

SCIENCE

10 December 1971

Vol. 174, No. 4014

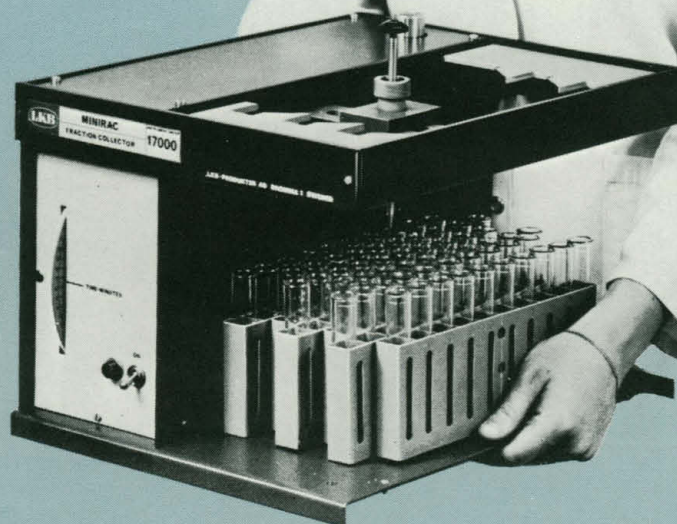
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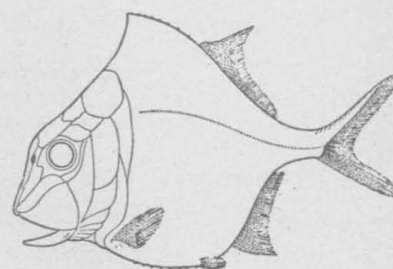
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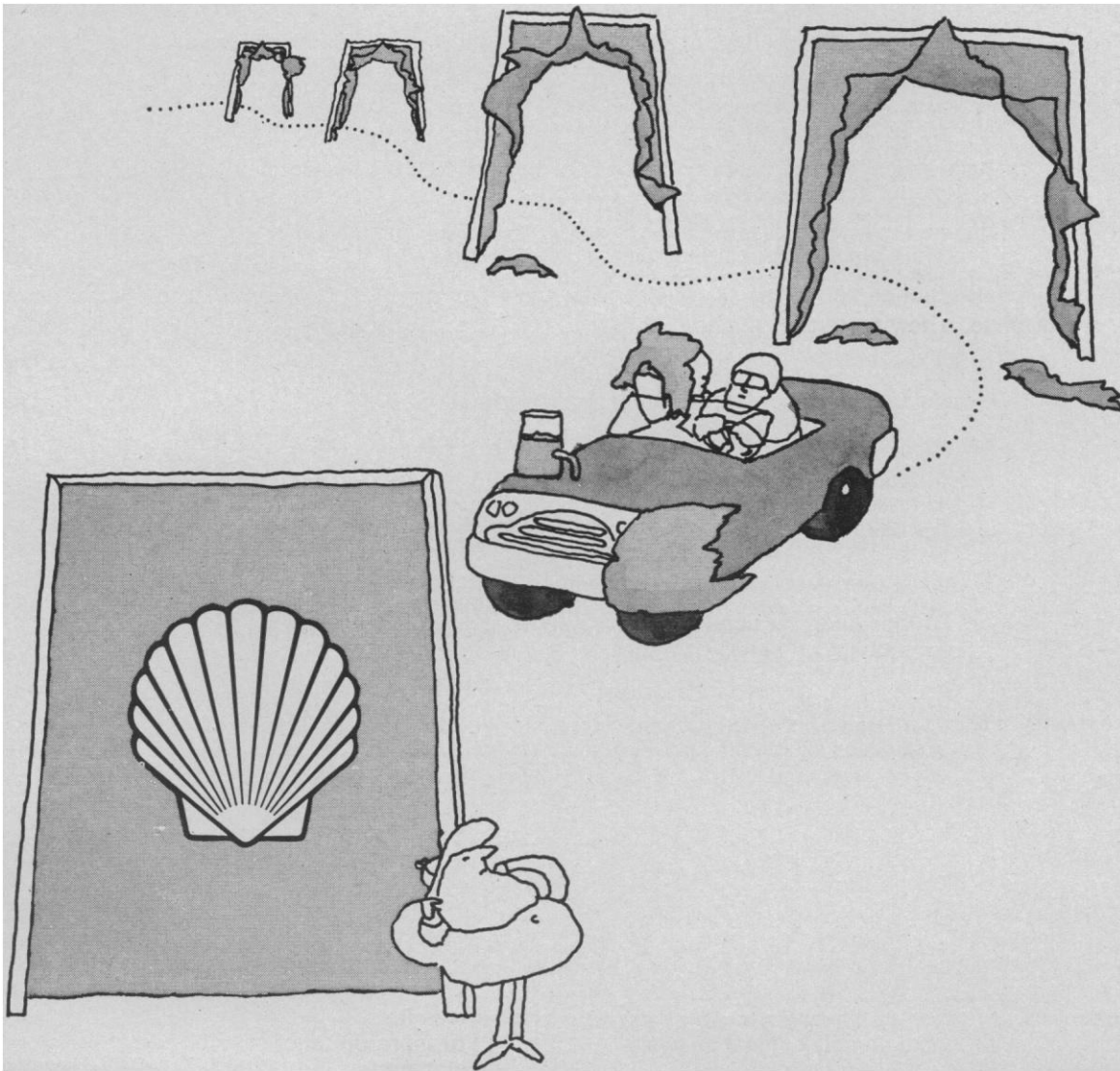
COVER

Cumulus clouds. See review of *The Physics of Clouds*, page 1120. [U.S. Department of Agriculture, Washington, D.C.]

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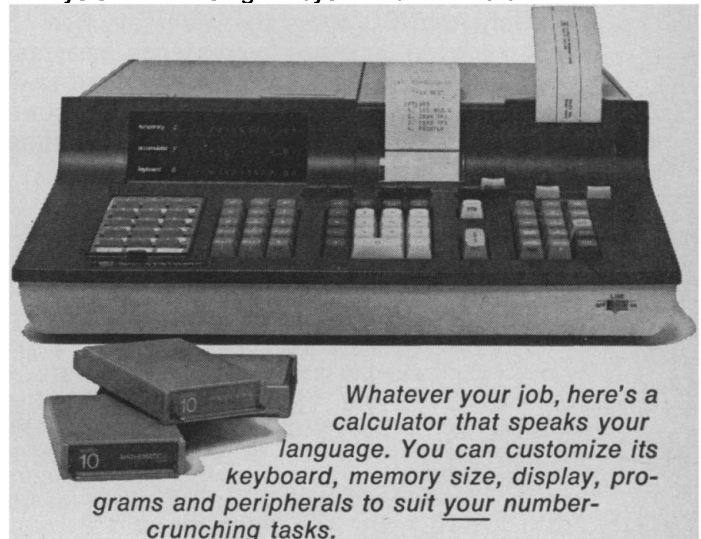
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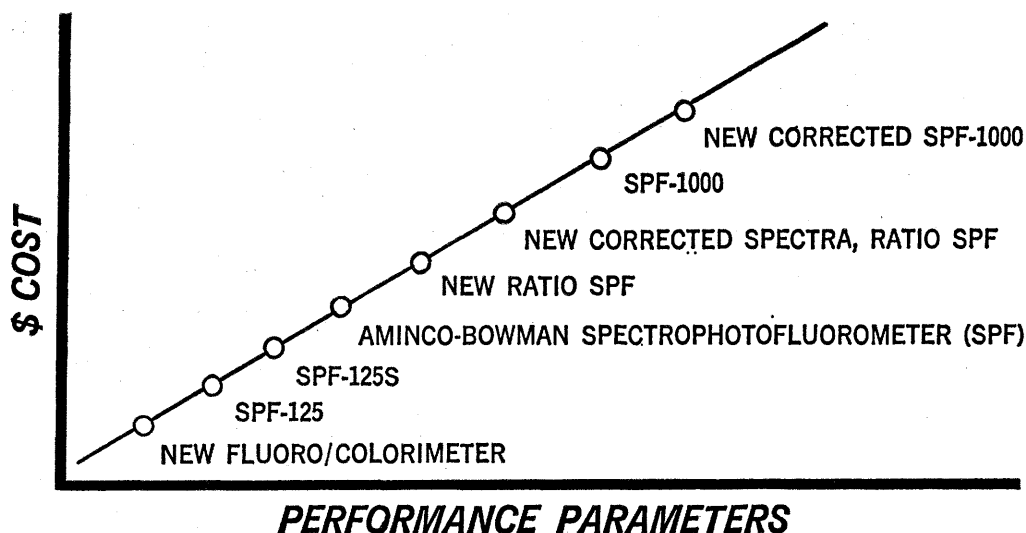
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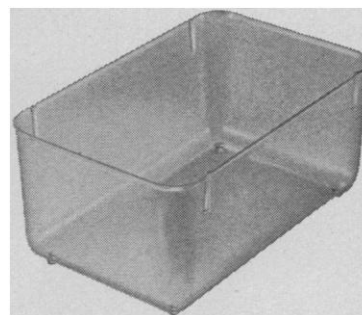
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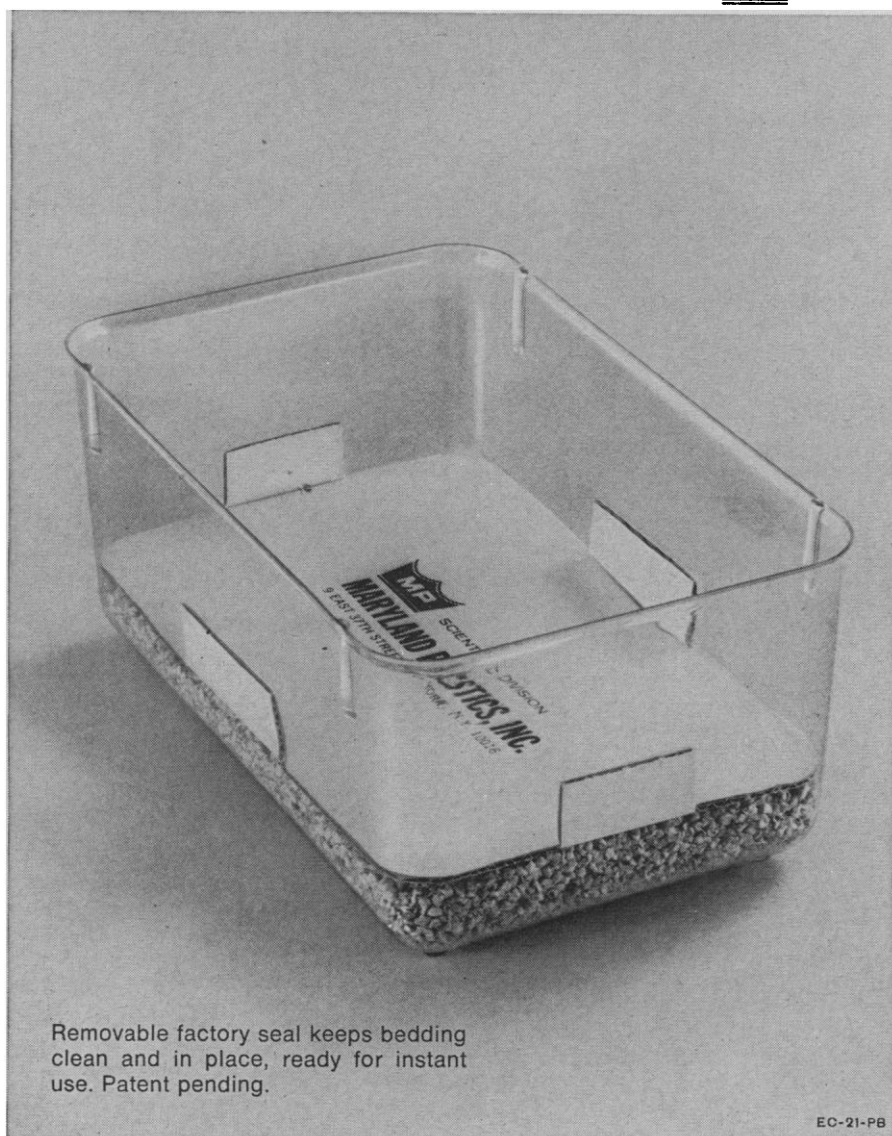
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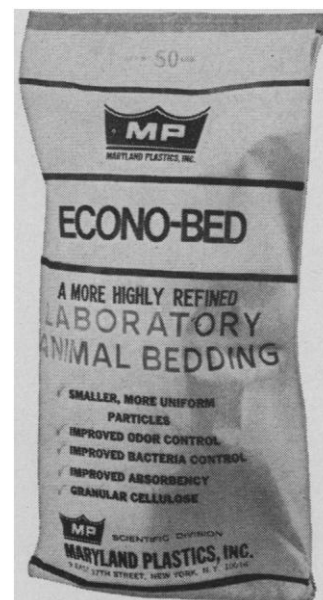


