpi, a pueblo located atop a mesa in northeast Arizona. In recent decades education, wage work, technological borrowing, and increased communication with modern American culture have made marked changes in Hopi culture, but some Hopis still live in masonry pueblos. See page 133. [National Park Service]

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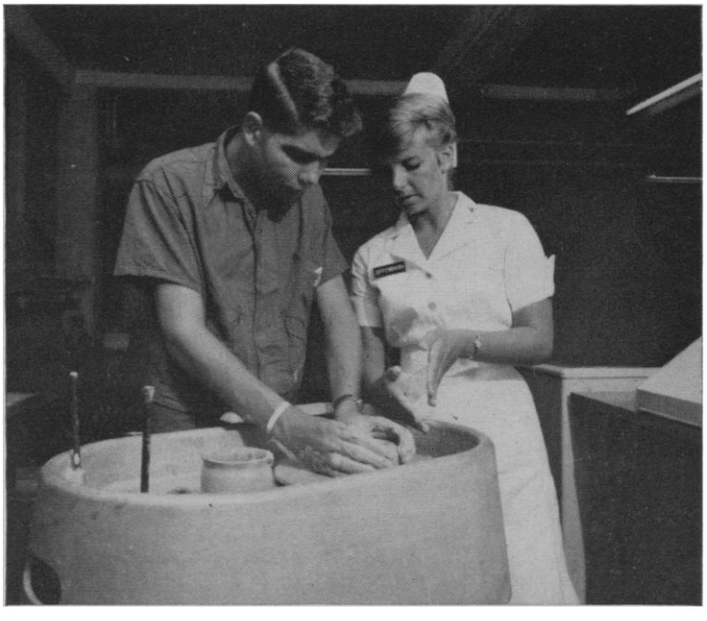

