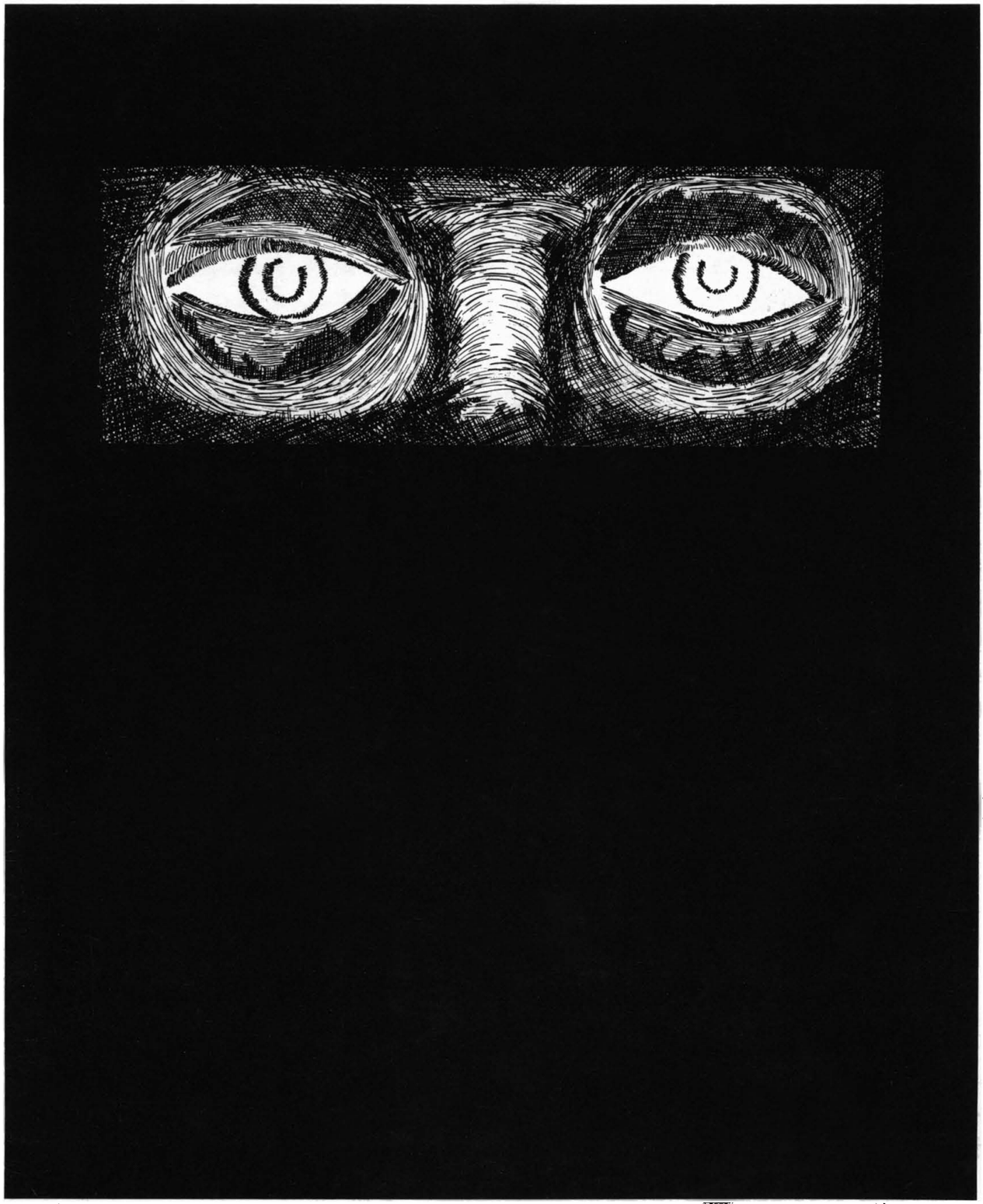
SCIENCE

25 April 1969
Vol. 164, No. 3878

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



This new Amino Acid Analyzer is now running sample #72

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For full information on the 121, the 120C and the modular 116, write Spinco Division, Palo Alto, Calif. 94304 for brochure SB-333.

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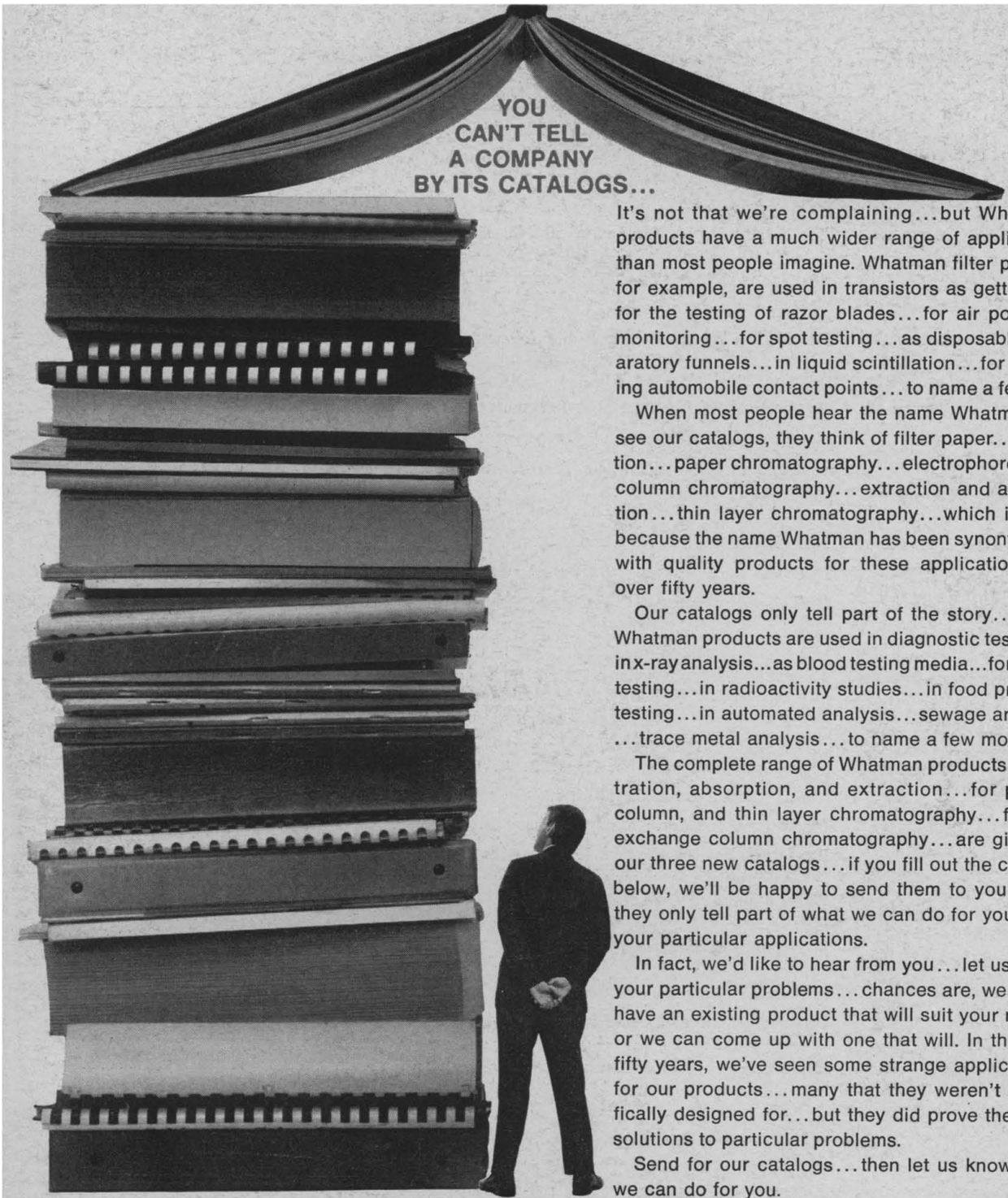

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It's not that we're complaining... but Whatman products have a much wider range of application than most people imagine. Whatman filter papers, for example, are used in transistors as getters... for the testing of razor blades... for air pollution monitoring... for spot testing... as disposable separatory funnels... in liquid scintillation... for cleaning automobile contact points... to name a few.

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The complete range of Whatman products for filtration, absorption, and extraction... for paper, column, and thin layer chromatography... for ion exchange column chromatography... are given in our three new catalogs... if you fill out the coupon below, we'll be happy to send them to you... but they only tell part of what we can do for you, with your particular applications.

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25 April 1969
Vol. 164, No. 3878

SCIENCE

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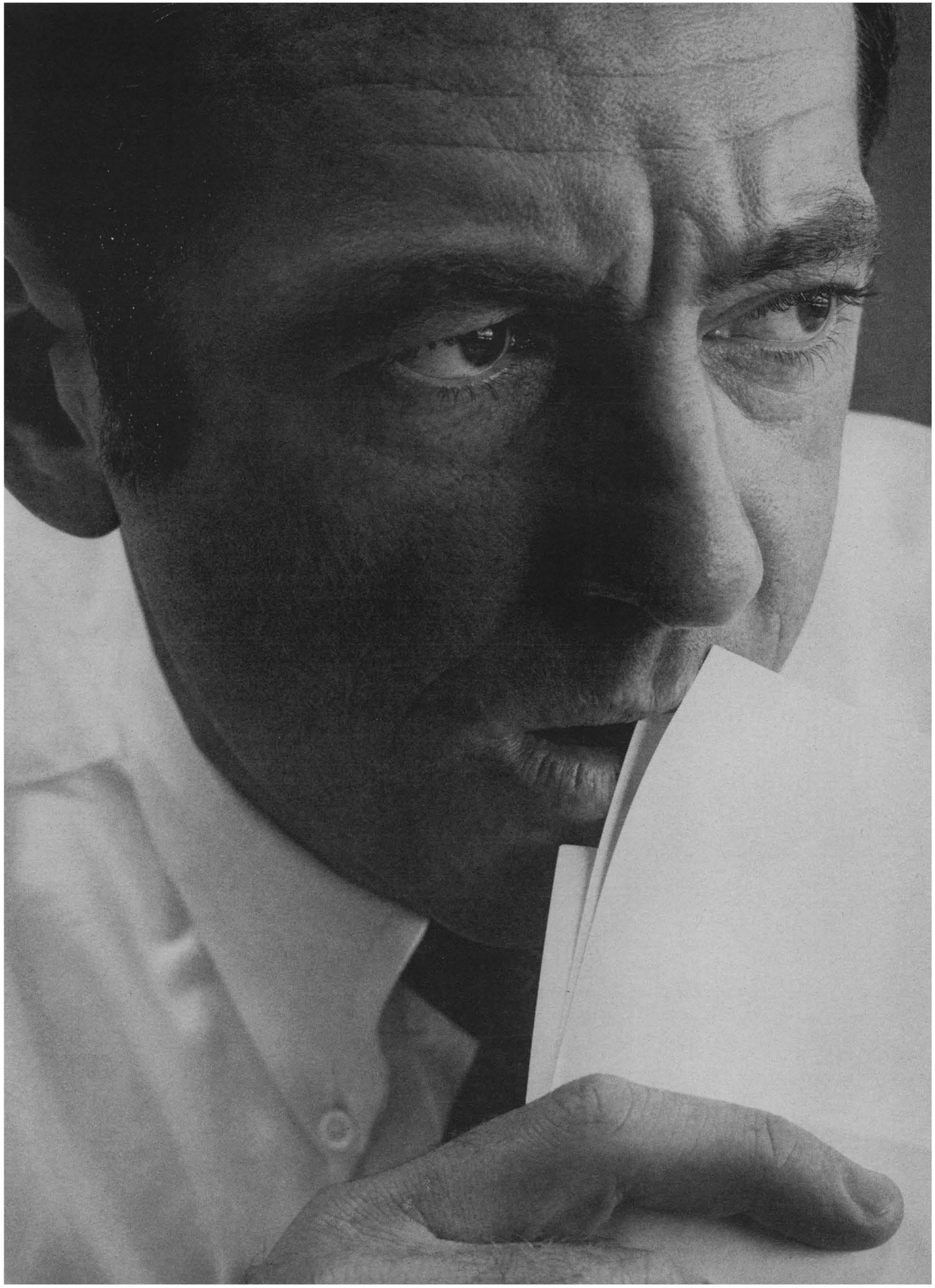
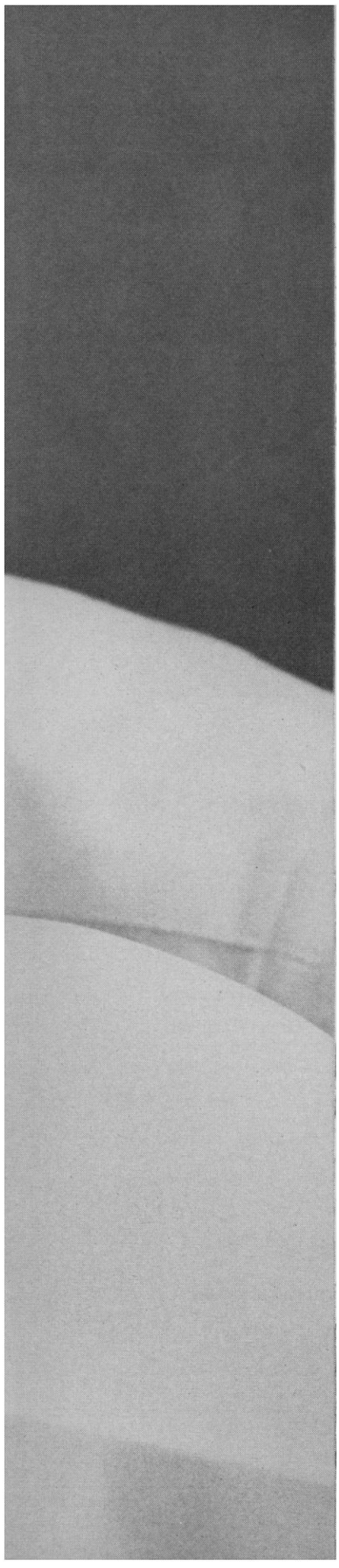
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Man's violence to his fellow man is becoming a threatening, maladaptive anachronism. There are no simple answers because violence reflects individual, group, and societal attempts to cope with today's puzzling culture of constant change. Meeting today's crisis of violence requires that we constructively channel our aggressive energies. See page 396. [Stanley I. Gilula, Department of Design, Southern Illinois University, Carbondale]