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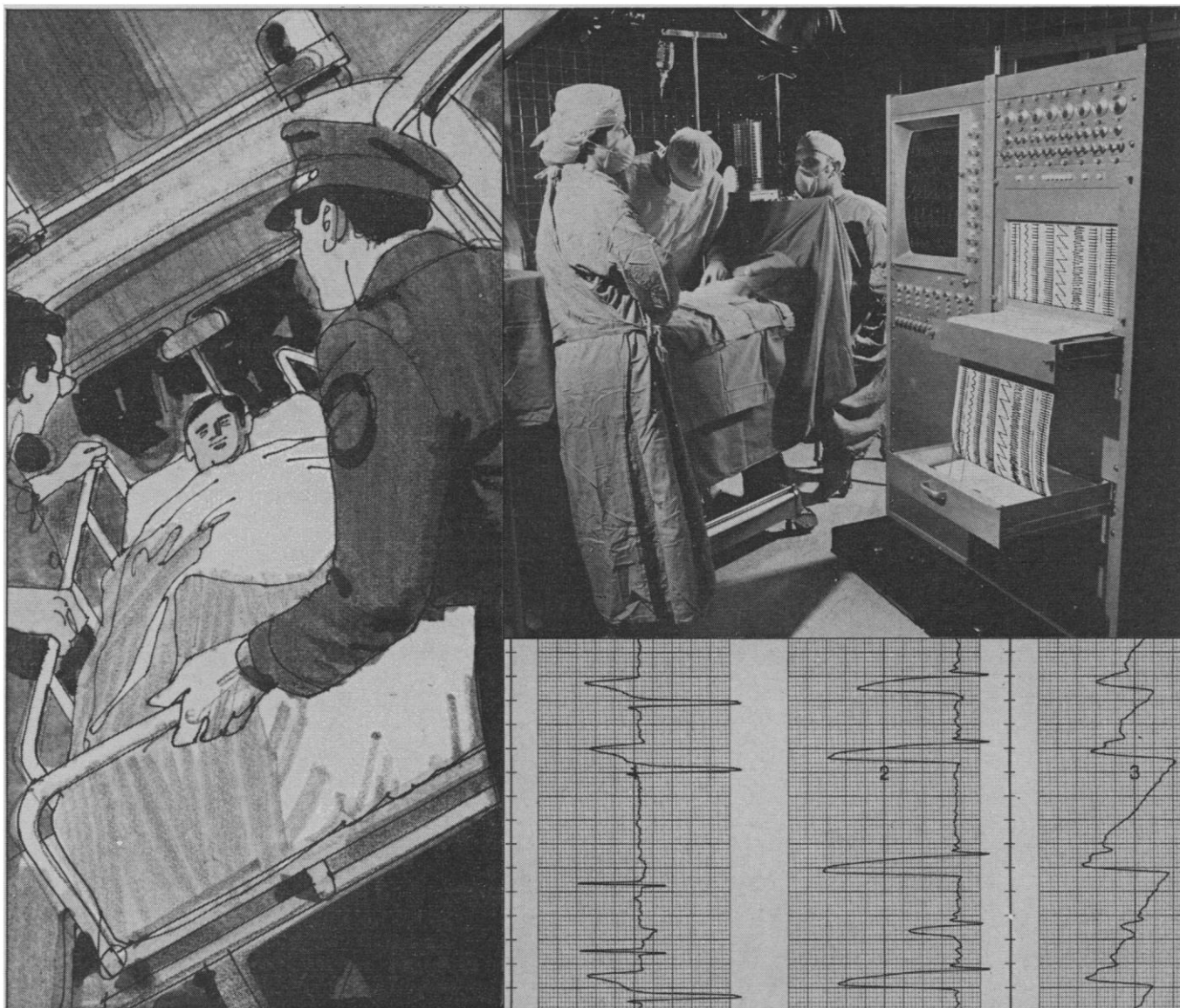
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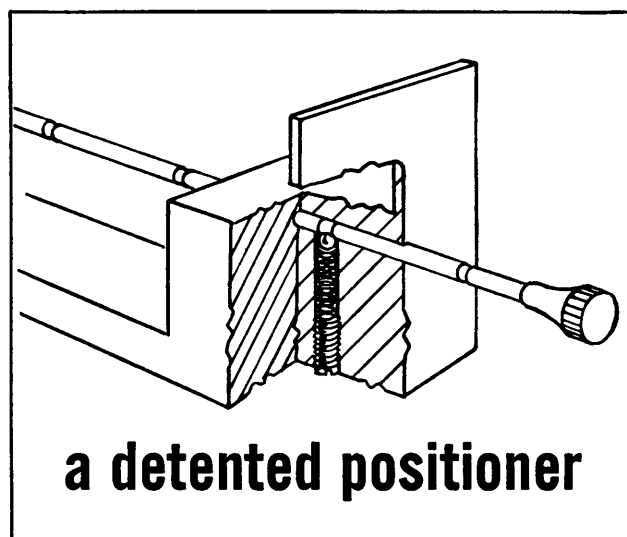
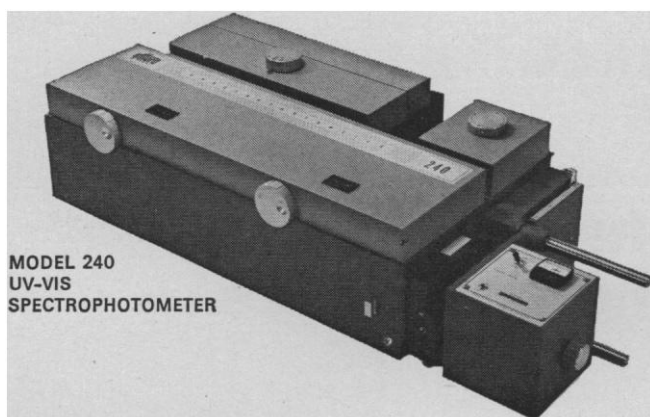
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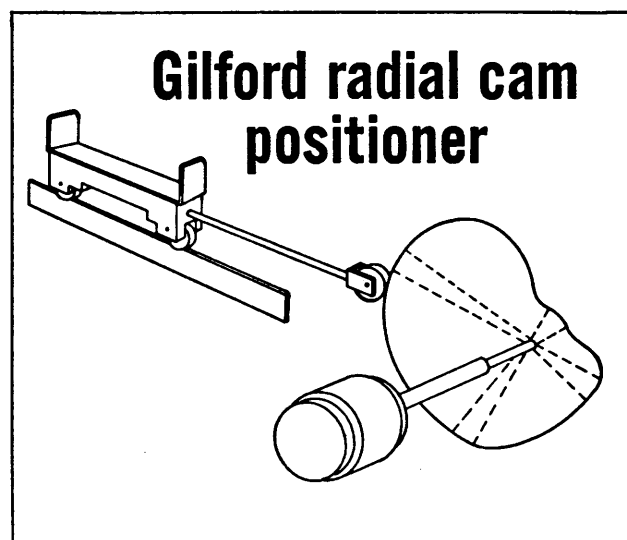
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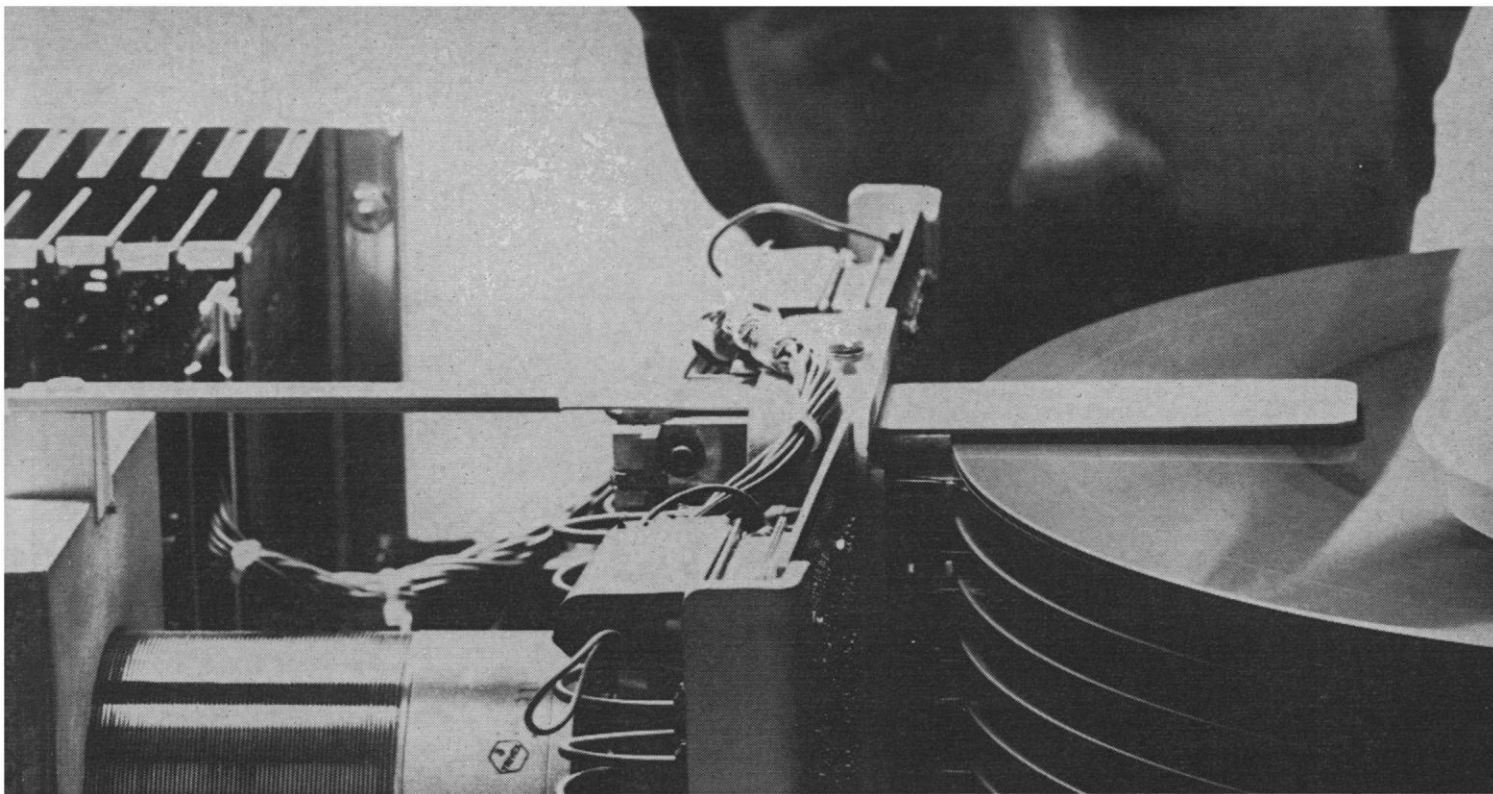
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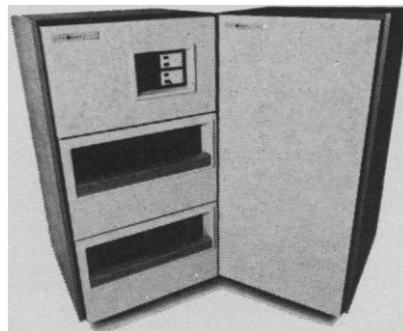
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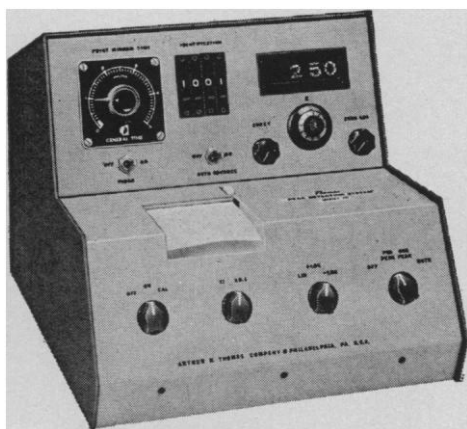
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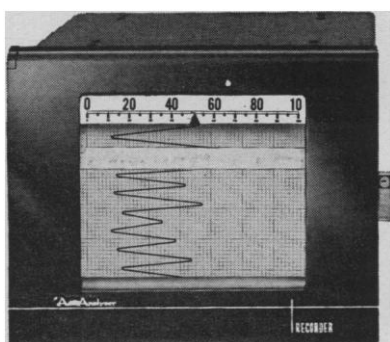