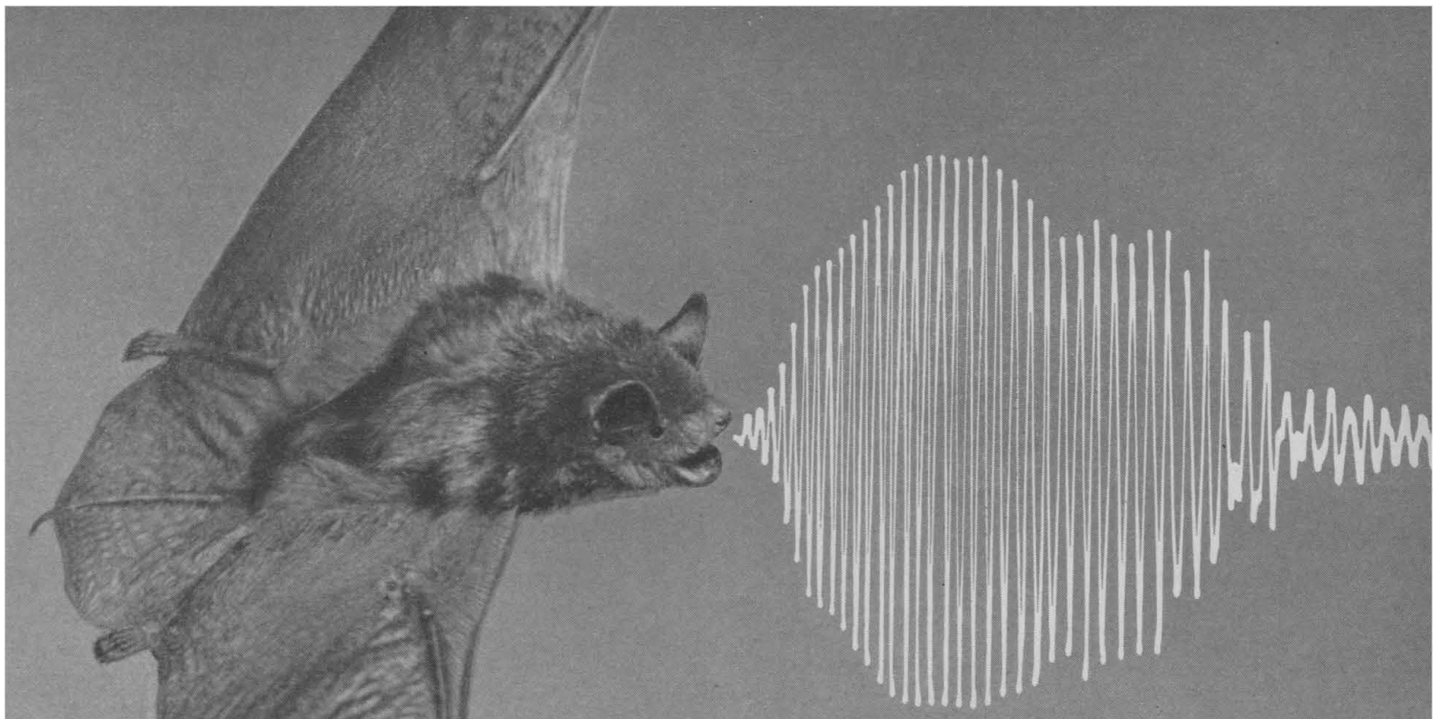

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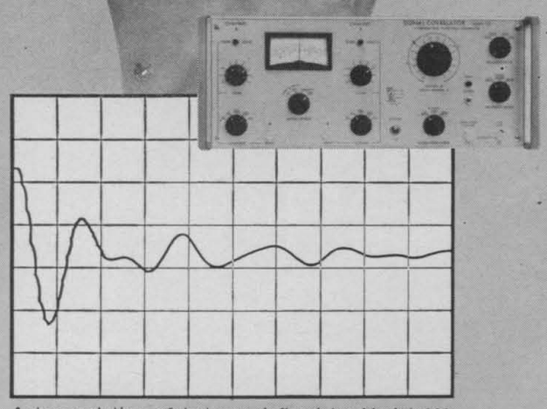

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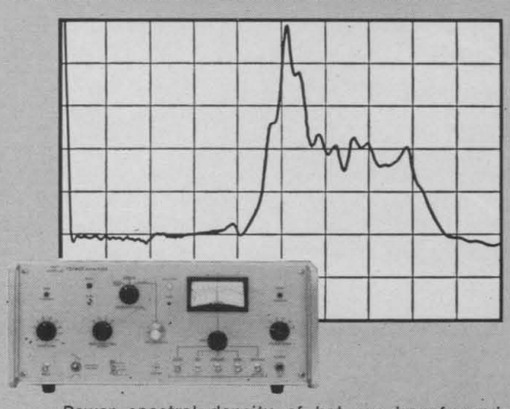