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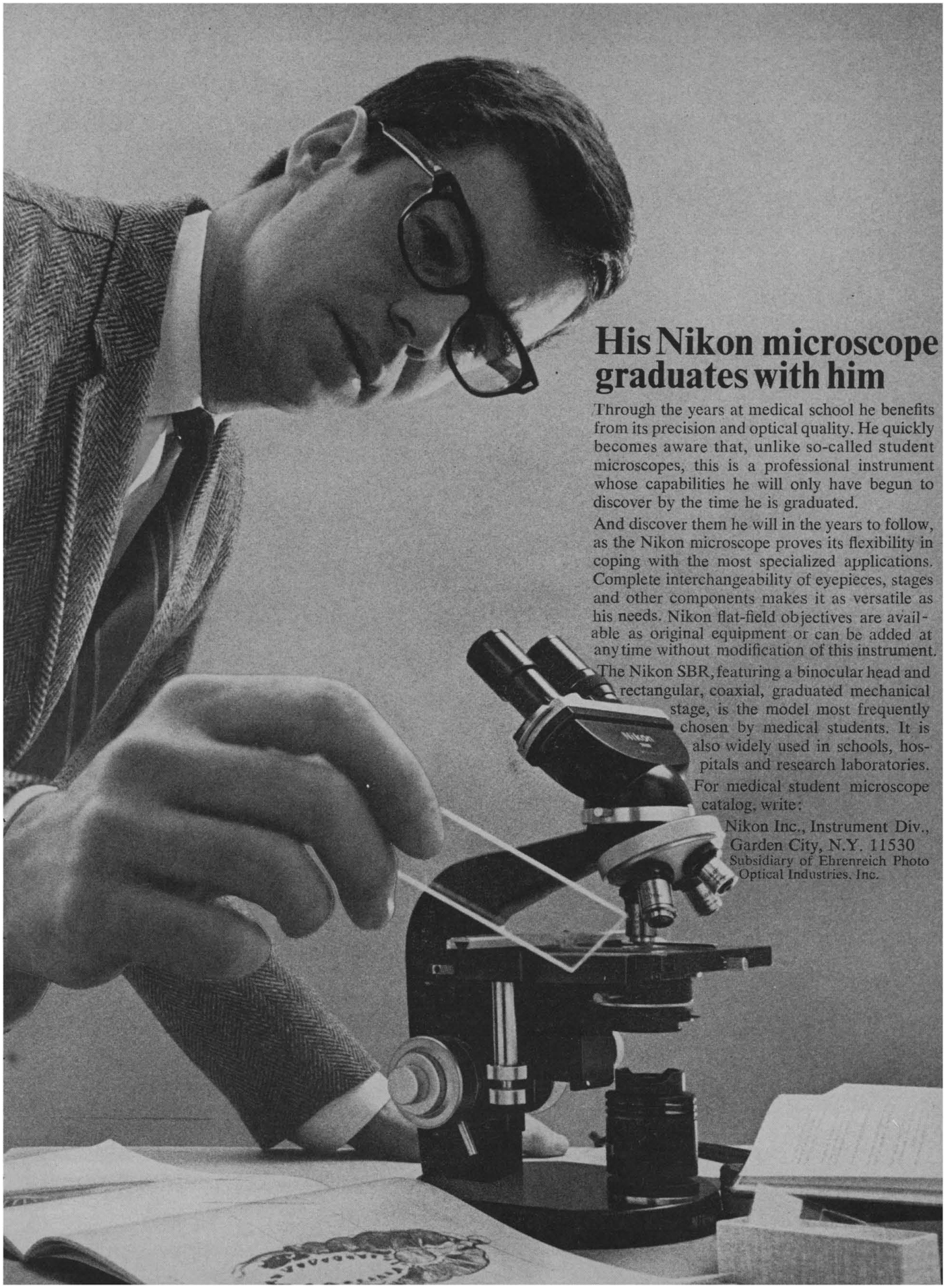

His Nikon microscope graduates with him

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And discover them he will in the years to follow, as the Nikon microscope proves its flexibility in coping with the most specialized applications. Complete interchangeability of eyepieces, stages and other components makes it as versatile as his needs. Nikon flat-field objectives are available as original equipment or can be added at any time without modification of this instrument.

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For medical student microscope catalog, write:

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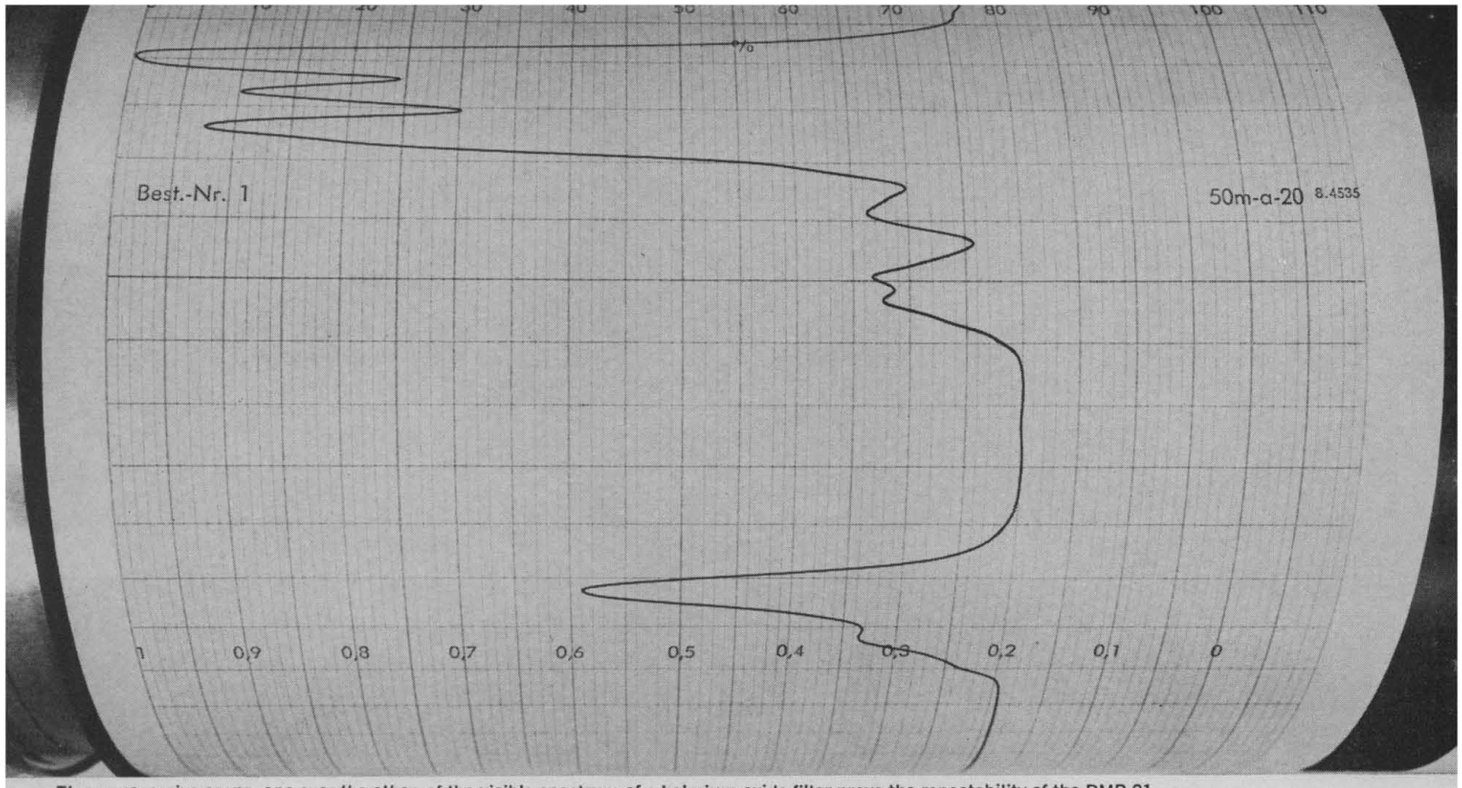

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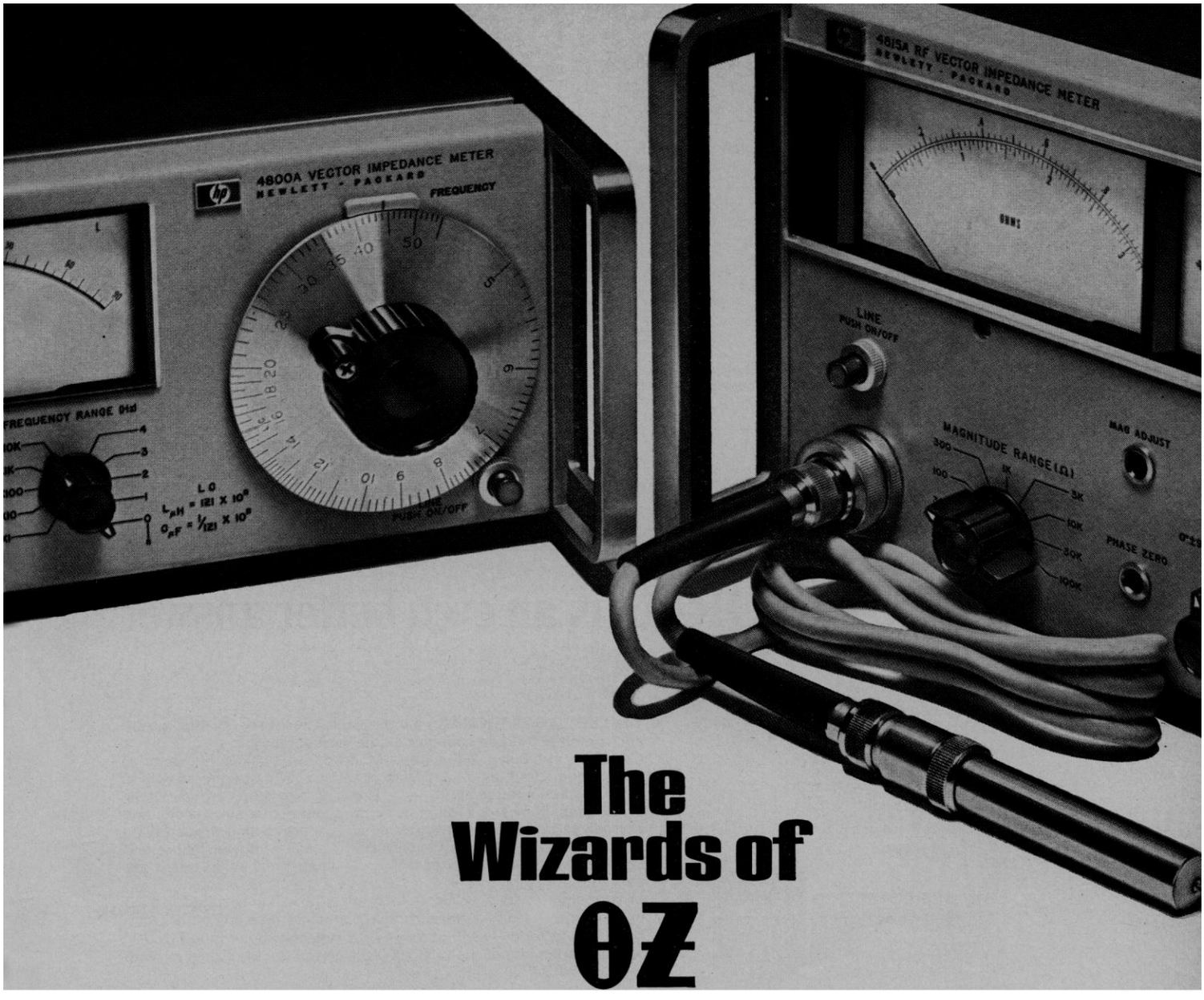

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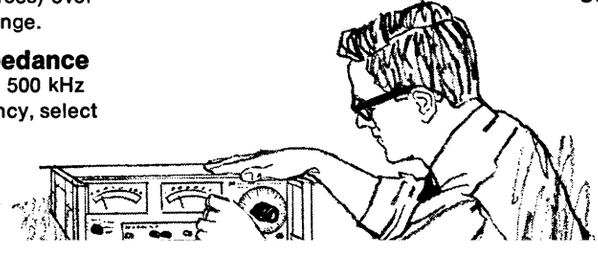

Application Note 86 describes many applications of the 4800A and the 4815A Vector Impedance Meters including the measurement of Z, R, L, and C. For your copy and complete specifications, contact your local Hewlett-Packard field engineer or write: Hewlett-Packard, Green Pond Road, Rockaway, New Jersey 07866. In Europe: 1217 Meyrin-Geneva, Switzerland.