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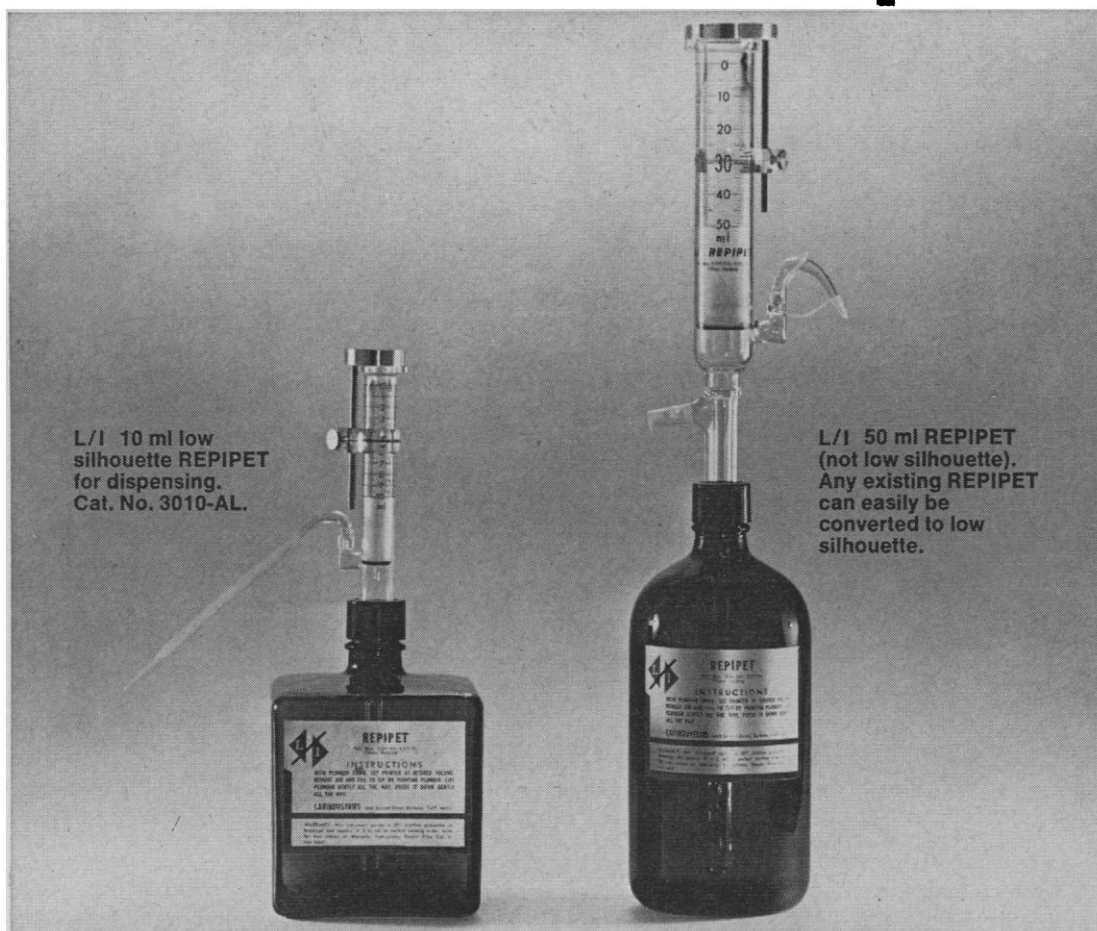
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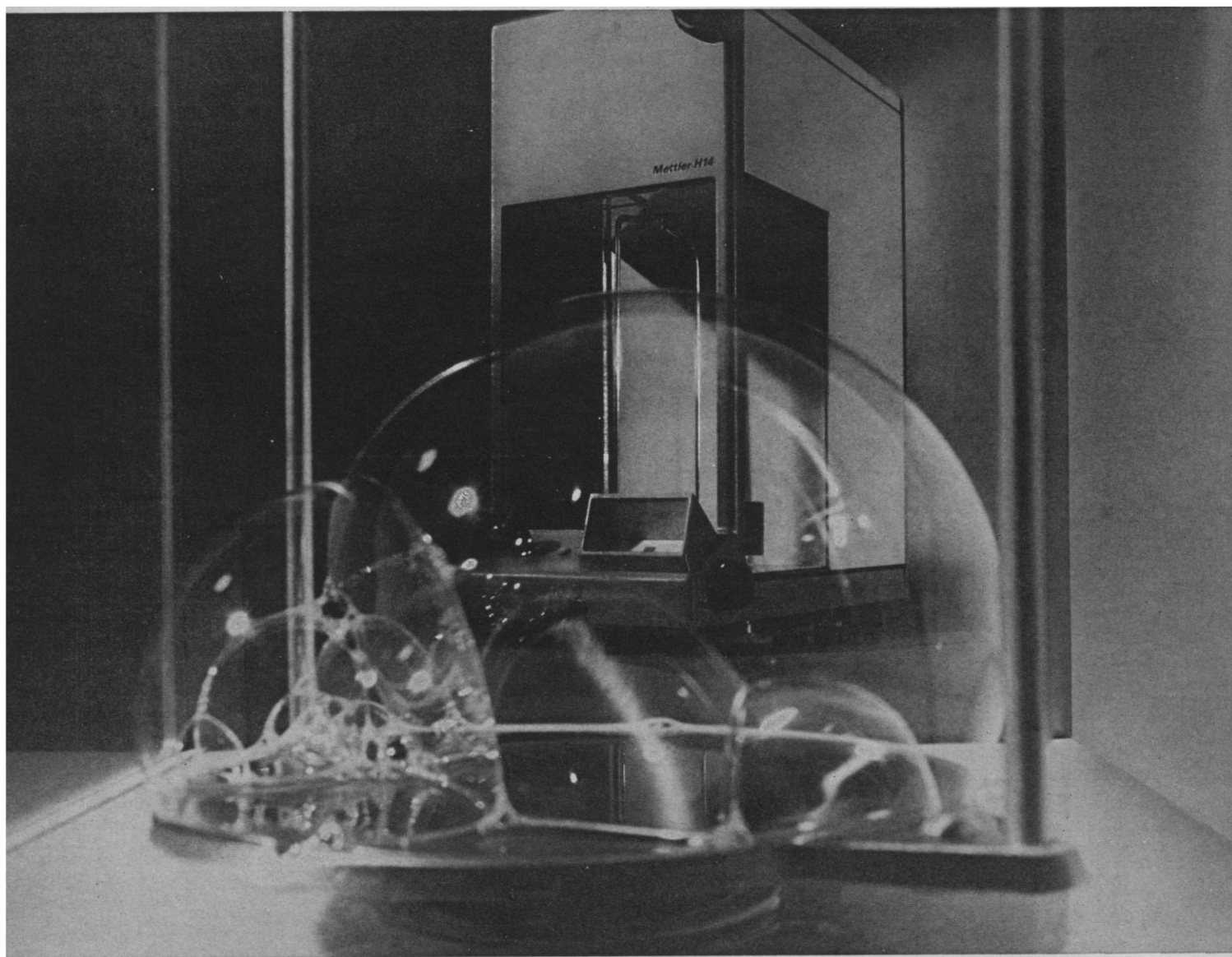
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all mankind, but not if in so doing we eliminate dignity entirely. We must work to raise the standard of living of the underdeveloped countries of the world, but not reduce all the people of the earth to poverty in the process. Hardin's editorial tries to express the fact that, today, "one world" would be a total, miserable mess in which civilization itself would be hard pressed to survive. Man is not served by the creation of equality at the expense of dignity.