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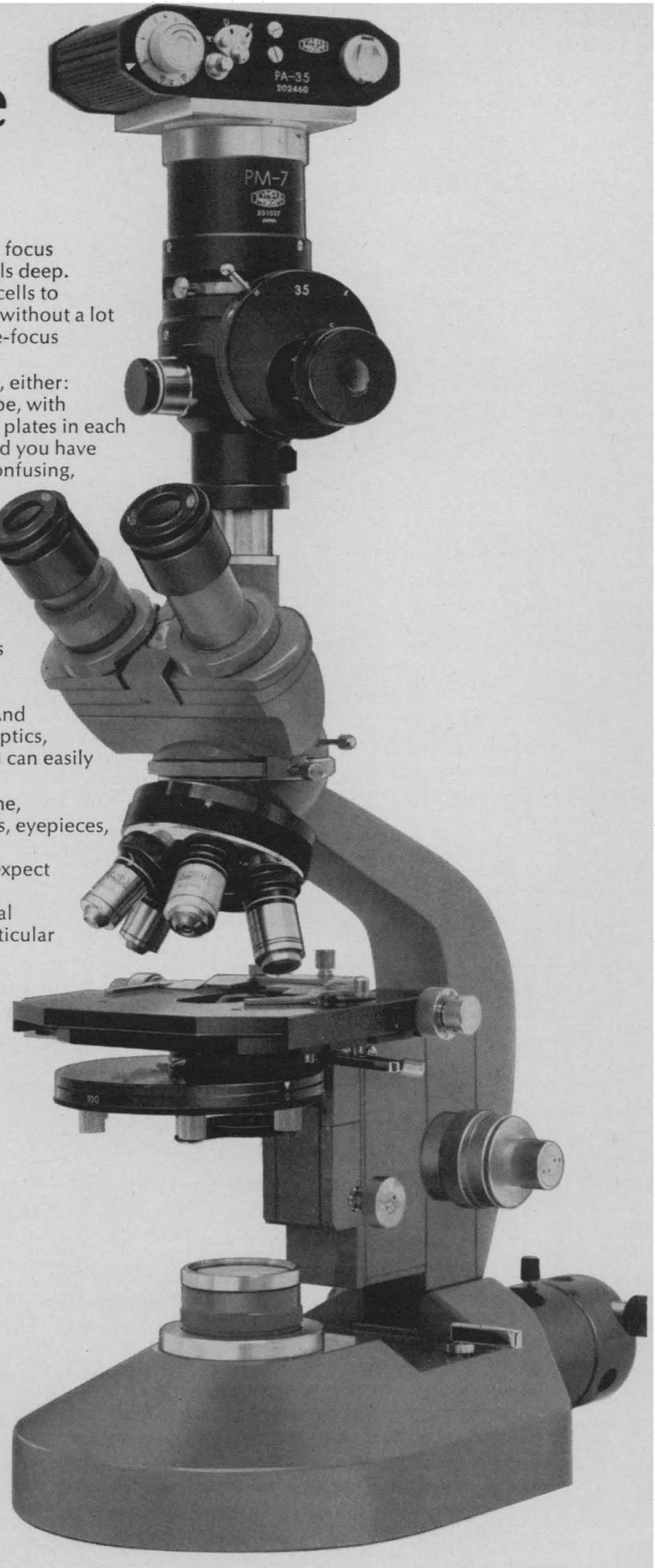

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most formal method of instruction, the lecture, has been considered most effective when it serves this emotional component (*2*). The professor as counselor and adviser serves this emotional factor even more, it seems, in the many spontaneous sessions that occur as an informal part of his job.

In meeting the exhausting demands of this third personal factor, the crux of the problem of higher education becomes not the integrity of the university, but the integrity of the professor. Even in his reluctance to recognize and label this dimension to his role, he will quickly note that there is little if any official reward for his counseling activity, either by his colleagues as they rate him as a professional and scholar, or by his institution as it defines his task. However, one observation is clear—the students' conception of education recognizes this, as evidenced by its frequent use, as a useful and necessary component of that experience.

RALPH SCHILLACE

Psychology Department, Oakland University, Rochester, Michigan 48063

References

1. B. F. Skinner, *The Technology of Teaching* (Appleton-Century-Crofts, New York, 1968).
2. L. Bragg, *Science* **154**, 93 (1966).

Animal Experimentation by High School Students

The National Research Council's Institute of Laboratory Animal Resources has recently issued revised guidelines for animal experimentation by high school students (*1*) which are in no way better and in several respects worse than its 1960 version. Basically, they reaffirm past principles requiring gentle handling, proper feeding and housing of animals; the use of anesthesia where appropriate; that "a qualified adult must assume primary responsibility" for all animal experimentation; and that "a trained life scientist, physician, dentist, or veterinarian directly supervise" surgical and pathological studies.

Unfortunately, these guidelines fail to demarcate socially acceptable boundaries for student work since, like the old guidelines, they place few limits on student experimentation. Thus, in full compliance with the guidelines, a high school student (whose work was exhibited at the International Science Fair organized by Science Service at Detroit in May 1968) inserted brain electrodes into squirrel monkeys (*2*).

One of the 25 monkeys used died during the fair and postmortem examination revealed that the electrodes were so improperly embedded that they were not even penetrating the brain.