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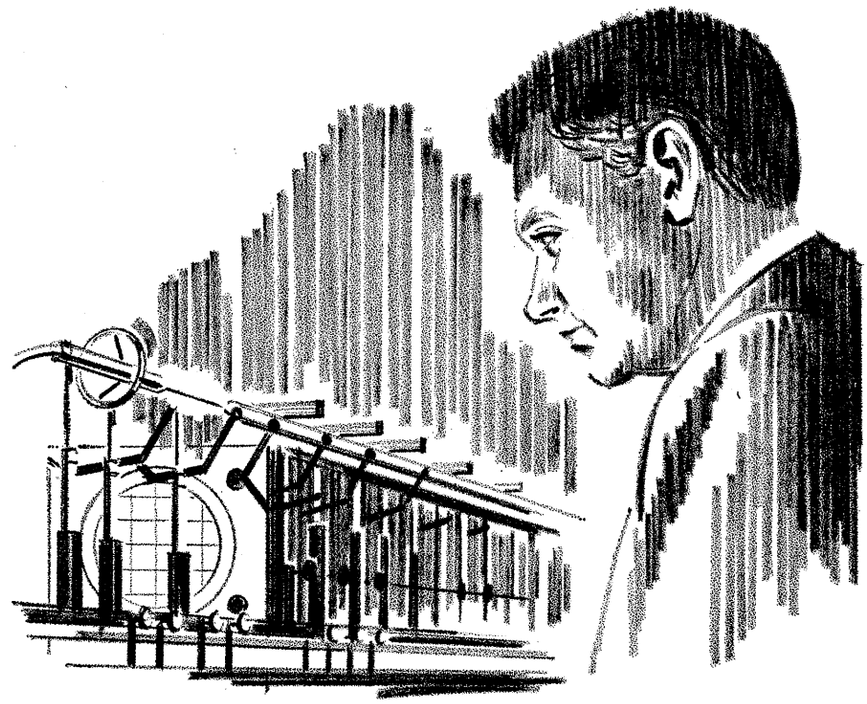

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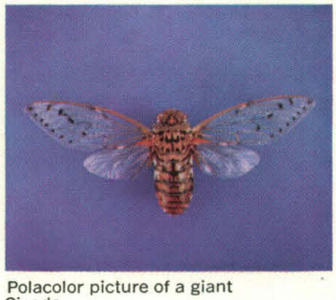
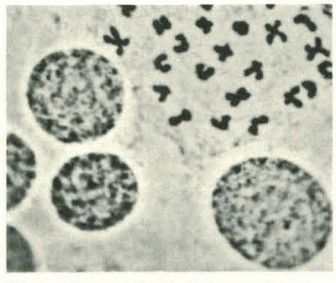


Polacolor picture of a giant Cicada.



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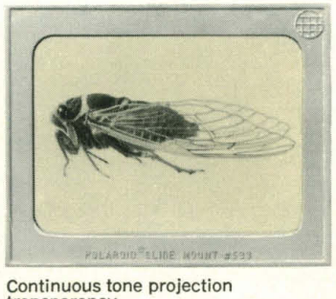

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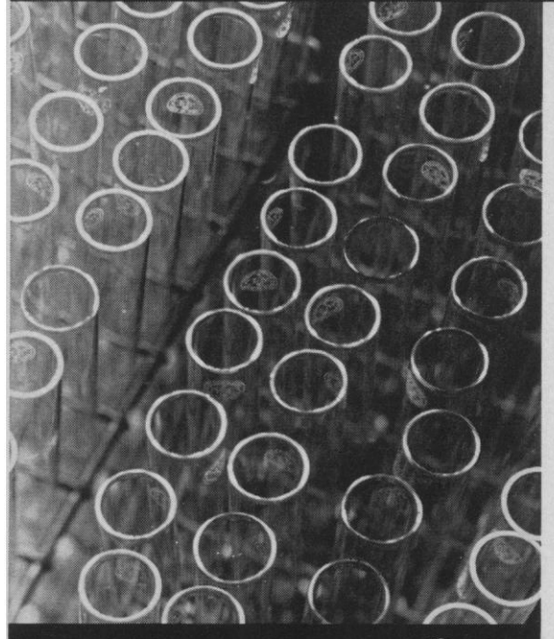

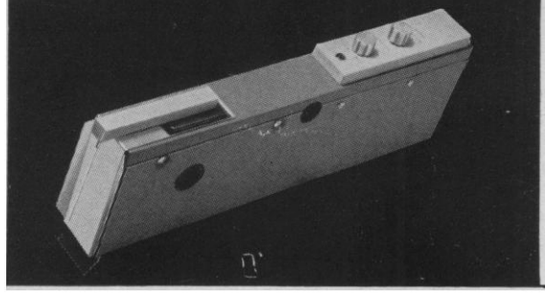

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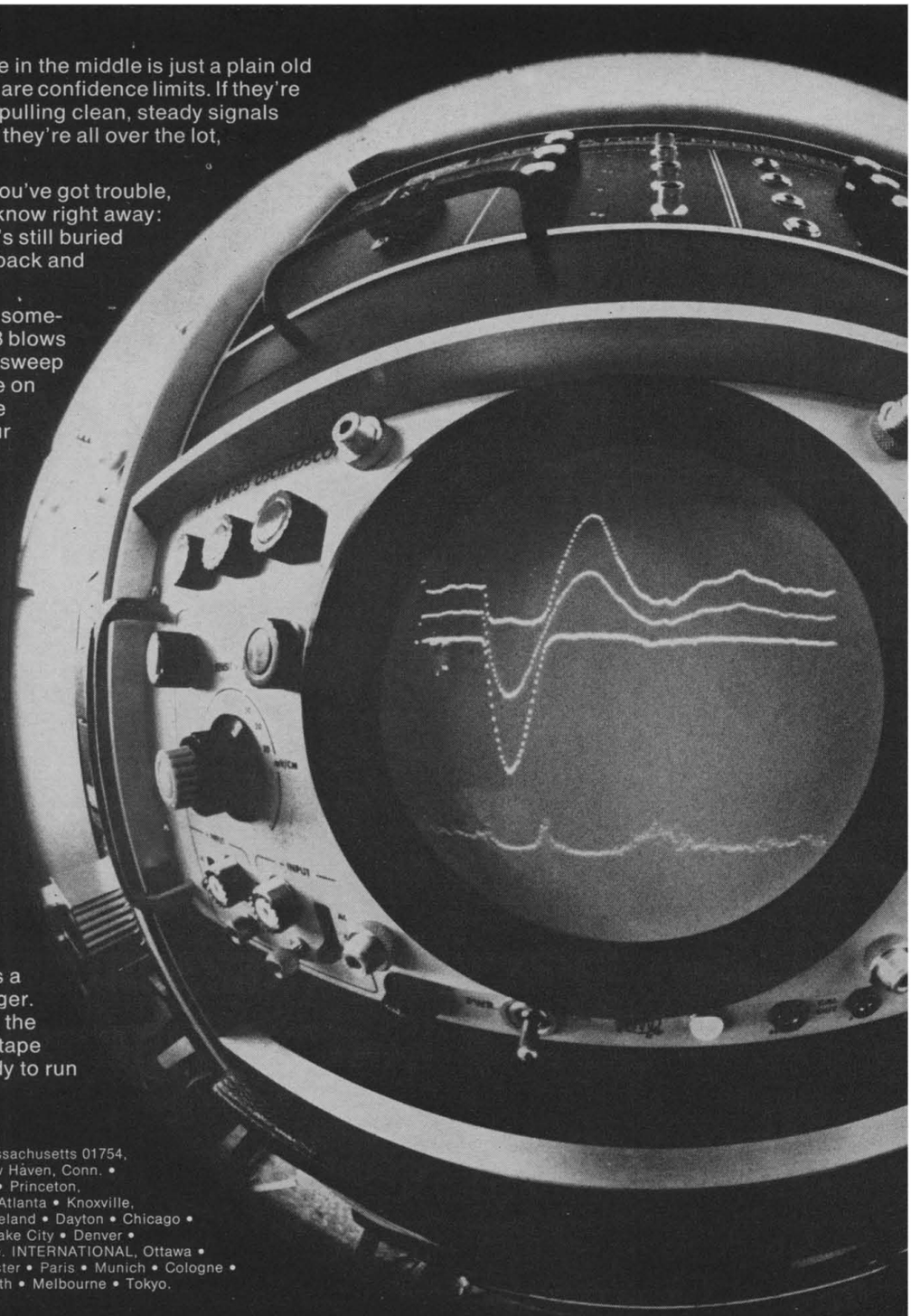

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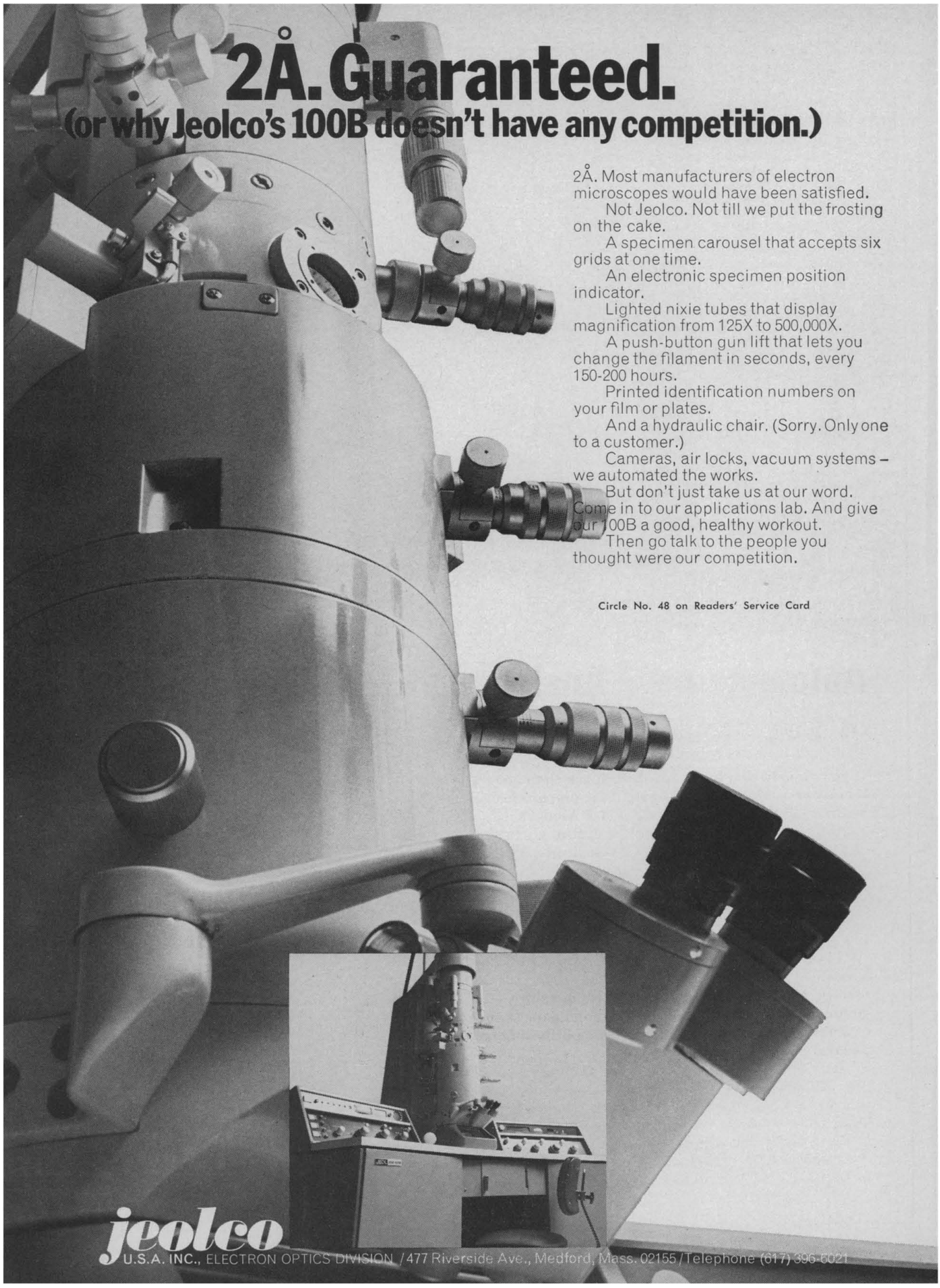

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An electronic specimen position indicator.

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Then go talk to the people you thought were our competition.

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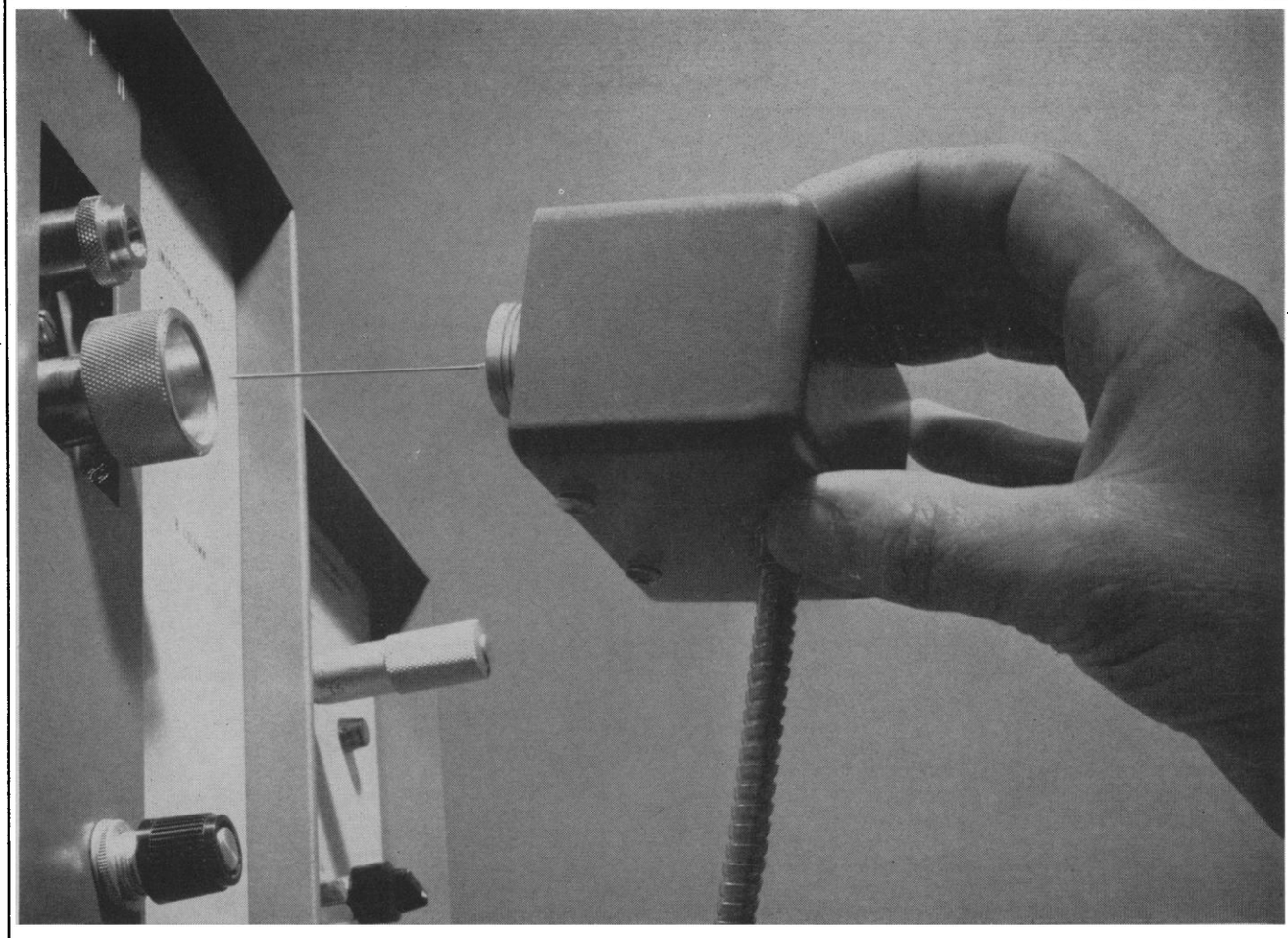