Perhaps the position of America as a wealthy society is fortuitous and undeserved; but can the poor of the world, and future humanity as well, be helped by universal poverty? If the resources of the earth can support the present large and ever increasing human population; if the planet will not be rendered lifeless in the attempt; if other forms of life will not have to be eliminated entirely to accommodate our overabundance—then demonstrate that this is so, and refute the arguments of those who say that it is impossible. But do not criticize those who oppose "one mouth, one meal" without giving a method by which this may be attained.

GERALD AUDESIRK

1775 East Woodbury Road,
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The replies to my editorial are precious source material for anyone interested in human reactions to the violation of a taboo. The point I made was well made by Malthus (1) in 1803, by W. F. Lloyd (2) in 1832, and very well indeed by John Stuart Mill (3) in 1848 in his *Principles of Political Economy*—"Society can feed the necessitous, if it takes their multiplication under control; or (if destitute of all moral feeling for the wretched offspring) it can leave the last to their own discretion, abandoning the first to their own care. But it cannot with impunity take the feeding upon itself, and leave the multiplying free."

The logical point has never been refuted, but the knowledge is repressed again and again. How can one shatter a taboo that impedes rational adjustment to the realities of the world? I don't know. My essay, "The tragedy of the commons" (4), was one attempt; elucidation of its international implications was the purpose of my editorial.

"Nature" acts as if she understands the principle. This was the thrust of Eliot Howard's *Territory in Bird Life* (5); in recent years V. C. Wynne-

Edwards (6) has also elaborated the point. So long as population growth is uncontrolled, the defense of territory is necessary for the survival of human dignity *somewhere*. We can call such a statement "selfish" if we wish—but what do we gain from the pejorative?

There is, of course, the vexing issue of ethnocentrism; if not all groups can be saved, who shall be favored? Only the mythical Man from Mars could give an objective answer to that question. In his absence, each of us must give his own reply. I have no objection if others, made of nobler stuff, wish to give their wealth to Africans, Indians, Pakistani, or what have you. In truth, I confess I cannot bring myself to do so. If the poor of the world will not, or cannot, "take their multiplication under control," I shall try to protect my access to the goods of the world, undeserving though I may be, and seek to save some of the earth's resources for my grandchildren and theirs.

GARRETT HARDIN

Department of Biological Sciences,
University of California,
Santa Barbara 93106

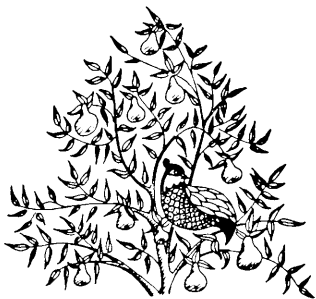
References

1. T. R. Malthus, *An Essay on the Principle of Population* (Johnson, London, ed. 2, 1803).
2. W. F. Lloyd, *Two Lectures on the Checks to Population* (Collingwood, Oxford, 1832).
3. J. S. Mill, *Principles of Political Economy* (Murray, London, 1848).
4. G. Hardin, *Science* **162**, 1243 (1968).
5. E. Howard, *Territory in Bird Life* (Murray, London, 1920).
6. See V. C. Wynne-Edwards, *Animal Dispersion in Relation to Social Behavior* (Oliver and Boyd, Edinburgh and London, 1962).

fd Virus Photo

Bryce Nelson's report (News and Comment, 27 Aug., p. 800) about the erroneous description of a photo in the 12 August issue of the *New York Times* as that of a "DNA molecule," rather than an "fd virus," further confuses, rather than clarifies, a very simple story. The story is that there is in fact no "story," except that the *New York Times* made an error.

In the 2 July issue of *Science*, Gabor, Kock, and Stroke (p. 11) described the holographic sharpening of an electron micrograph of the fd virus. The electron micrograph had originally been recorded by Crewe as a part of a collaborative effort by Crewe and Stroke. Subsequently the *New York Times* requested a photograph of the sharpened image of the virus that revealed a double helical stranding. The photograph



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was sent with the caption "Double Helical Structure of an fd Virus." The reporter in his story introduced an error by describing the picture as that of a DNA molecule.

GEORGE W. STROKE

*Department of Electrical Sciences,
State University of New York,
Stony Brook 11790, and
Department of Surgery,
Harvard Medical School,
Cambridge, Massachusetts 02138*

Research on Narcotic Antagonists

Allen Hammond's description of the current status of narcotic antagonists (News and Comment, 6 August, p. 503) correctly indicates that very little research has been done on extending the duration of action of existing antagonists, mainly because of lack of funds and lack of enthusiasm on the part of the pharmaceutical companies.

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LAWRENCE BERGNER

*New York City Department of Health,
125 Worth Street, New York 10013*

Two Kinds of Perpetual Motion

Concerning which law of thermodynamics would be violated by a perpetual motion machine, both David (Editorial, 28 May, p. 901) and Moeller (Letters, 15 Oct., p. 227) are partly right. The confusion probably arises from a distinction, which was first made by Ostwald, between two kinds of perpetual motion (1). Perpetual motion of the first kind (energy creation) would violate the first law of thermodynamics, while perpetual motion of the second kind (entropy reduction) would violate the second law.

DAVID L. WILSON

*Division of Biology, California Institute
of Technology, Pasadena 91109*

Reference

1. M. Planck, *Treatise on Thermodynamics* (Dover Publications, New York, ed. 3, 1926), pp. 89-90.

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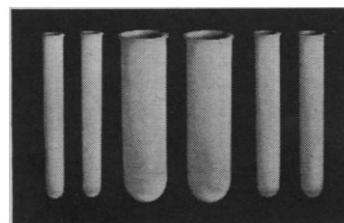
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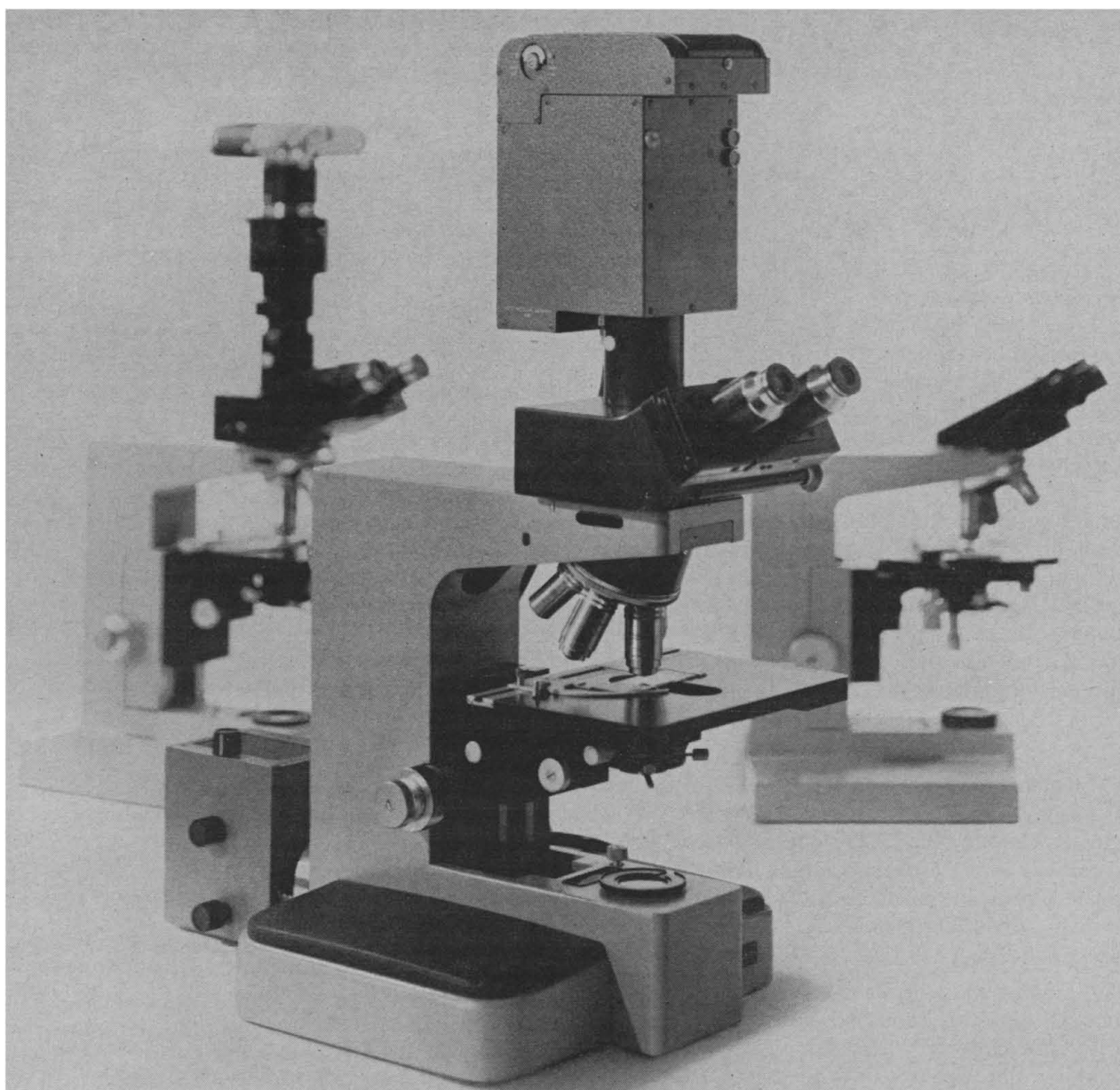
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The Role of Scientific Instrumentation

To a large extent, American leadership in science has been based on the widespread availability of excellent instrumentation. In an earlier era, scientists could make fundamental discoveries with the equivalent of sealing wax and string. Today an occasional worthwhile observation is made with simple tools, but most significant advances depend on the application of complex instrumentation. In many instances appropriate devices make possible a tenfold or greater speed in data collection. In other instances sophisticated equipment permits measurements and experiments heretofore inaccessible. Current trends indicate that, in the future, leadership in science will be even more contingent on pioneering the use of new and increasingly powerful equipment. American scientists are fortunate in having the support of an innovative instrumentation industry that has been a by-product of federal support of research.

The grants system placed considerable sums of money at the disposal of a large number of investigators who were a good market for effective apparatus. Many small companies were organized to invent, develop, and manufacture new products. Some companies produced unneeded or shoddy goods, and they failed. Others built needed and excellent equipment that was crucial to the advancement of science. Academic and industrial research benefited alike, and a thriving export trade was established.

One can learn something about economic systems and about the role of instrumentation in science by considering the contrasting situation in Russia. Those who have visited Russian laboratories generally come away with a favorable impression of individual scientists, their interest in science, their willingness to work, their familiarity with the literature, and their eagerness to learn. Yet much of the Russian work seems pedestrian. In many areas the Russians are followers, not leaders, despite the fact that large staffs are active. The consensus of visitors is that a major Russian deficiency is in their equipment. The creative potential of many fine young people is lost, for they must devote their time to making routine observations that could be made much faster and more accurately with modern equipment. At some institutes one may observe individual pieces of apparatus that have been invented and built there. However, scientists at other institutes seem unable to benefit from the inventiveness of their countrymen, for in the U.S.S.R. there is no adequate scientific instrumentation industry. In Western Europe the situation is quite different. Many laboratories are well equipped, and they have available the back-up of inventive companies.

In view of the key role of instrumentation in the progress of science, policies with respect to allocation of federal funds have been shortsighted. Several years ago when the budgetary squeeze became severe, the National Science Foundation implemented a policy of favoring support for personnel over support for instrumentation. At the universities individual grantees followed the same practice. The fraction of funds devoted to instrumentation was not very large, so that their diversion did not help the employment situation very much. However, in the absence of adequate replacements and the purchase of new kinds of instruments, the quality of equipment at many universities has declined, and research is being hampered. The deficit in scientific equipment should be met, and federal authorities should establish a long-term policy of steady support for the procurement of instrumentation on a level that will guarantee continued American leadership in science.