Nor do the guidelines place any restraint on, or enunciate standards or principles to govern the infliction of pain upon animals other than requiring the use of anesthesia where appropriate. Thus, survival surgery such as skin grafting and removal of organs, induction of painful pathological conditions, and abuse of pregnant animals to produce malformed offspring are commonly encountered in science fairs, where students aged 12 to 18 exhibit independent work (*2*). To my mind, there are strong grounds for restricting elementary and secondary school students to painless animal procedures and for confining surgical and pathological studies to institutes of higher education and research. One-fifth of 802 biology projects at 10 recent science fairs involved pain or death to higher animals. Considering the vast range of biological problems, the great array of plants, protozoa, and insects, and the many studies of animals which can be conducted without harming them, it is profoundly disturbing that one student in five now chooses a topic in which animals are hurt or killed. Yet these new guidelines, which Science Service has adopted posthaste, pay little heed to the undesirable moral, social, psychological, and scientific consequences of fostering poor, premature, and painful animal work.

The guidelines' clauses on supervision rely upon the student to seek supervision and upon his supervisor to determine what standards are advisable. Unqualified or uninformed supervisors direct all too many youngsters into undesirable work. The new guidelines do not even require that the supervisor be trained in the experimental procedures involved. Thus a student can merely discuss a project with his biology teacher or another person who has no special knowledge of the subject or techniques involved, and then proceed on his own at home, usually in a basement or bedroom, to harm and kill animals in juvenile emulation of meaningful scientific work. The guidelines do not require adequate experimental facilities and ignore the threat to life and health posed by student custody of dangerous drugs and toxic materials.

As the present guidelines condone such work, those scientists, educators, and citizens who are concerned with the humanity and good sense of biology and of American society should seek to have better ones formulated.

F. BARBARA ORLANS
7035 Wilson Lane, Bethesda, Maryland 20034

References

1. This guide for high school students of biology was prepared at the request of the Science Clubs of America and approved by the National Society for Medical Research, the Institute of Laboratory Animal Resources (National Research Council), and the American Association for Laboratory Animal Science (1968).
2. *Information Report* **17**, No. 2 (Animal Welfare Institute, New York, 1968).

Czech Science in Iron Glove

Nelson's report on the 23rd International Geological Congress in Prague (13 Sept., p. 1116) once again illustrates the interdependence between the scientific and political areas of life. In recent years the work in the physiological laboratories of Czechoslovakia has constituted a highly significant contribution to the basic and applied sectors of this discipline.

My contact with Czechoslovak investigators at international congresses and symposia, study of their publications in Western journals, and the opportunity to work with their fellows in American, English, and Swedish laboratories have taught me to respect their contributions and to anticipate their future work. Now, a sudden shift in political climate has abruptly dampened and threatens to extinguish this active physiological center. Many of the most productive workers have already fled their native country and now seek their livelihood in other places. Contact with those who remain is becoming tenuous because we fear that direct communications from Western colleagues might jeopardize their future. Probably parallel situations can be cited for most other scientific disciplines.

We must protest this destructive interference with free scholarly endeavor. I urge that the AAAS inform the Academy of Sciences in Moscow that we share what we assume to be their concern with interference with the scientific work and the scientists of Czechoslovakia. We who still enjoy freedom must be the jealous guardians of these privileges for our less fortunate colleagues.

CHESTER HYMAN
School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles 90033

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SCIENCE

Uneven Effects of Cuts in Science Funding

During the current fiscal year, federal support of academic science will be at a level a few percent below that of the preceding year. On the surface, it might appear that such a reduction could be accomplished with merely some "belt-tightening." However, the cut is greater than it seems because inflation and increasing costs have made the conduct of research more costly. In practice, the effects of cuts have been uneven, and considerable hardship has been experienced.

Among universities, two types have been particularly affected—the top private institutions and those that were striving hard to move toward excellence. Less affected have been some universities that derived part of their support from the state or from industrial sources. Other universities that never tried very hard to obtain federal funds had little to lose or to worry about.