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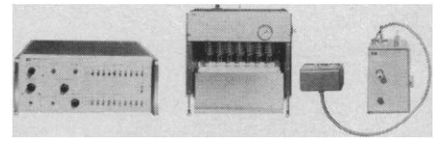

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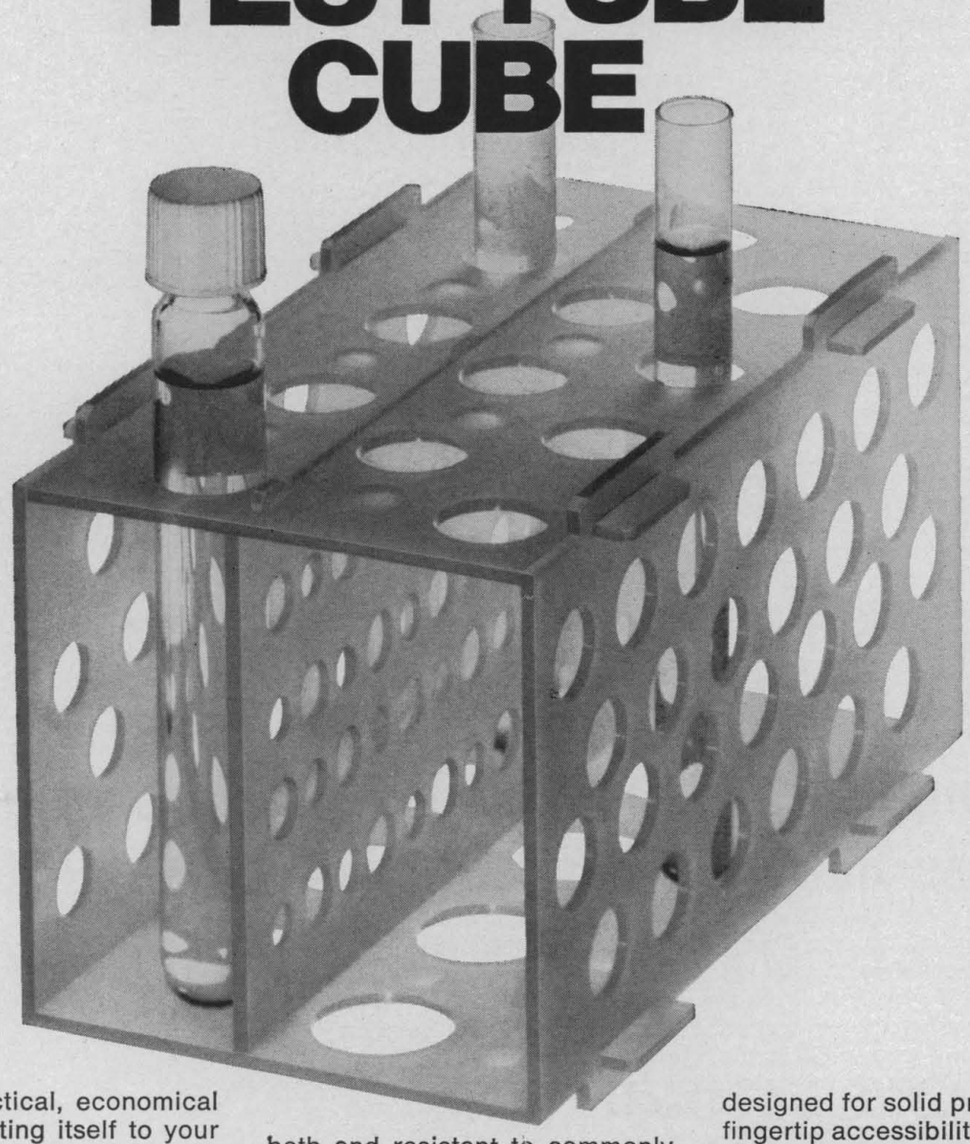

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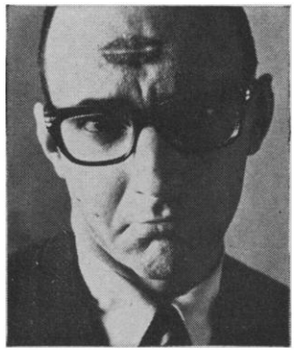

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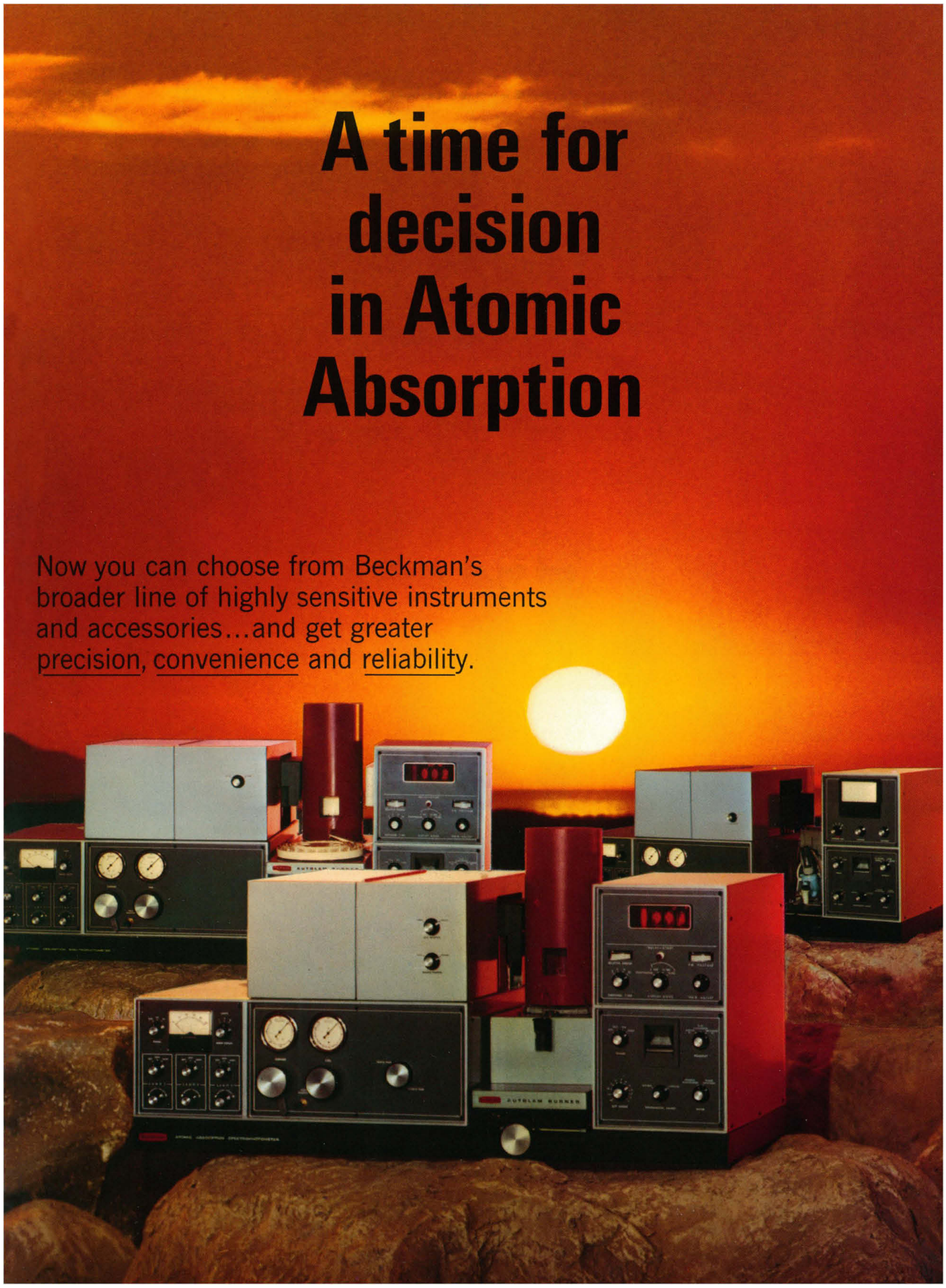

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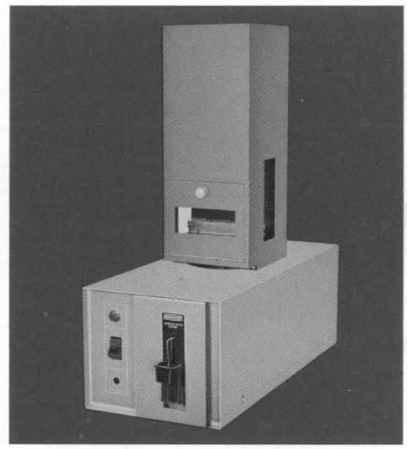

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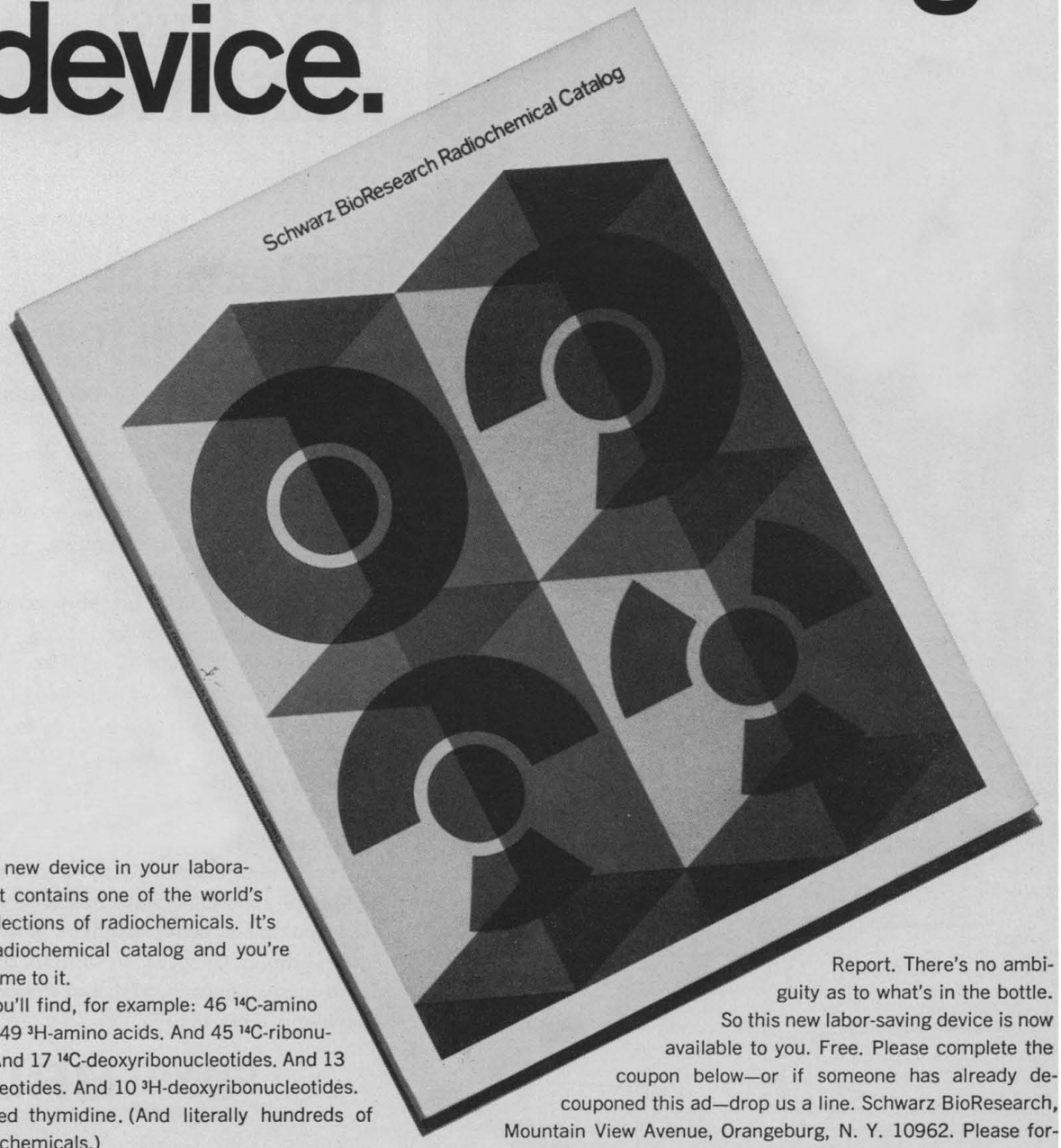

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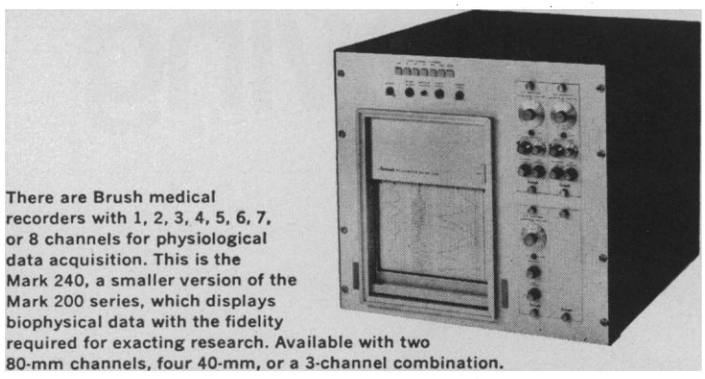