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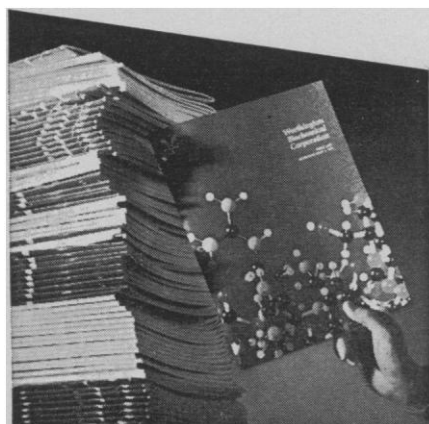
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ness that the continuing effectiveness and durability of the [Non-Proliferation] Treaty demand substantial progress in inhibiting vertical proliferation by real progress at SALT, adoption of other measures of self-restraint by all the nuclear powers, and agreement on the Comprehensive Test Ban Treaty."

Likewise, while applauding the agreement reached in Geneva on a draft treaty banning all biological weapons, the group was not able to resolve the main issue blocking an agreement on chemical weapons disarmament—"disagreement whether international verification of non-possession of C[hemical]-weapons is needed and is possible."

There was considerable discussion on the shortcomings of the present organization of disarmament talks, obviously reflecting a widespread anticipation of the imminent inclusion of China into the United Nations and other international forums—anticipation that called forth a spectrum of reactions, from enthusiasm through resignation to apprehension (2)—but also reflecting a rather widespread dissatisfaction on the part of other nuclear and near-nuclear nations with the dominating role of the United States and the Soviet Union in the disarmament talks. In the end, the group got on the bandwagon (gathering momentum from a variety of sources at the current session of the U.N. General Assembly) in favor of convening "a general disarmament conference . . . in which all interested states could participate and express their points of view."

On one issue, however, the working group on disarmament may have broken new ground. This was in advancing "A Specific Proposal for Tactical Nuclear Arms Limitation in Europe, designed to serve as a first approximation for further discussion."

a) No Foreign Nuclear Weapons in any European country. Delivery systems which are useful only when outfitted with nuclear warheads should be similarly prohibited. This in effect means denuclearization of Europe from the Rhine to the Soviet Border.

b) United Kingdom and French nuclear weapons should be limited to those now deployed, or currently in the process of being deployed. No distinction between "Tactical" and "Strategic" deployments or uses should be made in this case.

c) Soviet MRBM's and IRBM's which are located so as to be capable of striking Europe should be limited to a number equal to the total number of British and French weapons deployed on long range missiles. Similar arrangements for medium range aircraft should also be made.

d) The Non-Proliferation Treaty and the Partial Nuclear Test Ban should be

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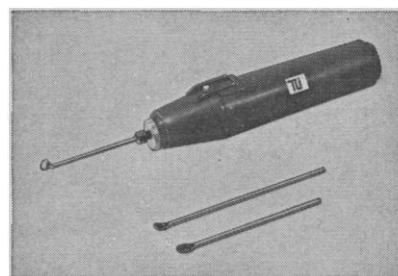
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continued in force and expanded to the extent possible. All possible political means should be used to reinforce the treaties so as to prevent any further spread of nuclear arms in Europe.

e) If these radical reductions are to be achieved, there must also be a substantial and simultaneous reduction of conventional armed forces and armaments."

Such an approach, in which nuclear and conventional disarmament in Central Europe are treated as the horse rather than the cart in a European security agreement, is in marked contrast with the more conventional approach, as expressed in the report of the working group on European security:

The prime objective of the ESC [European Security Conference] would be to negotiate an agreement between all member states under which:

1) All states in Europe agree to conduct their relations according to the following principles:

a) renunciation of the use or threat of force for the settlement of disputes, and acceptance of the obligation to settle all such disputes by peaceful means;

b) non-interference in the internal affairs of any state, and express recognition of the right of any state to choose without external interference its own social and political system;

c) recognition of the inviolability of existing borders and renunciation of territorial claims.

2) Steps would be taken to encourage co-operation on an equal basis between the European states in the field of trade, economics, science, technology, culture, information and travel aiming at the development of further political co-operation between the states.

3) There would be established a standing body or agency aiming at the development of further political co-operation between the states, which would provide, amongst other things, means for the peaceful settlement of disputes.

All of this would be a prerequisite to steps toward "a drastic reduction of nuclear and conventional forces . . . possibly accompanied by the establishment of nuclear-free zones; to be followed by the dissolution of the international military organizations of the blocs, the elimination of the remaining forces, bases, armaments and military manoeuvres on foreign soil."

Naturally, the presentation of two such different approaches engendered considerable discussion, not to speak of controversy. Although the proponents of the first scheme admitted to a number of difficulties and shortcomings—items overlooked, such as the question of the disposition of nuclear-capable naval forces, as well as serious political and psychological inhibitions—they were able to carry many of the con-

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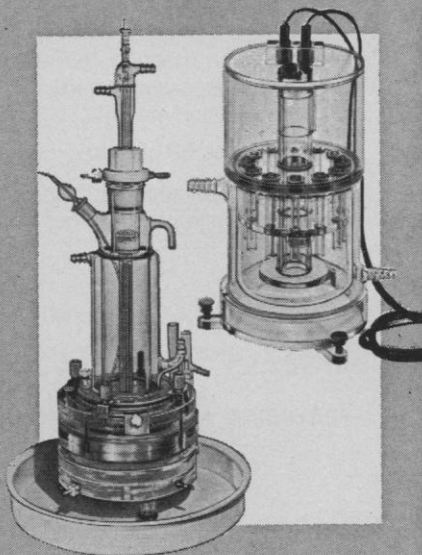
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ferees with them on the basis of a very strong feeling "that this radical approach may have a better chance of working than the traditional piecemeal attempts to ensure precise balance in every field each time a small disarmament proposal is made. Bold actions seemed to be the only practical way out of the present impasse."

Besides such discussions of comprehensive and regional arms control and disarmament problems, as well as the inevitable (and inevitably frustrating) discussions of current conflicts, Pugwash conferences also devote an appreciable portion of their deliberations to problems of developing nations (with stress on scientific and technological problems and questions of international cooperation involving these problems) and, unavoidably now, on ecology. The former reflects the very strong feeling on the part of scientists from the developing portions of the globe that, on the one hand, their points of view are woefully underrepresented in most international forums and, on the other hand, that cooperation among scientists in developing countries, as well as with their counterparts in the developed regions, will enable these scientists to increase their influence on the decision-making processes in their own countries. On both counts, scientists from developing countries are coming increasingly to recognize in Pugwash a useful forum for promoting projects aimed at narrowing the gap between "north and south"; and they are recognizing, as well, a possibility for promoting "east-west" cooperation in the field of development.

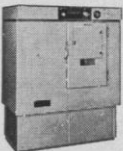
Ecology, on the other hand, is a field in which Pugwash, like most other groups of scientists, is inexpert and greatly in need of education on what the problems really are, especially in their international ramifications. Considering that the United Nations is preparing a major conference on environmental problems next year, Pugwash scientists have felt a great need for such self-education; they have therefore discussed a number of the international aspects of pollution in last year's and this year's conferences (3).

Next September's Pugwash conference, to be held in Oxford, England, will celebrate the 15th anniversary of this unique institution. As has been the case after every quinquennial period, the 1972 conference will serve as the occasion for a searching reexamination of the Pugwash movement, its potentials, and its goals. Despite past achieve-

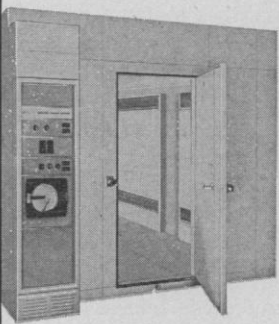
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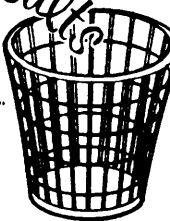
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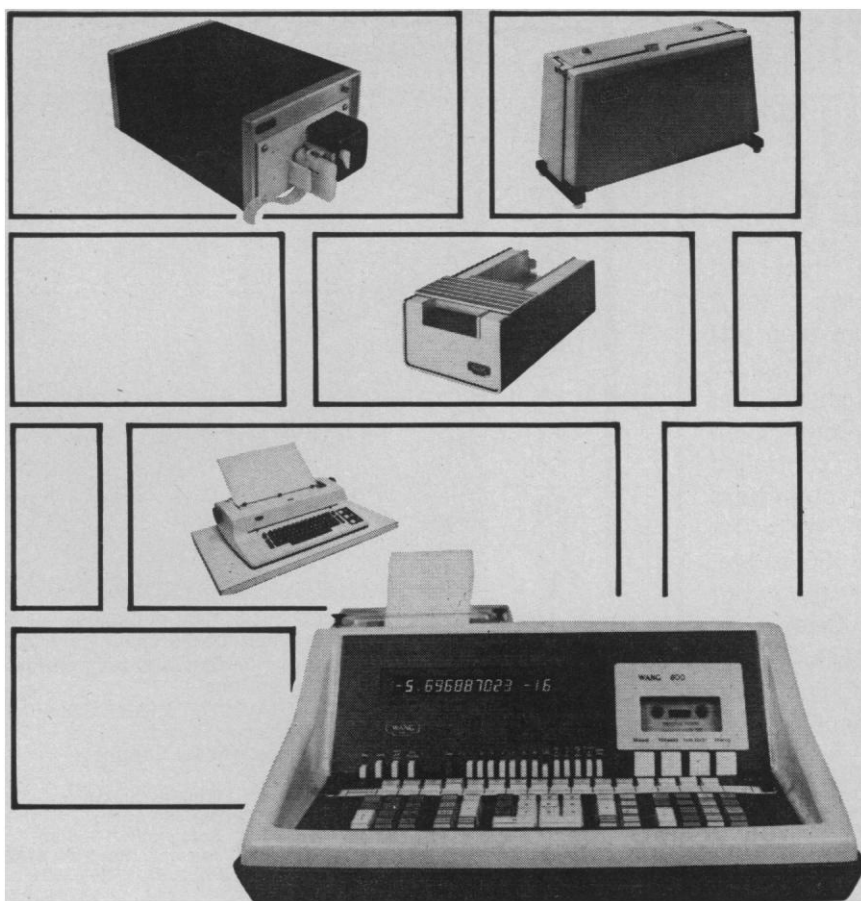
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ments—its pioneering and essential role in the attainment of the Test Ban Treaty of 1963, of the Nuclear Non-Proliferation Treaty of 1968, of the Ban on Biological Warfare Weapons now before the United Nations, and, indeed, of the SALT negotiations themselves—many participants feel that the problems of survival through the 1970's and 1980's require a new approach and a greatly broadened base in the world's intellectual community. Most Pugwash veterans are convinced, however, that Pugwash can be one of the most effective vehicles for enabling the world's intellectual community to face up to these problems; that if it did not exist, it would have to be invented for this purpose.

APPENDIX

The Problem of East Pakistan Refugees—an appeal by the Pugwash continuing committee.