The full extent of damage to top private institutions is difficult to assess. During 1967 and, especially, 1968, many of them incurred deficits. Having long enjoyed excellence, they had been among the first to attract substantial federal support and had become accustomed to it. Some had derived more than 80 percent of their funds from Washington. They had made financial commitments for supporting functions, such as computers and shops, on the basis of an expectation of continued support. However, Congress seems determined to distribute fewer dollars more widely. If this policy continues, a major consequence must be the destruction of much of the excellence that had been built up in major private institutions.

One of the objectives voiced by some congressmen was to spread excellence across the land. The National Science Foundation grants designed to facilitate this development stimulated healthy soul-searching and imaginative programs, both among successful institutional applicants and others. The momentum lost as a consequence of the budget cuts will not be easily recovered.

Within the universities the departments hardest hit have been those in the physical sciences. The space program has been pruned severely. The Department of Defense has cut sharply its support of academic physical science. The National Science Foundation was expected to take over responsibility for fields abandoned by NASA and the Defense Department, but NSF suffered the biggest cut of any major agency. As a result, large segments of physics departments at leading universities were suddenly without federal support. The current cutbacks in physics have been superimposed on earlier contraction. In February 1968, the American Institute of Physics reported that as many as 16 percent of qualified academic physicists had lost all federal support.

Another casualty of the budget cuts is support for chemistry. For many years, federal funding of this science has lagged. Following issuance of the Westheimer report in 1965, only modest progress was made before NSF came under budgetary pressure. For instance, to ease a serious deficiency in equipment at chemistry departments, this year's budget called for a miserly $3.7 million for equipment grants. No final figure has been named, but it will probably be much below the budgeted amount.

One cost of the overall cutbacks that is real but not readily measurable is loss of confidence on the part of many scientists in the wisdom and integrity of the government. When agencies are forced to renege on moral commitments, who can fully trust them thereafter?

—PHILIP H. ABELSON

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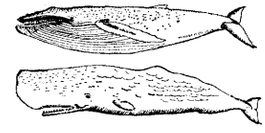

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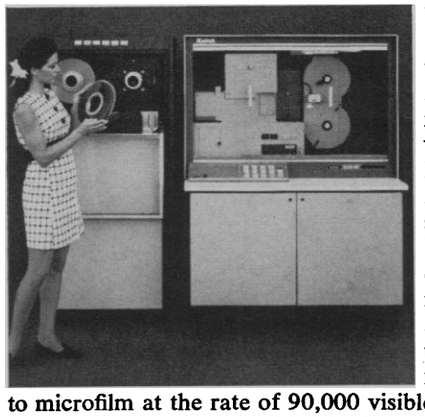

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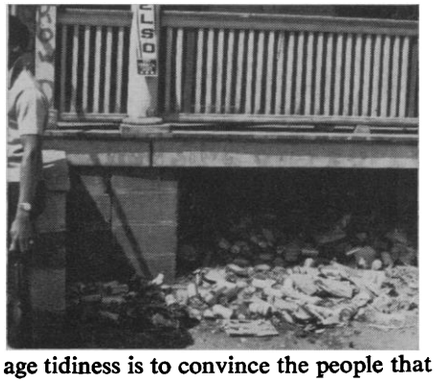
On the other hand, in case your scientific endeavor should call for just this convenience, the Business Systems Division of Eastman Kodak Company, Rochester, N.Y. 14650 wants to find you.

A little hope for the cities

In our own city we had to go less than a mile from our world headquarters to take this picture:



The people who threw those products of the packaging industry there didn't care. They can't think of it as their city. They have always thought of it as somebody else's city. They just live there.

Best way we can think of to encourage tidiness is to convince the people that the cities really are theirs. The admirable doctrine that the color of a man's skin is irrelevant to his place in society hasn't convinced them. Perhaps, then, it is not irrelevant. On that assumption, we see one way to help a little.

We note, for example, that Kodak cameras and films are selling like crazy in Harlem. In the nation as a whole, one out of nine hands thrusting a dollar toward a cash register is black. Yet not one out of 100 of the owners of those cash registers has hands of that color. Something out of balance there needs attention.