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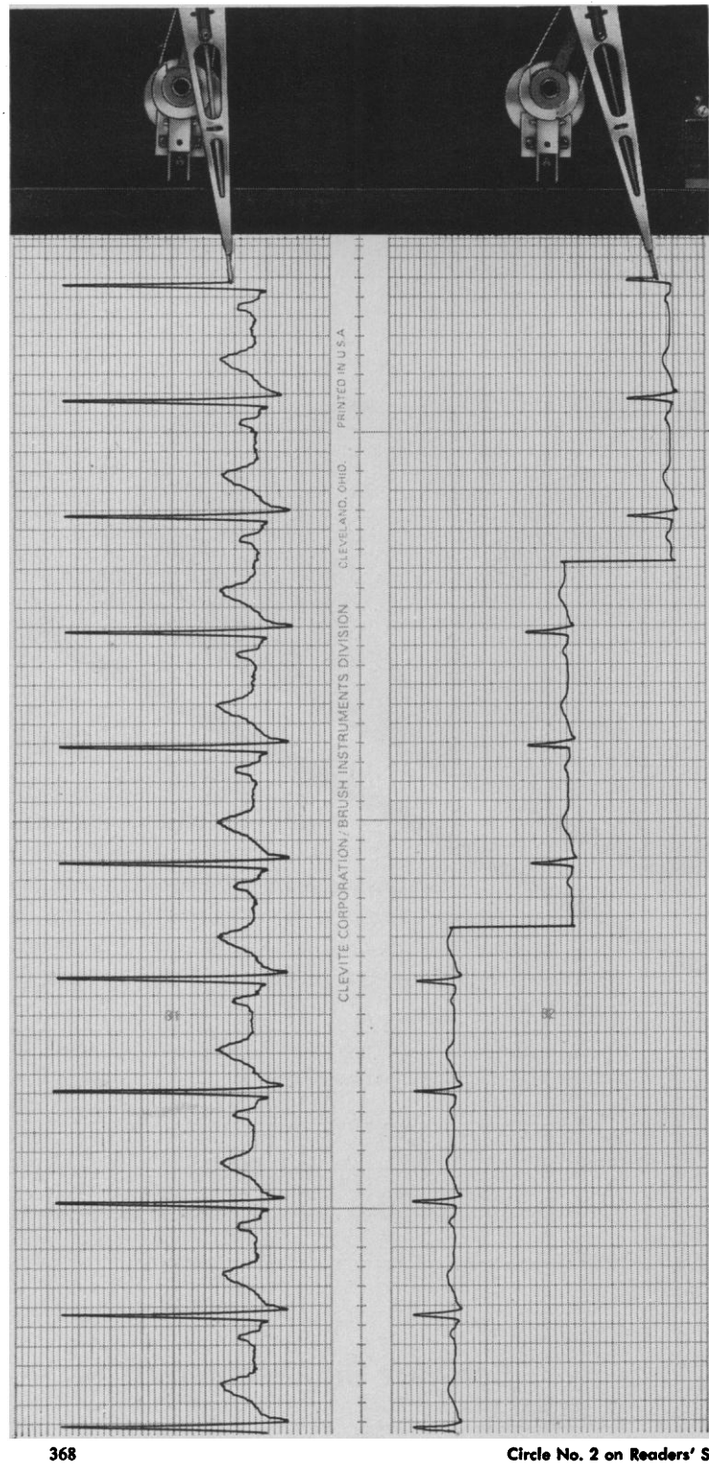

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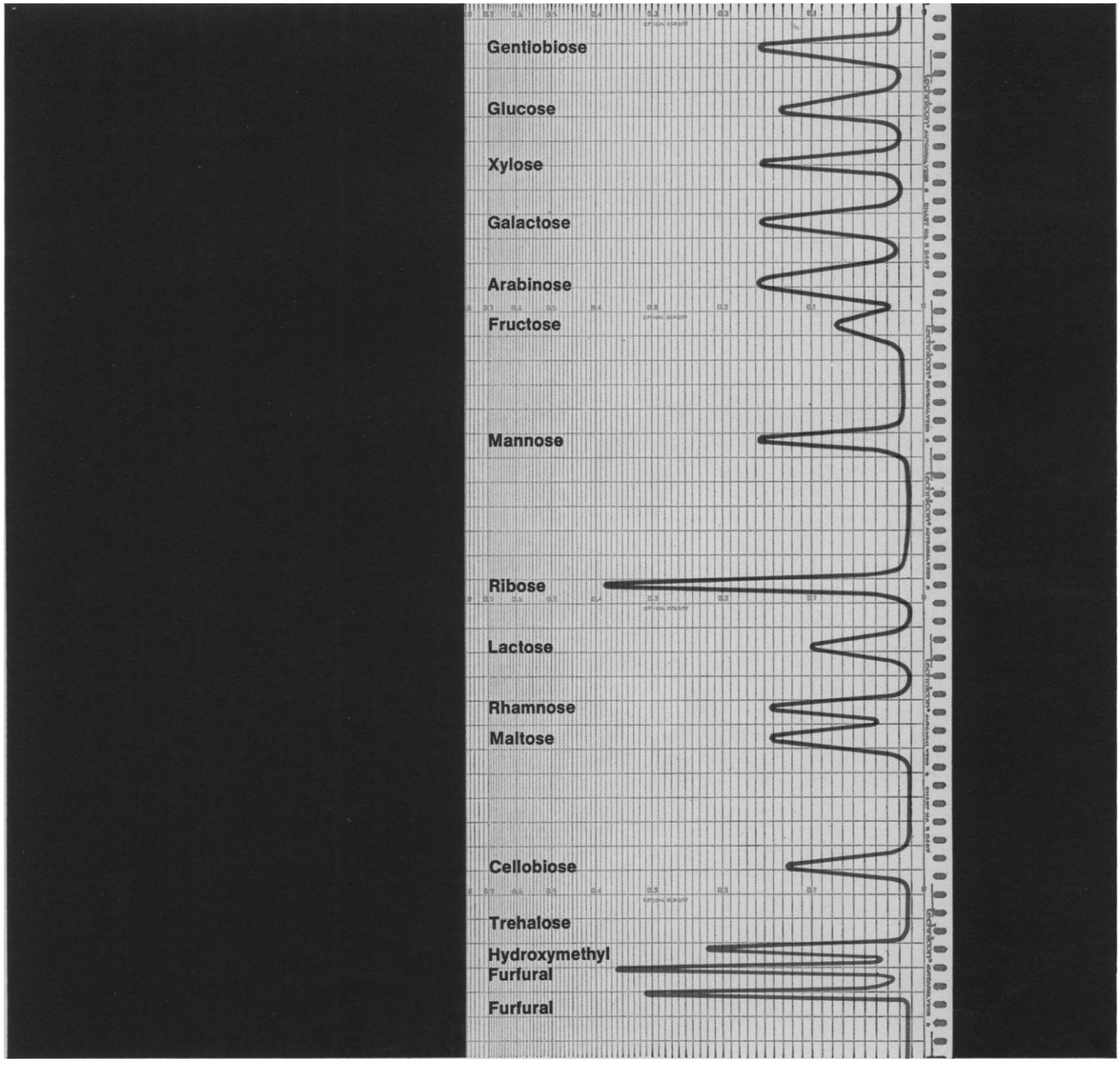

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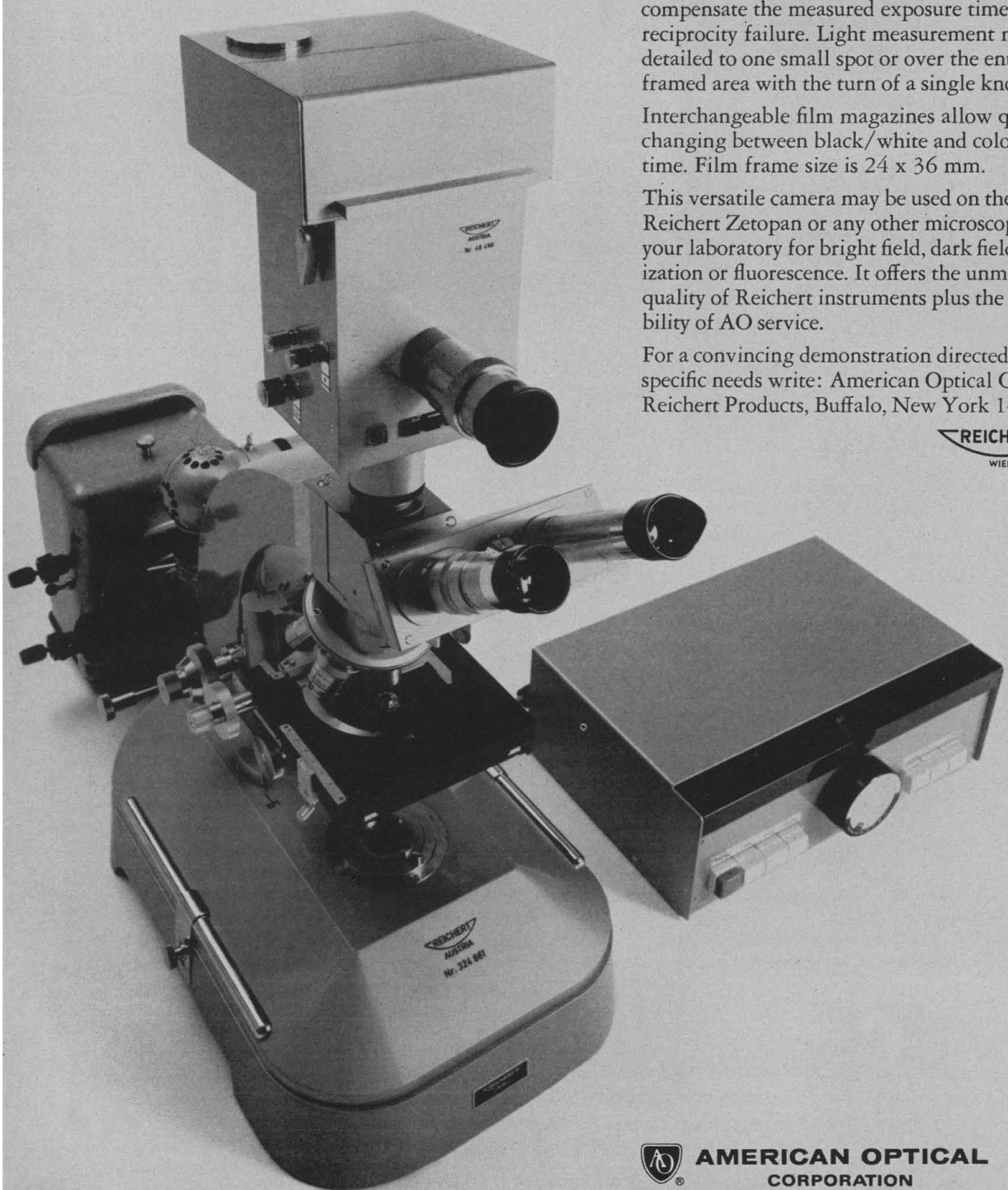

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How the Gecko gets his GRIP!

Some lizards are remarkable for their ability to cling to surfaces. The Stereoscan scanning electron microscope makes it possible to see the structures which give this little fellow his amazing grip!

The epidermal structures by which they cling are too small to be seen in light microscope preparations, and in transmission electron microscopy, the structure-function relationship is lost because they must be visualized in sectioned profiles. Scanning electron microscopy makes it possible to see the epidermal appendages directly.

Low magnification view of the entire toe demonstrating the great depth of focus available with the Stereoscan (27X). Specimen preparation consisted of coating the digit (removed) with 200 Å of gold by evaporation in vacuum.

The specie examined here is the Tokay *(Gekko gecko).*

The foot pad of gecko is composed of many *lamellae* on which there are small brushlike *setae* arranged in rows. These setae are branched so that each setae ends in thousands of terminal divisions. Each termination bears at its tip a small cup, or *calyx,* less than 0.2 micron in diameter. These are thin-lipped and can conform closely to irregular surfaces. It is this combination of close contact and atmospheric pressure which fastens the gecko to its perch.

From an article in preparation for Natural History Magazine by J. Gennaro, E. Ginsburg and R. Meszler. (New York University and University of Louisville)

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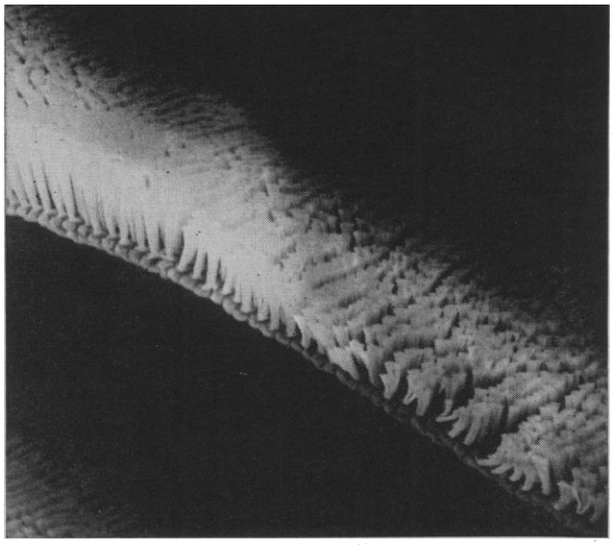
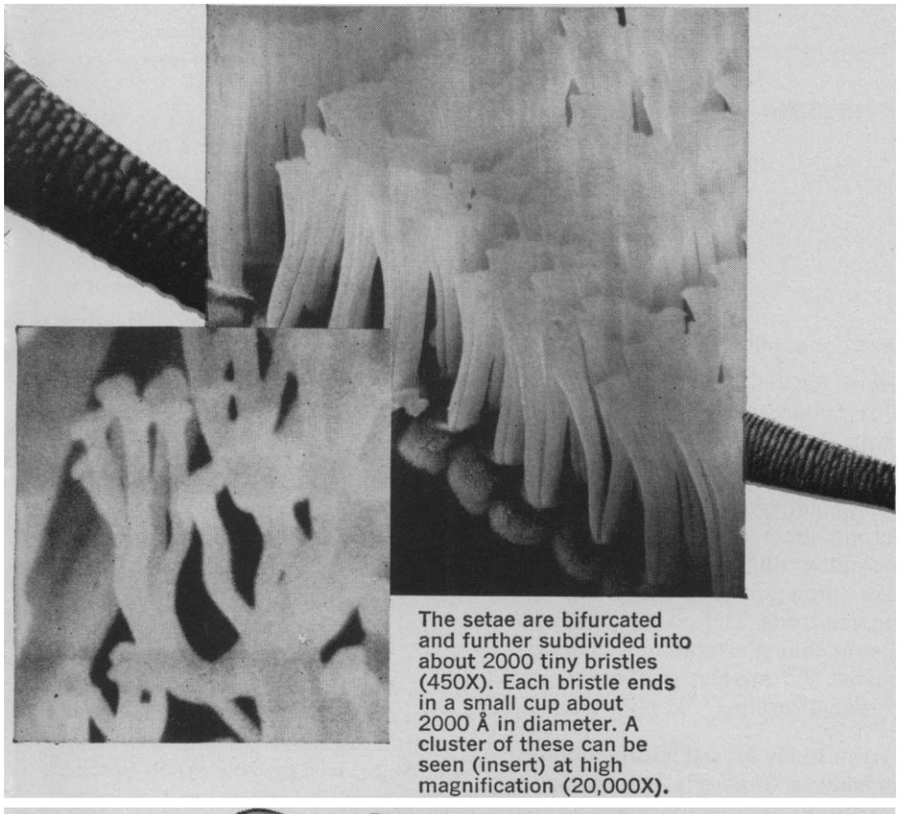


A detail of a single row of setae on one lamella showing their great number and regular arrangement (200X).