Recent events in East Pakistan have caused unprecedented human suffering and created a grave situation on the Subcontinent. There has been loss of life on a mass scale and millions of people have been forced to abandon their homes and seek refuge in India. The resulting tensions in the region threaten international peace and therefore demand the urgent attention of the United Nations. We appeal:

- to the Government of Pakistan to promote speedily a peaceful political settlement, refrain from actions which can make such settlement more difficult to achieve, create conditions for the safe return of the refugees to their homes and lands, and make possible the effective operation of international relief agencies among the affected population;
- to all governments to exert their influence on Pakistan to advance towards a peaceful political settlement;
- to all Governments, United Nations and other international organizations to recognize that the relief and welfare of the refugees in India is an international responsibility, and that they should, therefore, assume immediately the bulk of the financial burden; and
- to all outside countries to avoid any steps which might further aggravate the situation and, in particular, to refrain from supplying arms to Pakistan.

BERNARD T. FELD

Department of Physics,
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References and Notes

1. Pugwash is also the name of a pirate captain in a popular British comic strip.
2. Chinese scientists attended the first six Pugwash conferences but, since the conference held in Moscow at the end of 1960, they have been absent, although always invited. It is hoped they will resume regular participation in 1972.
3. Summaries of the reports of working groups at Sinaia will be published in *Bull. At. Sci.*, in press. Last year's summary can be found in *ibid.* 27 (No. 3) 20 (March 1971).

Regulation of Mammalian Reproduction

The status of knowledge on the regulation of mammalian reproduction was reviewed at a conference (27 September to 1 October 1970) at the National Institutes of Health in Bethesda under the joint auspices of the Center for Population Research and the Fogarty International Center. The keynote address was delivered by M. G. Candau (World Health Organization), who emphasized the need for worldwide efforts in research and training in reproductive physiology in view of increasing international recognition of the problems resulting from uncontrolled population growth. Candau was introduced by E. Egeberg (Department of Health, Education, and Welfare), representing U.S. commitment to this important field.

Under the chairmanship of S. J. Segal of the Population Council, sessions were held on: (i) the regulation of pituitary function, (ii) the regulation of sperm production, (iii) sperm maturation and fertilization, (iv) the biology of the ovum, (v) transport of gametes in the fallopian tube, and (vi) corpus luteum function. Each session included formal papers and extended discussion and the concluding session was devoted entirely to informal presentations and additional discussion.

There have been significant advances in delineating the complex feedback mechanisms involved in hypothalamic-pituitary-gonadal interactions. Uptake and physiological effects of steroid sex hormones in brain tissue, and the source of the hypothalamic releasing factor, were reviewed. Both LH (luteinizing hormone) and FSH (follicle stimulating hormone) releasing activities and prolactin inhibiting activity can be identified in tissue of the ventromedial hypothalamus, but the possibility remains that these factors may arise in higher brain centers and reach the median eminence by way of the cerebrospinal fluid. Evidence from several laboratories suggests involvement of an adrenergic link in the stimulatory and inhibitory actions of gonadal steroids on gonadotropin secretion and a role of alpha adrenergic receptors in the release mechanism for gonadotropins. Studies of circulating levels of gonadal and gonadotropic hormones before, during, and after sexual maturation and during the estrous cycle were described. Much remains to be learned about negative and positive feedback effects exerted by gonadal steroids, but methods

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Data on humans indicate that the cycle of follicular maturation leading to ovulation is initiated by gradual increases in pituitary secretion of FSH and LH beginning late in the luteal phase of the preceding cycle and continuing through menses into the subsequent cycle. A series of reports indicated that, in a variety of species including rat, monkey, and human, rising levels of estrogen during the follicular phase of the cycle appear to be the trigger for the LH peak and the induction of ovulation. These data suggest possible new developments in contraceptive technology, including the use of exogenous estrogens to induce ovulation early in the follicular phase when endometrial preparation for implantation is not yet adequate.

Reports on spermatogenesis and the development of fertilizing capacity of spermatozoa included morphological, physiological, and endocrine studies. A possible mechanism for the regulation of events within the seminiferous epithelium is suggested by electron micro-

scopic studies of the blood-testis barrier, which divides the epithelium into two compartments. Gonadotropic hormones apparently have access only to the basal compartment, and there is circumstantial evidence that the later stages of germ cell differentiation, which occur in the adluminal compartment, may be controlled by interchange of chemical substances from adjacent regions of specialization within the Sertoli cell cytoplasm.

The maturation of spermatozoa in the epididymis apparently requires an appropriate hormonal milieu, suggesting new ways to control male fertility without the potential genetic hazards of suppression of spermatogenesis. Alteration of the amounts of androgen in the epididymis may be the explanation for the reported antifertility effect in the rat when low doses of the antian-drogen, cyproterone acetate, are given continuously. These results seem promising since the antifertility effect is reversible and is apparently accomplished without altering the spermatogenic or androgenic functions of the testis.

In vitro studies of sperm capacitation and fertilization suggest that capacita-

tion may not require any specific factor in the female reproductive tract, but only a set of conditions highly favorable to sperm motility and survival. On the other hand, a factor associated with oocytes and their cumulus cells is implicated as the stimulus for the vesiculation reaction and release of the acrosomal enzymes that permit sperm penetration through the egg investments. Progesterone in high local concentrations may be the active agent in initiating the acrosome reaction, but a specific protein is also a possibility. This work has not yet progressed sufficiently for assessment of its potential applicability to fertility regulation, but a number of possible approaches to controlled intervention can be envisioned.

The physiology of the fallopian tube was considered in relation to the transport of eggs and sperm and the environment in which fertilization occurs. Particularly interesting were reports on the muscular contractility of the oviduct, which is independent of that of the uterus in pattern and in response to physiologic and pharmacologic stimuli. Uterine contractions appear to be under systemic control mediated by secretions

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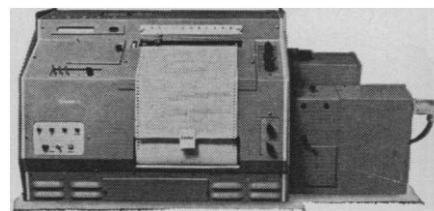
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of the posterior pituitary; in contrast, oviductal motility may be primarily under local control. Outbursts of activity in the circular muscle layer are apparently caused by the local release of small quantities of norepinephrine at regular intervals from the adrenergic nerve endings. The frequency, duration, and intensity of these outbursts is influenced by ovarian steroids.

Studies of egg transport in living animals suggest that the pattern of oviductal contractions at the time of ovulation is produced by the sequential action of estrogen and progesterone. Sex steroids also influence the development and beat of the oviductal cilia and the volume and constituents of oviductal fluid. The fallopian tube in the female, like the epididymis in the male, seems to be an endocrine target organ and normalcy of the hormonal environment is apparently required for normal reproductive function. Fertility may thus be regulated by altering the local hormonal milieu.

The roles of pituitary and placental trophic hormones in the formation and maintenance of the corpus luteum in a variety of species were discussed, but

no clear pattern of hormonal control has emerged. Antiserums to individual hormones are a particularly promising new tool for further studies of the requirements for luteal function in the estrous cycle and pregnancy. It is not yet clear whether luteal regression in the nonfertile cycle results from passive withdrawal of luteotrophic support or the active intervention of a luteolytic mechanism which, in pregnancy, may be counteracted by a luteotrophic stimulus from the conceptus. The postulated uterine luteolytic factor has not yet been isolated or identified, but there is significant evidence for its existence in some species. Recent data indicate that, in the pig, uterine flushings from the late luteal phase contain a protein factor that causes morphologic changes and rapid cell death in granulosa cell cultures. Studies of corpus luteum function in monkeys and women after hysterectomy cast doubt on the existence of a naturally occurring uterine luteolytic factor in primates, but a factor from lower mammalian forms may prove to be active in the human and thus may represent a promising prospect for human fertility control.

The conference reviewed a wide range of current research on the physiological regulation of mammalian reproduction. These investigations contribute to the pool of basic scientific knowledge required for new developments in contraceptive technology, and a number of potentially vulnerable links in the complex mechanisms controlling the reproductive process can now be identified. Nevertheless, much more fundamental research will be required before these and other leads can be exploited and new approaches to the control of human fertility can be made available.

More than 130 scientists from the United States and 23 foreign countries participated in the conference. The proceedings of the conference will be published in book form (1).

RUTH CROZIER

*Center for Population Research,
National Institute of Child Health
and Human Development,
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1. S. J. Segal, R. Crozier, P. A. Corfman, P. Condliffe, Eds., *The Regulation of Mammalian Reproduction* (Thomas, Springfield, in press).

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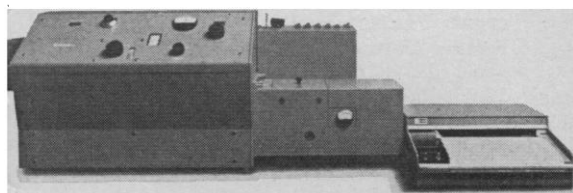
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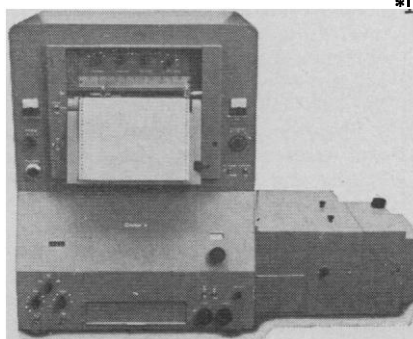
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336 pp., illus. \$9.50. Vol. 2, 1971, xii, 396 pp., illus. \$11.50.

Amino Acid Fortification of Protein Foods. A conference, Cambridge, Mass., September 1969. Nevin S. Scrimshaw and Aaron M. Altschul, Eds. M.I.T. Press, Cambridge, Mass., 1971. xxvi, 664 pp., illus. \$25.

The Analysis of High Resolution NMR Spectra. R. J. Abraham. Elsevier, New York, 1971. x, 324 pp., illus. \$30.50.

Annual Review of Microbiology. Vol. 25. Charles E. Clifton, Sidney Raffel, and Mortimer P. Starr, Eds. Annual Reviews, Palo Alto, Calif., 1971. xii, 772 pp., illus. \$10.

The Annus Mirabilis of Sir Isaac Newton, 1666-1666. A conference, Austin, Tex., November 1966. Robert Palter, Ed. M.I.T. Press, Cambridge, Mass., 1970. viii, 352 pp., illus. \$15. Reprinted from *Texas Quarterly*, vol. 10, No. 3 (1967).

Archaeological Site Science. Frank H. Goodyear. Elsevier, New York, 1971. xiv, 282 pp., illus. \$10.

Army Ants. A Study in Social Organization. T. C. Schneirla. Howard R. Topoff, Ed. Freeman, San Francisco, 1971. xxii, 350 pp. + plates. \$12.

The Artery and the Process of Arteriosclerosis. Pathogenesis. A conference, Lindau, West Germany, April 1970. Stewart Wolf, Ed. Plenum, New York, 1971. xii, 314 pp., illus. \$14.50. *Advances in Experimental Medicine and Biology*, vol. 16A.

The Attraction Paradigm. Donn Byrne. Academic Press, New York, 1971. xii, 474 pp., illus. \$17.50. *Personality and Psychopathology*, 11.

Auerbach Terminal Equipment Digest. Auerbach, Princeton, N.J., ed. 2, 1971. x, 210 pp., illus. \$17.50.

Avian Biology. Vol. 1. Donald S. Farner, James R. King, and Kenneth C. Parkes, Eds. Academic Press, New York, 1971. xx, 586 pp., illus. \$30.