One role we have played for the past 75 years has been to counsel men on setting up independent businesses of their own as dealers in our products. Right now we are pushing that role hard in the centers of the cities. Maybe we can help convince more citizens that the cities belong to those who live in them.

for the group of pituitary glycoprotein hormones, TSH, luteinizing hormone (LH or ICSH), and follicle-stimulating hormone (FSH), than for any of the other pituitary hormones, and questions can still be raised concerning the purity of present preparations. The complete review of the chemistry of mammalian thyrotropins (TSH) by P. G. Condliffe (Paris and Bethesda) and by J. G. Pierce and his collaborators (Los Angeles) was thus very useful. With a few exceptions (concerning the possible presence of tryptophan and glucose in bovine TSH) the analytical data from the two laboratories were in reasonable agreement, but the two speakers currently hold different views concerning the important question of whether the native TSH molecule (with a molecular weight of approximately 25,000) consists of subunits. The findings of Condliffe concerning the behavior of reduced carboxymethylated TSH during gel filtration suggest that TSH may be analogous to LH in that more than one peptide chain may be present (see below); however, the end-group and sedimentation-equilibrium data of Pierce and co-workers point toward a single peptide chain with a molecular weight of 25,000. Analyses of the fractions obtained by gel filtration should solve the apparent discrepancy. Double-diffusion studies showed various degrees of immunoreactivity among thyrotropins of different mammalian species, but none was found between LH and TSH by this technique. However, with their radioimmunoassay system, G. Rosselin, P. Freychet, and J. Dolais (Paris) stated that some common immunological sites are shared by gonadotropins and TSH, as reported by others.

Y.-A. Fontaine (Paris) considered the zoological specificity of thyrotropins, reporting the inability of hypophysial extracts from eels to stimulate mouse thyroid gland or sheep isolated thyroid cells, whereas both mammalian (bovine) and eel material can stimulate the trout thyroid. However, if fish TSH (carp) is used in very large quantities, mammalian thyroids will respond, but the activity on mammals is about 1/300 that observed on the trout. Lungfish material affects both mouse and trout thyroids much as does bovine TSH. An inherent thyrotropic activity (that is, heterothyrotropic) of mammalian gonadotropins in fish is apparent.

M. Jutisz and P. de la Llosa (Paris) reviewed their work on the separation of two subunits in the gonadotropin LH by urea, guanidine, or acid (*p*H 3), and their recombination into an active molecule, an achievement which has also been reported by Papkoff and Samy. Luteinizing hormone is beginning to yield some significant sequence data (Ward, Papkoff), but these were not discussed. Some disagreement still exists among workers on mammalian LH's even with respect to composition, with considerable discrepancies noted in the values for carbohydrate content.

A. V. Nalbandov (Urbana) expressed his belief that in higher vertebrates FSH and LH were either released together (revival of an old idea) or formed a complex in the blood which acted on the target tissues. The need for more than mammalian FSH and LH to promote ovarian maturation in the chicken points either to a possible essential third gonadotropin, serving as a factor maturing the follicle, in the chicken pituitary, or to a recognized chicken gonadotropin which has this function as well. The activities of gonadotropins from and in other vertebrate groups were considered at some length. A particularly interesting report on the purification and properties of a gonadotropin from carp was given by E. Burzawa-Gerard (Paris). This material, which gives excellent responses in several biological assays in lower vertebrates, does not elicit any responses in standard tests for mammalian gonadotropins such as the Parlow and Steelman-Pohley assays. Its composition is significantly different from that of any known mammalian gonadotropin.

I. I. Geschwind (Davis) marshaled the evidence for the existence of four major families of hormones: the neurohypophysial hormones, the ACTH-MSH-LPH complex, the glycoprotein hormones, and growth hormone–prolactin. Except for the first group, neither the amino acid sequence of any nonmammalian pituitary hormone, nor of any glycoprotein hormone or prolactin, has been elucidated, and therefore it would be premature to attempt to develop lines of molecular evolution for these hormones. The proceedings of the colloquium will be published by the French National Center for Scientific Research.

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