The setae are bifurcated and further subdivided into about 2000 tiny bristles (450X). Each bristle ends in a small cup about 2000 Å in diameter. A cluster of these can be seen (insert) at high magnification (20,000X).

high temperatures, wind and solar drying of soil, and low vegetation during dry seasons and to drying of springs (*1*). The adverse effects of deforestation and desiccation for humans and animals occur even where annual rainfall shows no change. The problem is that moisture supplies are lost or become irregular, not that total rainfall decreases. Defoliation, as a kind of deforestation, probably produces similar effects.

As for the effects of defoliation on animals, I have found, in working on neotropical birds, that many species of the forest interior die off and are replaced by species of more open areas if deforestation occurs. Presumably this happens in Vietnam. McClure noted many specialized species of the forest interior in nearby Malaya (*2*). I have repeatedly noted that birds of the forest interior disappear even if patches of undisturbed forest remain, because many such birds are at such low densities that they apparently must have large areas of forest for sufficient population sizes. Probably medium-to-large animals, with low densities, die off faster than insects and small animals, which can survive in tiny patches of forest; this is contrary to Tschirley's suggestion. The large animals he mentions as surviving in defoliated areas probably are not forest animals but those of low growth; such species may increase.

Population increases and nondefoliatory deforestation will eventually eliminate many of the forest-adapted species, presumably. But hastening extinctions by defoliation is not desirable. Even if species of open country increase in numbers, loss of the many more species adapted to forests would be unfortunate. Future studies should pay attention to the forest-adapted species, not to the open-country ones.

EDWIN O. WILLIS

Department of Zoology, University of Washington, Seattle 98105

References

1. P. Sartorius and H. Henle, *Forestry and Economic Development* (Praeger, New York, 1968).
2. H. E. McClure, *Wilson Bull.* **79**, 131 (1967).

NATO Science

Greenberg's informative article on NATO science (28 Feb., p. 915) is misleading in two respects. He identifies the NATO Science Committee as the

direct predecessor of the Scientific Affairs Division. Actually, the latter is a permanent part of the International Secretariat. Its director, Assistant Secretary-General Gunnar Randers, reports to the Secretary-General of the Organization. Randers follows Ramsey, Seitz, Nierenberg, Allis, and McLucas in this position. The Science Committee, which is still very much in existence, meets three times per year and is composed of distinguished scientists serving as official representatives of the 15 member nations of NATO. It provides policy guidance and program authorization to the Scientific Affairs Division. Isidor Rabi has normally represented the United States on this committee. The confusion may have resulted from the peculiar NATO practice of having a Secretariat official simultaneously serve as the chairman of an intergovernmental committee.

More serious is Greenberg's conclusion, that the U.S. considers this aspect of NATO's activities to be of diminishing importance, based on the fact that Randers is the first non-American to hold the position of chief science officer. On the contrary, the U.S. has taken the lead in urging an even more purposeful program with a wide international base of interest and support. Randers' appointment is evidence that the Europeans are today equally able to provide distinguished and effective leaders—perhaps in itself a tribute to the programs of the committee.

EUGENE G. KOVACH

Office of General Scientific Affairs, Department of State, Washington, D.C. 20520

. . . the NATO Advanced Study Institutes Program provides partial or full support for about 50 institutes each year. Since most of these are in Europe, the degree to which young U.S. scientists can participate is severely limited. To help alleviate this situation and to insure U.S. representation at some of these institutes, the National Science Foundation since 1959 has made available each year a number of international travel grants for U.S. scientists. NSF generally limits support to graduate and postdoctoral students and younger faculty members who are still in the formative stages of their scientific careers. The program is thus one of the few sources of international travel support for scientists who are not yet professionally established.

Candidates for these awards must be nominated by the scientific directors of

the various institutes in Europe. Those who are interested should address inquiries to the directors of the institutes, in accordance with the information which is published in this country on academic bulletin boards and in appropriate journals. Approximately 70 travel grants are made annually to about 30 NATO institutes.

TERENCE L. PORTER
Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550

Sorcerer's Apprentice in Academia

As part of a large-scale survey of opinion on vital questions in the field of higher education, the Carnegie Commission on Higher Education sent me, as a university professor, questionnaire number 29,872, containing 89 questions divided into some 230 separate parts. Since "the information . . . will be of help to . . . bodies concerned with public policy in this area . . ." it presents two real problems.

The secret or Australian ballot has demonstrated inherent advantages. Consequently I hesitate to complete a questionnaire which asks not only for my voting record and my preferences among convention candidates, but also for the political views of my father. When the depth of the questions continues, as in this case, to the point where I must state whether or not I have changed religions, I must consign it to the wastebasket, rather than to the "National Computer Systems Processing Center" as Clark Kerr requests.

The first problem arises as one detects in the questionnaire itself a screening device which automatically eliminates responses from those who react as I do. Although I am tempted to attribute a tendency toward conformity or even naivete to the majority of respondents, one must certainly caution that the results of the survey will contain a considerable bias, introduced by the very depth of the questionnaire itself.

Second, as a computer scientist concerned with invasion of privacy, such extensive probings of academia cause me to recall Norbert Wiener's fear that our computers might fall under the control of the sorcerer's apprentice.

M. H. HALSTEAD
Purdue University, Lafayette, Indiana 47907

25 April 1969, Volume 164, Number 3878 **SCIENCE**

Responsible versus Irresponsible Dissent

For a long time we have fondly preserved the fiction that the drama of social change is a conflict between dissenters and the top layers of the Establishment. But as the critics fling themselves in Kamikaze-like assaults on sluggish institutions, they eventually come into head-on collision with the people who are most deeply implicated in the sluggishness, namely, the great majority. The stone wall against which many radical reforms shatter is the indifference (or downright hostility) of that majority.

The collision between dissenters and lower middle class opponents is exceedingly dangerous. As long as the dissenters are confronting the top layers of the power structure, they are dealing with people who are reasonably secure, often willing to compromise, able to yield ground without anxiety. But when the dissenters collide with the lower middle class, they confront an insecure opponent, quick to anger and not prepared to yield an inch.

It is at this point that young rebels find great appeal in Herbert Marcuse's ideas. When they think they are attacking the fat cats at the top of the social structure, democratic doctrine seems a serviceable banner to wrap themselves in. But democratic doctrine suddenly becomes a considerable embarrassment when they discover that "the people" they seek to liberate are in fact bitterly opposed to them.

Marcuse deals with that difficulty by saying that democracy and tolerance are themselves barriers to the overthrow of an evil society. He favors a more "directed" society. In doing so, he makes the assumption made by all who fall into authoritarian doctrines—that, in the "directed" society he envisages, people who share his values will be calling the tune. So thought the businessmen who supported Hitler.

The debasement of the critical role makes responsible action for social change increasingly difficult. The irresponsible critic never exposes himself to the tough tests of reality. He doesn't limit himself to feasible options. He doesn't subject his view of the world to the cleansing discipline of historical perspective or contemporary relevance. He defines the problem to suit himself. It's a hard game to lose. If he takes care to stay outside the arena of action and decision, his judgment and integrity will never be tested, never risked, never laid on the line. He can feel a limitless moral superiority to the mere mortals who put their reputation at hazard every day in accountable action.

The consequences of such reckless radicalism are predictable. Out of such self-indulgence come few victories. The model of the ineffectual radical is the man or woman who spends a few brief years exploding in indignation, posturing, attitudinizing, oversimplifying, shooting at the wrong targets, unwilling to address himself to the exacting business of understanding the machinery of society, unwilling to undergo the arduous training necessary to master the processes he hopes to change.

Those who are engaged in the grueling work of accomplishing institutional change are in desperate need of allies. Responsible social critics can be of enormous help in identifying targets for action, in clarifying and focusing issues, in formulating significant goals and mobilizing support for those goals. The responsible critic comes to understand the complex machinery by which change must be accomplished, finds the key points of leverage, identifies feasible alternatives, and measures his work by real results. We have many such critics, and we owe them a great debt.—JOHN W. GARDNER

Adapted from the Godkin Lectures, Harvard University, 27 March 1969.

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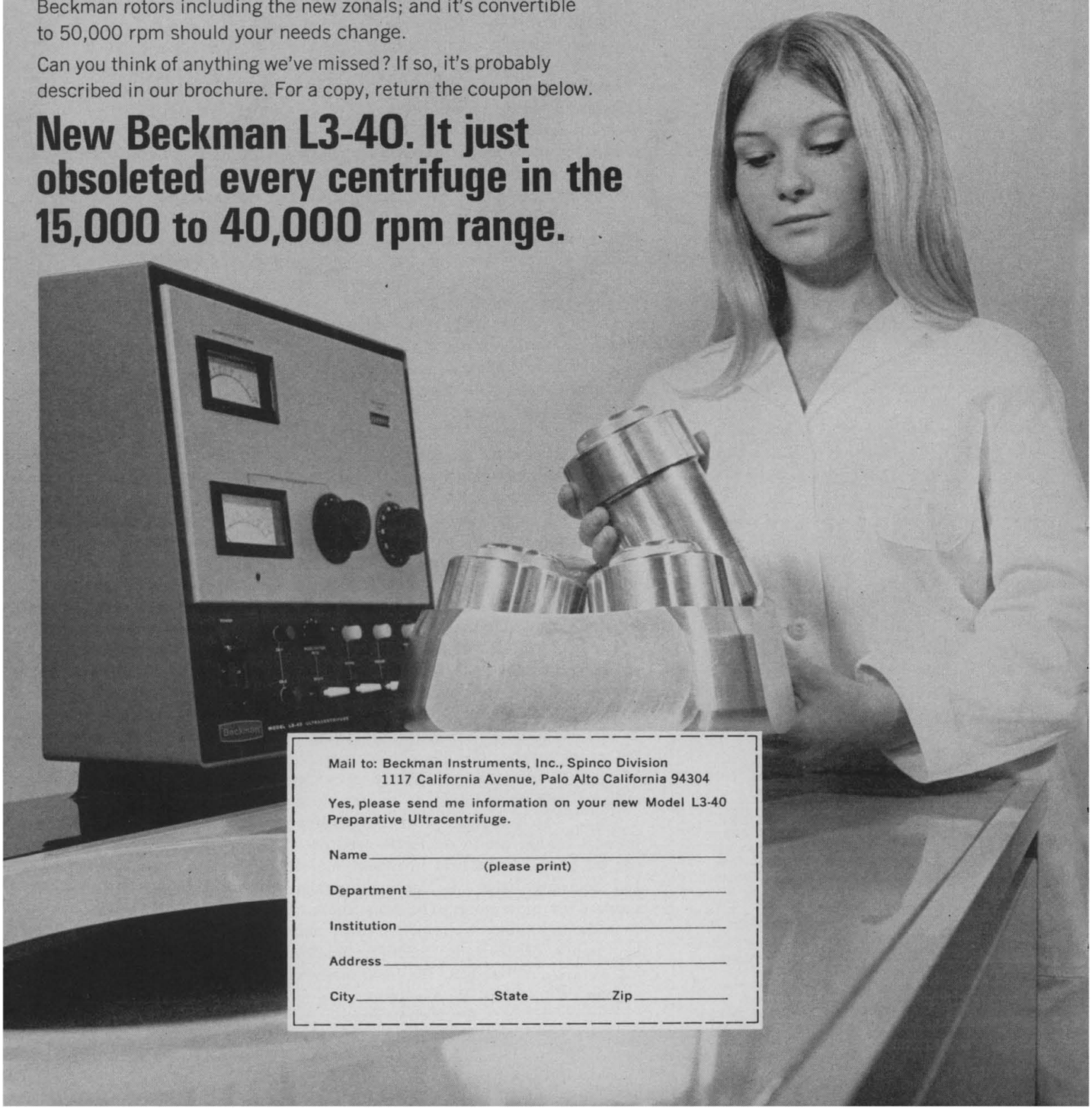