Basic Child Psychiatry. Philip Barker. Science House, New York, 1971. 236 pp., illus. \$10.

Basic Neurology. An Introduction to the Structure and Function of the Nervous System. J. P. Schade and Donald H. Ford, Eds. Elsevier, New York, ed. 2, 1971. viii, 272 pp., illus. \$16.50.

Bees. Their Vision, Chemical Senses, and Language. Karl von Frisch. Cornell University Press, Ithaca, N.Y., ed. 2, 1971. xviii, 158 pp., illus. \$7.50.

Before Nature Dies. Jean Dorst. Translated from the French by Constance D. Sherman. Penguin, Baltimore, Md., 1971. 352 pp. + plates. Paper, \$2.45. Reprint of the 1970 edition.

Behavior of Nonhuman Primates. Modern Research Trends. Vol. 4. Allan M. Schrier and Fred Stollnitz, Eds. Academic Press, New York, 1971. xvi, 240 pp., illus. \$10.

Bibliography of Ticks and Tickborne Diseases From Homer (about 800 B.C.) to 31 December 1969. Vol. 3. Harry Hoogstraal with the editorial assistance of Alice Djigounian and the NAMRU-3 Medical Zoology Department Bibliographic Staff. U.S. Naval Medical Research Unit

No. 3, Cairo, Egypt, 1971. vi, 436 pp., illus. Paper, \$6.

Biological Effects of Polynucleotides. A symposium, New York, June 1970. Roland F. Beers, Jr., and Werner Braun, Eds. Springer-Verlag, New York, 1971. xvi, 344 pp., illus. \$24.

Biology of Memory. A symposium, Tihany, Hungary, September 1969. G. Ádám, Ed. Plenum, New York, 1971. 372 pp., illus. \$22.50.

Body Time. Physiological Rhythms and Social Stress. Gay Gaer Luce. Pantheon, New York, 1971. xviii, 394 pp., illus. \$6.95.

Bollettino del Centro Camuno di Studi Preistorici. Vol. 6. Emmanuel Anati, Ed. Centro di Camuno di Studi Preistorici, Capo di Ponte (Brescia), Italy, 1971. 144 pp., illus. 5000 lire.

The Books of Autolykos. On a Moving Sphere and On Risings and Settings. Translated and edited by Frans Bruin and Alexander Vondjidis. American University of Beirut, Beirut, Lebanon, 1971. x, 70 pp., illus. \$6.50.

Botany. Carl L. Wilson, Walter E. Loomis, and Taylor A. Steeves. Line illustrations based on drawings by Hannah T. Croasdale. Holt, Rinehart and Winston, New York, ed. 5, 1971. xvi, 752 pp., illus. \$13.

Brain Hypoxia. A symposium, Carshalton, England, August 1970. J. B. Brierley and B. S. Meldrum, Eds. Heinemann, London; Lippincott, Philadelphia, 1971. vi, 320 pp., illus. \$20. *Spastics International Medical Publications. Clinics in Developmental Medicine*, No. 39/40.

Calcium and the Heart. Proceedings of a meeting, London, September 1970. P. Harris and L. Opie, Eds. Academic Press, New York, 1971. x, 198 pp., illus. \$6.

Chance and Necessity. An Essay on the Natural Philosophy of Modern Biology. Jacques Monod. Translated from the French edition (Paris, 1970) by Austryn Wainhouse. Knopf, New York, 1971. xiv, 204 pp., illus. \$6.95.

Chemistry of the Cell Interface. Part A. Harry Darrow Brown. Academic Press, New York, 1971. xii, 340 pp., illus. \$22.

The Chilean Senate. Internal Distribution of Influence. Weston H. Agor. Published for the Institute of Latin American Studies by the University of Texas Press, Austin, 1971. xxii, 206 pp. \$7. *Latin American Monographs*, No. 23.

Cinderella. Author Index Practices and Philosophies. Stephen Juhasz, Maureen Funnell, and Edwin Vaught. *Applied Mechanics Reviews*, San Antonio, Tex., 1971 (available from National Technical Information Service, Springfield, Va.). Various pagings, illus. Spiral bound, \$3. AMR Report No. 54.

The Classification, Evolution, and Dispersal of the Winter Stonefly Genus *Allo-capnia*. Herbert H. Ross and William E. Ricker. University of Illinois Press, Urbana, 1971. viii, 168 pp., illus. Paper, \$8.95. *Illinois Biological Monographs*, 45.

The Cult of the Seer in the Ancient Middle East. A Contribution to Current Research on Hallucinations Drawn from Coptic and Other Texts. Violet MacDermot. University of California Press, Berkeley, 1971. xii, 830 pp. \$24.

The Determination of Impurities in Nuclear Grade Sodium Metal. Louis Silverman. Pergamon, New York, 1971. x, 144 pp. \$10. International Series of Monographs in Analytical Chemistry, vol. 44.

Directory of Selected Scientific Institutions in Mainland China. Prepared by Surveys and Research Corporation. Published for the National Science Foundation by the Hoover Institution Press, Stanford, Calif., 1971. xxii, 470 pp., illus. \$19.50. Hoover Institution Publications Series, 96.

The Distribution of Prehistoric Population Aggregates. A conference, Prescott, Ariz., April 1971. George J. Gumerman, Ed. Prescott College Press, 1971. xii, 164 pp., illus. Paper, \$4.95. Anthropological Reports, No. 1.

Documents of Destruction. Germany and Jewry, 1933-1945. Raul Hilberg, Ed. Quadrangle, Chicago, 1971. xii, 244 pp. Cloth, \$8.95; paper, \$2.95.

Drugs of Abuse. Their Genetic and Other Chronic Nonpsychiatric Hazards. A symposium, San Francisco, October 1969. Samuel S. Epstein, Joshua Lederberg, Marvin Legator, Eleanor E. Carroll, and Jack D. Blaine, Eds. M.I.T. Press, Cambridge, Mass., 1971. xvi, 228 pp., illus. \$15.

The Economics of Defense. A Bipartisan Review of Military Spending. Members of Congress for Peace Through Law, Military Spending Committee. Praeger, New York, 1971. xx, 258 pp. \$15. Praeger Special Studies in U.S. Economic and Social Development.

The Economics of Socialism. Principles Governing the Operation of the Centrally Planned Economies in the USSR and Eastern Europe under the New System. J. Wilczynski. Aldine, Chicago, 1970. 234 pp., illus. \$8.95. Studies in Economics.

The Elements of Neutron Interaction Theory. Anthony Foderaro. M.I.T. Press, Cambridge, Mass., 1971. xiv, 586 pp., illus. \$19.95.

Encyclopedia of Industrial Chemical Analysis. Vol. 13, Fluorine to Glycols. Foster Dee Snell and Leslie S. Ettre, Eds. Interscience (Wiley), New York, 1971. xiv, 608 pp., illus. \$45; by subscription, \$35.

Environment and Society in Transition. (Scientific Developments, Social Consequences, Policy Implications). A conference, New York, April 1970. Peter Albertson and Margery Barnett, Eds. New York Academy of Sciences, New York, 1971. 700 pp. Paper, \$30. *Annals of the New York Academy of Sciences*, vol. 184.

Evaluation of Missouri's Coal Resources. Charles E. Robertson. Missouri Geological Survey and Water Resources, Rolla, 1971. vii, 92 pp. + loose maps, boxed. Paper, \$4. Report of Investigations, No. 48.

Experiments in Nuclear Science. Grafton D. Chase, Stephen Rituper, and John W. Sulcoski. Illustrated by Vincent Civiletti. Burgess, Minneapolis, ed. 2, 1971. xviii, 204 pp. Paper, \$4.95. Teacher's Guide. 90 pp., illus. Paper, \$3.

Experiments in Physiology and Biochemistry. Vol. 4. G. A. Kerkut, Ed. Academic Press, New York, 1971. xvi, 386 pp., illus. \$19.

The Falling Sickness. A History of Epi-

lepsy from the Greeks to the Beginnings of Modern Neurology. Owsei Temkin. Johns Hopkins Press, Baltimore, Md., ed. 2, 1971. xviii, 468 pp., illus. \$15.

Fine Structure of the Developing Epithelial Attachment of Human Teeth. Hubert E. Schroeder and Max A. Listgarten. Karger, Basel, 1971 (U.S. distributor, Phiebig, White Plains, N.Y.). xiv, 134 pp., illus. \$11.05. Monographs in Developmental Biology, vol. 2.

Foundations of Cyclopean Perception. Bela Julesz. University of Chicago Press, Chicago, 1971. xiv, 406 pp., illus. \$20.

Functional Morphology of the Heart. E. Bajusz, G. Jasmin, W. Hort, and G. Baroldi, Eds. Karger, Basel, 1971 (U.S. distributor, Phiebig, White Plains, N.Y.). viii, 594 pp., illus. \$47.50. Methods and Achievements in Experimental Pathology, vol. 5.

Fundamentals of Earthquake Engineering. Nathan M. Newmark and Emilio Rosenbluth. Prentice-Hall, Englewood Cliffs, N.J., 1971. xvi, 640 pp., illus. \$25. Civil Engineering and Engineering Mechanics Series.

Fungal Genetics. J. R. S. Fincham and P. R. Day. Blackwell, Oxford, England, ed. 3, 1971 (U.S. distributor, Davis, Philadelphia). xiv, 402 pp., illus. \$19.50. Botanical Monographs, vol. 4.

Fused Pyrimidines. D. J. Brown, Ed. Part 2, Purines. J. H. Lister with contributions by R. L. Jones and P. D. Lawley and collaboration with G. H. Hitchings and G. B. Elion. Wiley-Interscience, New York, 1971. xxvi, 656 pp., illus. \$49.50. The Chemistry of Heterocyclic Compounds, vol. 24, part 2.

Geography of Europe. A Regional Analysis. Vincent H. Malmström. Prentice-Hall, Englewood Cliffs, N.J., 1971. x, 166 pp., illus. Cloth, \$6.95; paper, \$2.50. Prentice-Hall Foundations of World Regional Geography Series.

Glacier Ice. Austin Post and Edward R. LaChapelle. The Mountaineers, Seattle; University of Washington Press, Seattle, 1971. xiv, 110 pp., illus. \$20.

The Great American Bomb Machine. Roger Rapoport. Dutton, New York, 1971. 160 pp. \$5.95.

The Great American Forest. Rutherford Platt. Illustrations by Stanley Wyatt. Prentice-Hall, Englewood Cliffs, N.J., 1971. xiv, 272 pp. Paper, \$2.95. Reprint of the 1965 edition.

Guide to the Applications of the Laplace and γ -Transforms. Gustav Doetsch. Illustrated by Rudolf Herschel. Translated from the German edition (Munich, 1967). W. M. Fairbairn, Ed. Van Nostrand Reinhold, New York, ed. 2, 1971. xii, 240 pp. \$15.95.

A Handbook for Orienting the Manager to the Computer. Frederick G. Harold. Auerbach, Princeton, N.J., 1971. viii, 248 pp., illus. \$9.95.

Handbook of Speech Pathology and Audiology. Lee Edward Travis, Ed. Appleton-Century-Crofts, New York, ed. 2, 1971. x, 1312 pp., illus. \$29.95.