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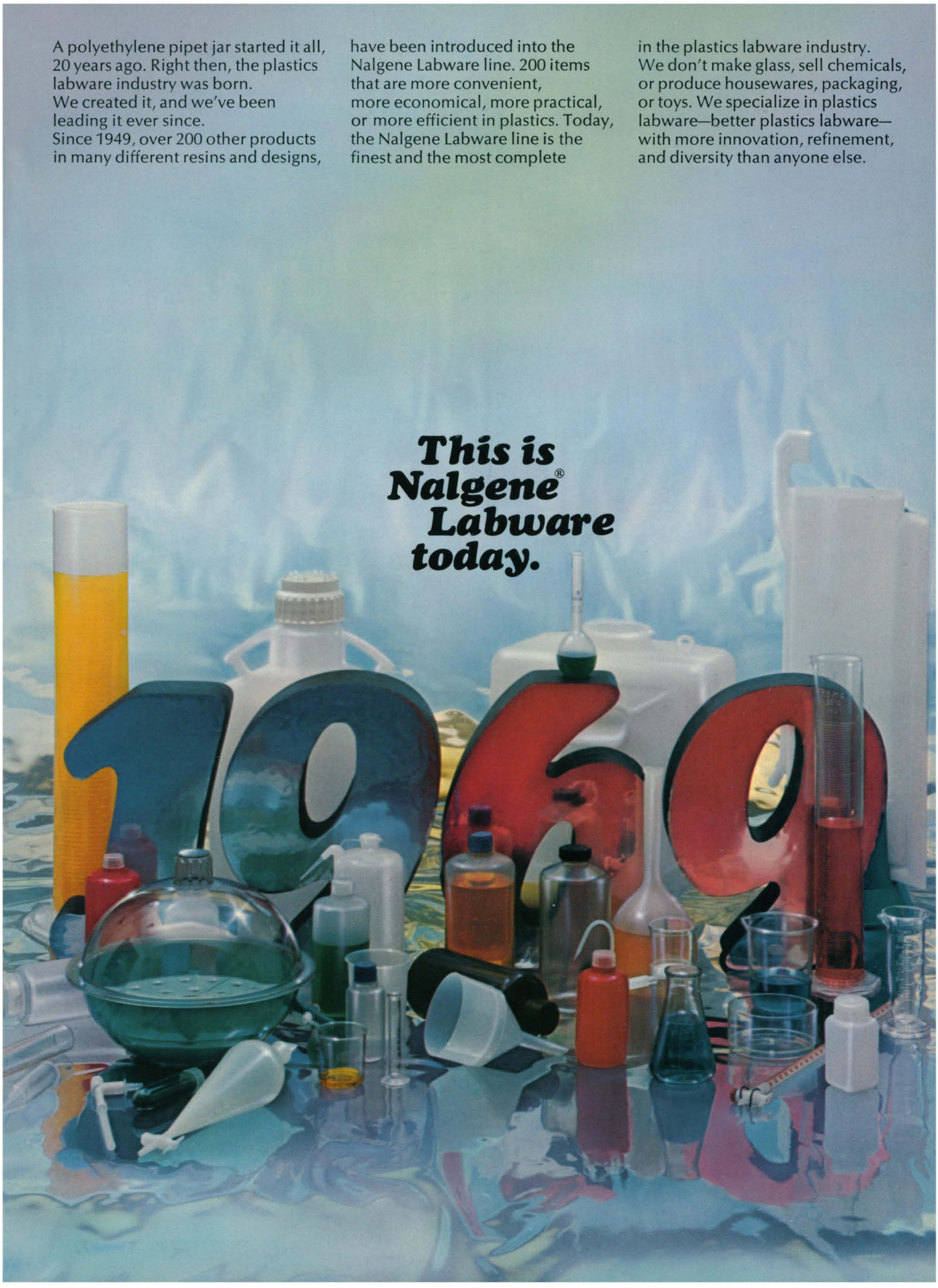

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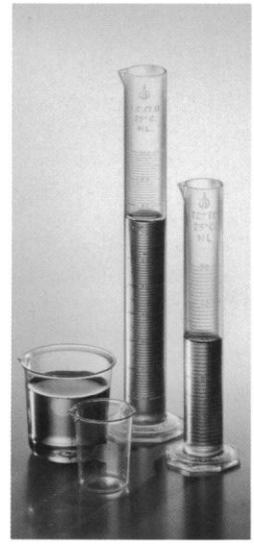

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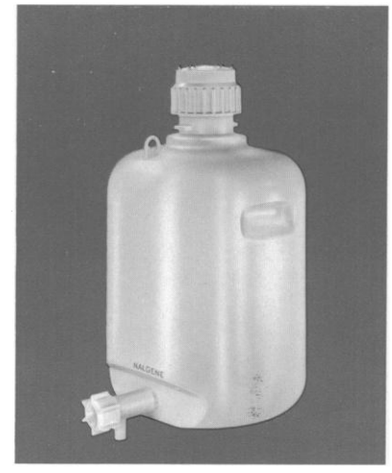

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pants turned their attention to the activity in single cells from which the brain is built.

The session on anatomy and physiology was chaired by W. A. H. Rushton. H. B. Barlow elaborated the proposition that increasingly fewer signals are generated in more numerous fibers, as information is relayed in sensory pathways. He adduced examples of receptive fields in the retina and the visual cortex and discussed adaptation and his recent work on binocular stereopsis in support of the argument. V. B. Brooks gave a beautiful account of some recent work by himself and his colleagues on elucidating the functions of the motor-sensory cortex. The afferent information flow in this part of cortex consists of somatic and kinesthetic, as well as visual and auditory, stimuli. The motor-sensory cortex is arranged functionally in radial columns, similarly to the somatosensory and visual cortex. The input receiving columns are about 0.2 millimeter in diameter and the output columns about 1 millimeter in diameter. Thus one efferent column contains about 25 afferent columns. There is extensive overlapping of afferent and efferent columns among themselves and with each other. Decisions to move and how to move are not made in the motor-sensory cortex. Rather, the latter is concerned with receiving afferent information and executing movements involving positive feedback. This is well suited for the tactile placing reaction, the instinctive tactile grasping reaction, and the act of accurate stepping. J. C. Eccles reviewed cerebellar structure and physiology, including the pathways that link the cerebellum to the spinal cord and the cerebrum. He emphasized that the cerebellum is part of a dynamic loop. It does not contain precise somatotopic maps as, for example, the sensory or motor cortex. Instead, there is a large overlap of somatic inputs and any small region in the cerebellum will receive inputs from a very large number of sources. The cerebellum does not hold information of ongoing activity for long periods of time. It operates, as if it were giving advice, moment to moment, on ongoing activity. Experimental evidence for dynamic loop control of movement is provided by the tremor of about 9 cycles per second which is found superimposed on movement.

The session on models and theory was chaired by Otto Schmitt who put forward an ingenious idea of treating nervous systems as interpenetrating domains—for example, three, of which one would represent the intracellular space, another the extracellular space, and a third the space occupied by nerve membranes. Such an approach could achieve the advantage of lumping some properties of individual cells into characteristics of the domains. Warren McCulloch gave a paper on digital oscillators. He showed that under certain conditions a randomly connected net of shift registers under the control of a logic network will produce a surprisingly large number of different sequences without repetition and mostly of relatively short length. This would overcome some of the earlier problems of too few or too long sequences in neural net models. McCulloch stressed the importance of looking at irreducibly triadic relationships in place of two valued logical ones, since our thought processes are concerned essentially with relationships ARB such as "A is conscious of B" or "A thinks that B" and the relation R cannot be left out of account. R. F. Reiss presented some ideas on how to deal with the potentially very large number of possible states of sequential machines and presented certain quantitative measures for this problem. K. N. Leibovic and N. H. Sabah surveyed synaptic input-output relations, signals in nerve fibers, and the functional significance of small network structures, such as reciprocal synapses. Among some novel ideas which they presented they postulated, on theoretical grounds, a synaptic mechanism mediated by neural activity–dependent K^+ concentrations in adjacent cells and in the intercellular space. They also proposed a new type of signal, which they named "g-pulses" and which is intermediate between electrotonic signals and "all or none" spikes. These "g-pulses" behave somewhat like damped spikes and they can be deduced from a modified form of the Hodgkin and Huxley equations for excitable tissue. The "g-pulses" are of interest in view of the numerous, strange signals recently recorded in nerve preparations which look, in fact, like something between spikes and electrotonic polarization. They could be a flexible and reliable form of signal with regard to information processing. Some psychophysical implications were briefly mentioned.

The size of the symposium was sufficiently small to enable all participants to interact with one another and sufficiently large so that each of the various groups—whether primarily mathematical or biological—could make a signifi-

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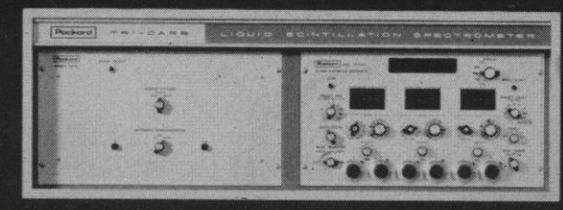

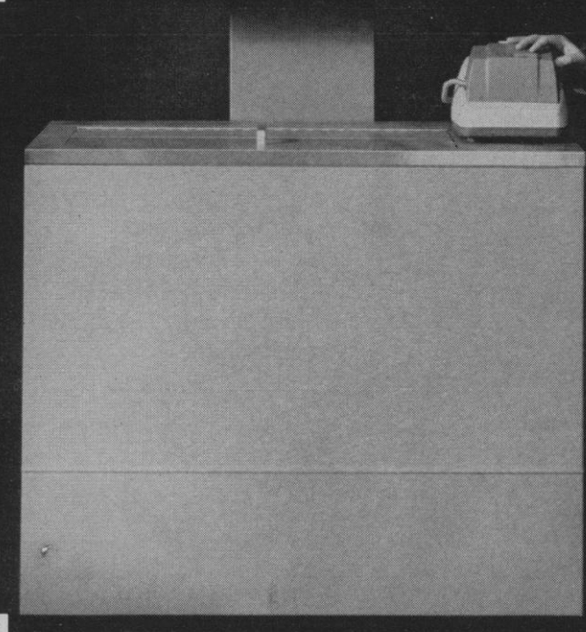

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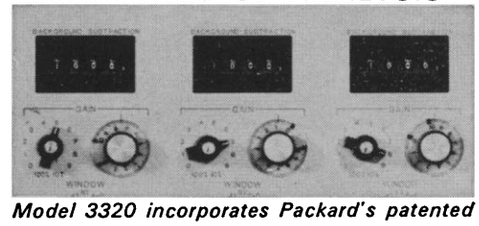

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cant contribution. In fact, one of the most successful features of the symposium was the degree of interaction which was achieved and the feeling that new horizons had opened up.

The meeting was organized in cooperation with the John C. Eccles Laboratory of Neurobiology; the Departments of Biophysical Sciences, Mathematics, Computer Sciences, and the Center for Theoretical Biology of the State University of New York at Buffalo; and the Center for Visual Science of the University of Rochester.

In these times of financial stringency it was gratifying to receive support from University funds allocated through the Graduate School and supervised by the Research Foundation of the State University of New York at Buffalo. Some further support came from the Clynes Biocybernetic Foundation and the Departments of Biophysical Sciences, Mathematics, and Computer Science of SUNY.

The proceedings of the symposium will be published by Springer-Verlag in 1969 under the title *Information Processing in the Nervous System.*

K. N. LEIBOVIC
State University of New York, Buffalo

Mental Retardation Caused by Physical Trauma

The relationship of physical trauma to the production of mental retardation was considered 13–16 October 1968 at the University of Nebraska, Lincoln, by 45 participants including neurosurgeons, neuropathologists, obstetricians, pediatricians, and psychologists from the United States and overseas. It was the fourth of seven research conferences on the etiology of mental retardation recommended in 1962 by the epidemiology of postnatal and perinatal trauma, clinicopathologic correlations, and pathogenesis of traumatic damage to the developing brain.

The opening address underscored some of the problems confronting observers and research workers in the definition and estimation of the qualitative differences in function which are called mental retardation. The scope, incidence, and size of the patient population at risk or affected is not accurately known or defined.

All parameters of behavioral change are not examined in the standard testing of children, thus making it difficult to estimate the incidence of minor neurological impairment following physical trauma. The question was raised whether, with such tests, we uncover a diffuseness of representation or a diffuseness of lesion. The possibility that an elementary function might be spared at the expense of a general loss of higher functions was suggested.

The use of animal models is a direct approach to the problems, experimental reproduction of events with time and specific cortical areas are controlled. Work was reviewed which demonstrated the capacity of the young animal to compensate for large losses of brain mass, but with not always predictable results.