Handbook of Technical Writing Practices. Stello Jordan, Joseph M. Kleinman, and H. Lee Shimberg, Eds. Wiley-Interscience, New York, 1971. Two volumes. xxx, 1374 pp. + index, illus. \$42.50. Wiley Series on Human Communication.

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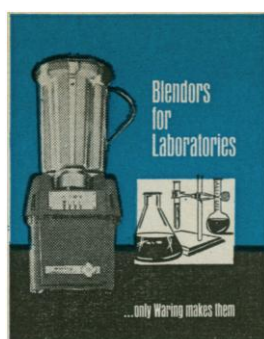
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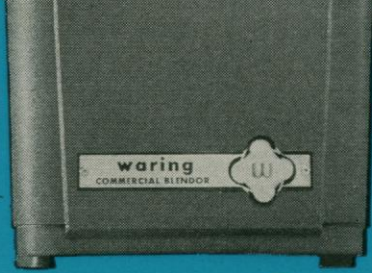
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An Illustrated Catalogue of the Rothschild Collection of Fleas (Siphonaptera) in the British Museum (Natural History). Vol. 5, Leptopsyllidae and Ancistropsyllidae. G. H. E. Hopkins and Miriam Rothschild. British Museum (Natural History), London, 1971. viii, 530 pp. + plates. £25. Publication No. 706.

Impingement of Man on the Oceans. Donald W. Hood, Ed. Wiley-Interscience, New York, 1971. xii, 738 pp., illus. \$24.95.

Inadvertent Climate Modification. Report of the Study of Man's Impact on Climate (SMIC). Sponsored by the Massachusetts Institute of Technology. M.I.T. Press, Cambridge, Mass., 1971. xxiv, 308 pp., illus. Paper, \$2.95.

Industrial Applications of Technological Forecasting. Its Utilization in R&D Management. Marvin J. Cetron and Christine A. Ralph. Wiley-Interscience, New York, 1971. xxiv, 564 pp., illus. \$24.95.

Instinct and Intelligence. Behavior of Animals and Man. S. A. Barnett. Illustrations by Stanley Wyatt. Prentice-Hall, Englewood Cliffs, N.J., 1971. xii, 224 pp. Paper, \$2.95. Reprint of the 1967 edition.

Intentional Behavior and Motivation. A Cognitive Theory. Francis W. Irwin. Lippincott, Philadelphia, 1971. xvi, 202 pp., illus. \$8.95. Lippincott College Psychology Series.

An Introduction to the Theory of Diffraction. C. J. Ball. Pergamon, New York, 1971. viii, 134 pp., illus. Commonwealth and International Library: Materials Science and Technology.

Ionizing Radiation and Life. An Introduction to Radiation Biology and Biological Methods. Victor Arena. Mosby, St. Louis, Mo., 1971. xiv, 544 pp., illus. \$13.50.

Laboratory Guide to Parasitology. With Introduction to Experimental Methods. Ralph W. Macy and Allen K. Berntzen. Thomas, Springfield, Ill., 1971. xxiv, 292 pp., illus. Spiral bound, \$12.75.

Learning and Sleep. The Theory and Practice of Hypnopaedia. F. Rubin. Williams and Wilkins, Baltimore, Md.; Wright, Bristol, England, 1971. x, 138 pp., illus. Paper, \$5.

Linear Operators. Part 3, Spectral Operators. Nelson Dunford and Jacob T. Schwartz with the assistance of William G. Bade and Robert G. Bartle. Wiley-Interscience, New York, 1971. xiv, 498 pp., illus. \$12.50.

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terscience, New York, 1971. xx + pp. 1925-2592. \$32.50. Pure and Applied Mathematics, vol. 7, part 3.

Les Maladies des Plantes Maraicheres. C. M. Messiaen and R. Lafon. Institut National de la Recherche Agronomique, Paris, ed. 2, 1971. 442 pp., illus. 6450 F. I.N.R.A. Publication 6-70.

Managing Large Systems. Organizations for the Future. Leonard R. Sayles and Margaret K. Chandler. Harper and Row, New York, 1971. xviii, 332 pp., illus. \$15.

Manual of Planktonic Foraminifera. J. A. Postuma. Elsevier, New York, 1971. viii, 420 pp., illus. \$29.

Marxism, Ideology and Myths. David Flakser. Philosophical Library, New York, 1971. x, 238 pp. \$6.75.

The Matter of Life. Philosophical Problems of Biology. Michael A. Simon. Yale University Press, New Haven, Conn., 1971. xii, 258 pp. \$7.50.

Mechanisms of Molecular Migrations. Vol. 4. B. S. Thyagarajan, Ed. Wiley-Interscience, New York, 1971. xviii, 326 pp., illus. \$22.50.

Methods in Computational Physics. Advances in Research and Applications. Vol. 10, Atomic and Molecular Scattering. Berni Alder, Sidney Fernbach, and Manuel Rotenberg, Eds. Academic Press, New York, 1971. xiv, 342 pp., illus. \$22.

Microbial Toxins. Vol. 5, Bacterial Endotoxins. Solomon Kadis, George Weinbaum, and Samuel J. Aji, Eds. Academic Press, New York, 1971. xviii, 508 pp., illus. \$27.

Modern Experimental Organic Chemistry. Derry L. Fishel and Raymond C. Fort. Macmillan, New York, 1971. xiv, 206 pp., illus. Paper, \$6.95. A Series of Books in Chemistry.

The Night Country. Loren Eiseley. Illustrations by Leonard Everett Fisher. Scribner, New York, 1971. x, 242 pp., illus. \$7.95.

1972 Britannica Yearbook of Science and the Future. Encyclopaedia Britannica, Chicago, 1971. 448 pp., illus. \$12.50.

Normal Two-Dimensional Singularities. Henry B. Laufer. Princeton University Press, Princeton, N.J.; University of Tokyo Press, Tokyo, 1971. xii, 162 pp., illus. Paper, \$7. Annals of Mathematics Studies, No. 71.

On Group-Theoretic Decision Problems and Their Classification. Charles F. Miller, III. Princeton University Press, Princeton, N.J.; University of Tokyo Press, Tokyo, 1971. x, 106 pp. Paper, \$5. Annals of Mathematics Studies, No. 68.

Pesticides and Freshwater Fauna. R. C. Muirhead-Thomson. Academic Press, New York, 1971. x, 248 pp., illus. \$10.

Photochemistry and Spectroscopy. J. P. Simons. Wiley-Interscience, New York, 1971. xiv, 344 pp. + plates. \$16.50.

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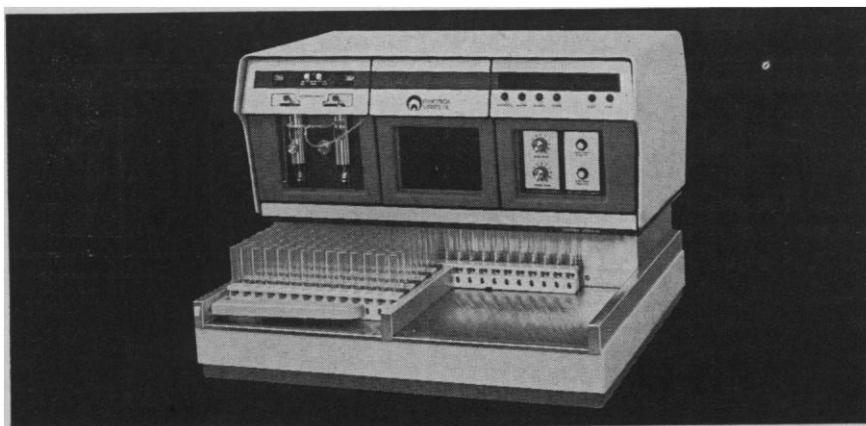
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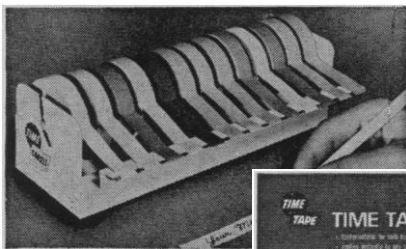
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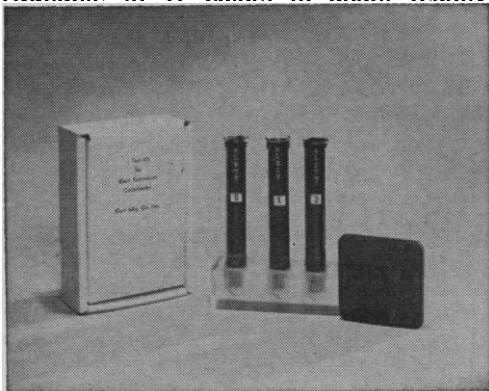
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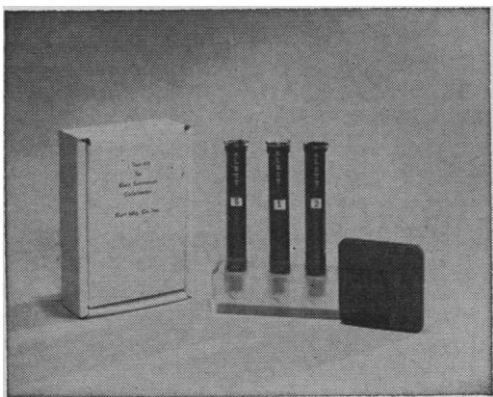
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Innovative Science Ph.D., minor business with 20 years' broad industrial and university management experience, seeking new challenge. Would like to consider university/college presidency or equivalent with faculty interested in meeting modern challenge to higher education. Box 419, SCIENCE. 12/10

Physiologist/Biophysicist, Ph.D., 28, 2 years of postdoctoral research. Qualified in membrane biophysics, mammalian/cellular physiology, neurophysiology. Teaching experience. Desires teaching/research position, academic/nonacademic. Box 438, SCIENCE. X

Translator: English-Spanish-French (B.S.E.E., B.A. Psy, Haba). Business, engineering, social sciences. flat rate: one day/\$50/1000 words ppd. Arturo Aguilar, 16918 Cranbrook, Torrance, Calif. 90504. 12/10, 17

Woman Ecologist, liberal arts background, Stanford Ph.D., 4 years' teaching experience, funded research. Teaching areas: ecology, evolution, quantitative biology. Box 425, SCIENCE. X

Zoologist, Ph.D. Interest and experience in teaching. Publications, ecology and behavior. Seeks postdoctoral/permanent position. Box 439, SCIENCE. X

POSITIONS OPEN

MOLECULAR BIOLOGIST

Postdoctoral position, work utilizing bacterial genetics, biochemistry and physiology, to study the control of nucleic acid synthesis in bacteria. Experience in either genetics biochemistry or virology helpful. Send résumé to **Archie Andrews, Personnel, Room A6001, University of Michigan Medical Center, 1405 East Ann, Ann Arbor, Michigan 48104**

ELECTRONICS SPECIALIST

Engineering graduate (B.S.) with experience in mass spectrometry, magnetic resonance spectrometry, and general electronics maintenance work needed. Duties consist of operation, maintenance, and repair of spectrometers and related scientific equipment. Good salary, fringe and educational benefits. Send résumé to:

**St. Louis University
School of Medicine
Department of Biochemistry
1402 South Grand Boulevard
St. Louis, Missouri 63104**

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