Results of experimental cortical ablation suggested that with the maturation of subcortical motor systems, the presence of the inhibitory functions of the localized areas of the cortex become increasingly important, although not necessarily a function, of the mass of cortical tissue removed. The inability of the operated adult or older infant subjects to do better on testing would appear to be intimately associated with the appearence of hyperactivity and distractability. These studies point to the need for both long-term clinical

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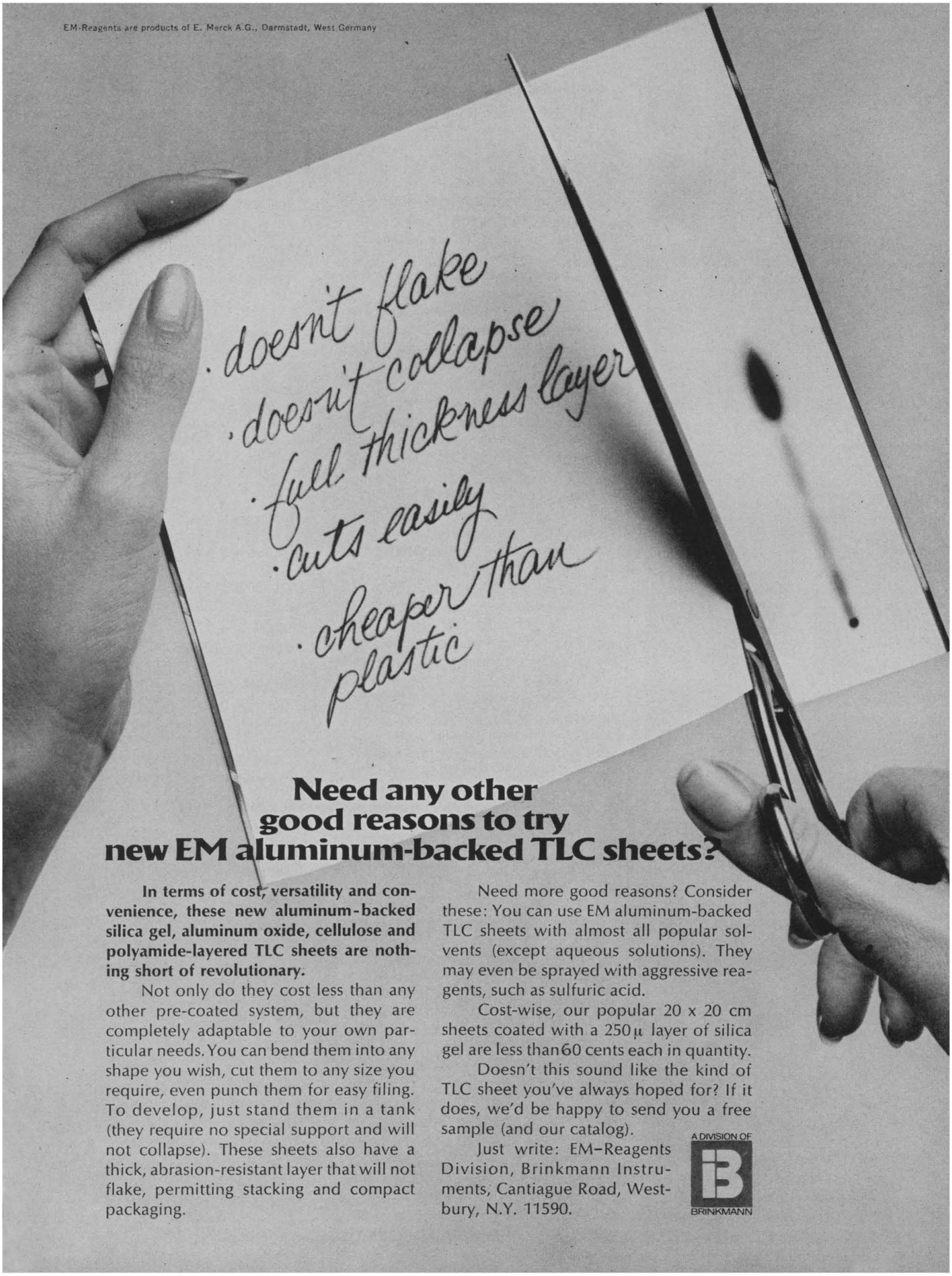

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evaluation and the assessment of dysfunction not quantitated by standard psychological testing.

Analyses of the cerebral pathology in subjects continuously institutionalized with histories of perinatal trauma or hypoxia were presented. The distinctive neuropathology of the premature was employed to differentiate the effects of anoxia from those of direct trauma. The cerebral cortex of the premature, unlike the full-term infant, is relatively resistent to hypoxia. A description was given of a possible sequence of hypoxia, venous stasis, and thrombosis leading to hemorrhagic infarction consistently located in the periventricular area in the premature or in the full-term infant with prenatal anoxia.

The role of trauma to the neck leading to cerebral damage was emphasized by showing, in 17 percent of perinatal deaths, one or both vertebral arteries were damaged. Despite the serious difficulties in the analysis of late effects of birth trauma, it was thought valid to correlate the distribution of lesions produced in adults by vertebral artery damage with functional deficits typical of cerebral palsy—cortical blindness in association with lesions of the calcarine cortex, ataxic cerebellar dysfunction, and temporal lobe epilepsy with scaring in the area supplied by the vertebral arteries.

The contrasts were reviewed between reaction to injury of the adult brain, typically the formation of dense glial scar, with that of the immature brain of the rat. The latter is characterized by rapid resorption of the necrotic tissue by lipid-filled macrophages, dissolution, and formation of a smooth walled cyst by the end of the second week. It was postulated that the more rapid removal of necrotic tissue might be due to the higher water content of the immature brain or a difference in metabolic activity of the macrophages. Of clinicopathologic significance is the fact that application of adult reaction patterns may lead to false impressions as to the etiology of diseases such as porencephaly, hydranencephaly, and aqueductal stenosis.

Most attractive were the elegant biophysical analyses of prenatal obstetrical events. The mechanical energy associated with uterine contractions may cause fetal distress by application of pressure directly to the fetal body (chiefly the vertex); by occlusion of the umbilical cord; and by impeding venous outflow or arterial inflow in the intervillous space. The application of sophis-

ticated techniques to the recording of alterations in amniotic fluid pressures, fetal heart rate, EEG, and acid-base balance, all rapidly related in time sequence to fetal-maternal exchange, provides a sensitive measure of physiologic events during labor. It would appear that anoxia due to physiologic effects on the infant's cardiovascular system is not due to trauma itself and is potentially responsible to pharmacologic manipulation.

Also presented was an analysis of simultaneous recordings from intrauterine pressure receptors and fetal heart rate. Decelerative patterns coinciding with the maximum peak of uterine contraction, called type I dips, are abolished by atropine and thought to be due to cephalic compression and a transient stimulation of the vagus nerve, but do not alter the Apgar score. Decelerative dips, type II, occurring after the uterine contraction are associated with hypoxia, acidosis, and a low Apgar score in the neonate. Monitoring to detect these changes has considerable clinical application.

Current epidemiologic studies of perinatal trauma all focus on the obstetrical history and the classical criteria for retardation. Drawing upon material from the Collaborative Study on the Etiology of Cerebral Palsy, Mental Retardation, and Other Neurological Disorders, offspring identified as having cerebral palsy or mental retardation seemed to provide evidence that obstetrical history has only a minor effect on WISC performance while racial-socio-cultural factors are associated with major deviations.

Other reports of data from the Collaborative Perinatal Research Project drew statistical correlations between the size of the maternal pelvis, position of the fetal head during delivery, and forceps delivery with neuropsychological outcome. It is suggested that as early as the time of birth, sufficiently lateralized neuropsychological differentiation appears to have taken place for injury to have an effect on the individual's intellectual capacity. The mean Binet scores of all reported groups was in the 104 to 110 range which would not fit accepted definitions of mental retardation.

The epidemiologic problems of postnatal head injury were introduced and a statement was made that a conservative estimate of the annual incidence of head injury in infants and children was 3 percent of the population under the age of 6 years. However, the incidence of significant postnatal trauma is low;

but there are no reliable estimates of postnatal injury as a cause of less than optimal performance in the noninstitutionalized.

Preliminary results from longitudinal interdisciplinary clinical study seeking to investigate the early and long-term effects of head injury in children from birth to 14 years showed a rapid regression of posttraumatic neurological deficits with a plateau reached by 3 months.

Impairments in adaptive behavior were considered in conjunction with intellectual deficits in children and adolescents following protracted coma due to accelerated concussion. The sequelae which are constant after moderate or severe concussion are mainly subjective: anxiety or irritability, difficulty with sustained mental concentration, impaired memory, distractability, perserveration, and excessive liability to fatigue. The severity of these symptoms is related directly to the period of posttraumatic amnesia. A newer group of more severely retarded patients are those resuscitated after the hypoxic insult of cardiorespiratory arrest.

As summarized it would appear that the perinatal problem is much larger than that of postnatal trauma. Although perinatal trauma and anoxia together may be causative in 10 percent of institutionalized retardates (Malamud) and birth trauma alone related to 16 percent of the diagnosed cases of retardation or cerebral palsy in 7-year-olds (Drorbaugh and Clifford), the much greater effect of racial-socio-cultural factors performance on standard I.Q. tests by the school age population deserves appropriate consideration. Postnatal trauma is a much less significant cause of severe retardation but the population at risk is enormous and the problem of head injury deserves both full demographic analysis and pragmatic efforts at prevention or amelioration of severity. The estimation of incidence of both perinatal and postnatal injury is obscured by the iceberg quality of cerebral dysfunction, and there is a need for long-term follow-up with attention to selected indices of complex performance. Animal models were considered to offer a challenging and hopeful field of investigation to outline precise behavioral changes with respect to neurological lesions defined as to location, extent, and time.

The delineation of the role of hypoxia and of direct trauma in the production of perinatal brain damage was a major achievement of the conference. The recurring theme of sequential hy-

poxia, acidosis, stasis, thrombosis, and infarction scored the crucial nature of obstetrical factors. The pathophysiology of placental function would seem deserving of attention, at least equal to that lavished on liver and kidney. Hon and Dodge were among those emphasizing the need for centers of perinatal biology capable of the application of sophisticated methodology to the biophysical and biochemical events of labor. Such centers would bring together obstetricians, pediatricians, physiologists, biochemists, biomedical engineers, and other specialists to focus on the most vulnerable period in the life of the child.

The meeting was sponsored by the U.S. Department of Health, Education, and Welfare, National Institutes of Health, National Institute of Neurological Diseases and Stroke (NINDS). The detailed proceedings of the conference will be published by NINDS.

EDGAR A. BERING, JR.
National Institute of Neurological Diseases and Stroke, Bethesda, Maryland 20014

Calcified Tissues

Useful, new contributions to the field of calcified tissues were reported at the Sixth European Symposium on Calcified Tissues held in Lund, Sweden, 21–24 August 1968.

In the first session, specialized instruments offered hope for the future. The presentation by Hobdell (London) on scanning electron microscopy was of interest since it brought into perspective how bone is constructed at the ultrastructural level. Bones from different animals were fixed and extracted with fat solvents, mounted, and then scanned at magnifications up to 20,000. Such specimens showed a great deal of detail of the lining of the lacunae, the nature of the interlamellar material, and the pattern of mineral collagen fibers and fiber bundles. Removal of collagen by solvents resulted in a pattern of the mineral front alone, suggesting that it separates one collagen fiber bundle from the next one overlaying it.

Höhling (Münster) provided further evidence of the power of probe methods in establishing the nature of mineralization at the subcellular level. Hitherto, electron-probe analysis has been a somewhat crude technique, incapable of locating the site of the mineral deposi-

tion in or near cells. It is now apparent that calcium, phosphorus, and sulfur can be detected with increasing precision. Dentine, both mineralized and mineralizing, was studied. The results show that the ratio of calcium to phosphorus is somewhat lower in the mineralizing front than it is for fully formed apatite. However, in predentine there is little phosphorus, with calcium apparently bound to an unresolved organic matrix.

Fleisch (Berne) reported some effects of diphosphonates on calcium metabolism, the thesis being that these compounds (which are close structural analogues of pyrophosphate) might stabilize hydroxyapatite crystals and inhibit bone resorption. Two diphosphonates were found to inhibit the dissolution of calcium phosphate in vitro and to inhibit aortic calcification induced by vitamin D in rats when they were given subcutaneously or orally. These compounds blocked parathyroid-induced bone resorption in tissue culture and partially or completely prevented hypercalcemia induced by parathyroid extract in thyroparathyroidectomized rats. A monophosphonate was found not to possess these properties.

Gudmundsson (London) reported that the blood calcitonin level in six normal subjects was 80 to 250 mU per liter of plasma. Foster had administered intravenous calcitonin to several patients with disorders of calcium metabolism and found an increase in urinary calcium and phosphorus in the first 3 hours. In some patients this increase was associated with hypocalcemia. Bijvoet (Leiden) had administered calcitonin to four patients with Paget's disease and observed a small fall in plasma calcium and a large fall in plasma hydroxyproline. Urinary calcium was increased and then decreased.

Heaney (Omaha) described the use of a circumferential counter with which radioactivity in 3-inch segments of the forearm was determined after intravenous administration of strontium-35. The combination of the retention data with the plasma specific activity values permitted calculation of turnover in the forearm which amounted to about 0.5 to 2.0 of calcium per segment per day, being higher in cancellous than in compact bone. Patients with rheumatoid arthritis had substantially higher accretion ratios in all joint regions than the controls, whereas whole-body turnover values did not reveal this discrimination.

Several useful techniques were

described in relation to radioisotope uptake. In particular, Rekonen (Finland) reported some interesting observations of uptake of strontium-35 in joints damaged by rheumatoid arthritis. The scanning methods were sufficiently precise to allow a good comparison between various tissues; the advantage of technetium-99 as a tracer was also illustrated. Later, Ahlback (Stockholm) gave details of the radiographic observation of a new syndrome which he called osteonecrosis of the knee; he outlined the history, symptoms, and the results of physical examination.

Of special interest was the nature of the radiolucent focus and the degree of nonuniformity from late radiographic changes. The following paper by Bohne (New York), using a slightly different technique of emission scintimetry, came to much the same conclusions—unusual radiolucent lesions in the medial femoral condyle. In this case, data were quantitated and the patterns of figures led to some sharp discussion as to the significance of the findings.

The cinematographic evidence of Ascenzi on the properties of single osteons was well received. For the first time we were able to see compression curves superimposed upon actual pictures of changes in single osteons isolated by techniques for which the Pisa Laboratory is well known. The degree of reproducibility was convincing, particularly with respect to the point of failure of osteons from different parts of bone. It is too early at this stage to be overcritical about the results but the general support of Gebhardt's theories is to be expected.

A new model for the study of hydroxyproline turnover was produced by Flanagan (Boston). He incubated rat metaphyseal bone slices in Krebs-Ringer solution for up to 6 hours and studied the time course of accumulation of hydroxyproline in the media. An early exponential release was attributed to solubility, and a linear component was attributed to new synthesis and release with resorption. Using labeled proline it was shown that there was no significant pool of free intracellular proline and that the rate of release of labeled hydroxyproline in the medium rose exponentially for 3 hours and then continued linearly for at least 6 hours.

Russell (Oxford and Davos) infused 3′5′-cyclic AMP into the renal arteries of ten thyroparathyroidectomized dogs. They were able to demonstrate a large increase in phosphorus excretion from

the infused kidney after a few minutes at cyclic AMP concentrations from 10^{-4} to $10^{-5}M$. This work provided additional evidence for the intermediary role of cyclic AMP in the action of parathyroid hormone on the kidney.

Finally, there was some light from Sledge (Massachusetts) on the subject of heparin and related compounds in the release of lysozome from embryonic cartilage. A flourishing finish to a successful symposium in which old subjects were aired once again and one or two promising new starters stumbled under questioning.

The proceedings of this symposium are published in the supplement to volume 2 of Calcified Tissue Research.

B. E. C. NORDIN
F. G. E. PAUTARD
The Medical School, Leeds University, Leeds 2, Yorkshire, England

Calendar of Events

Courses

Electron Microscopy in the Biological Sciences, Boston, Mass., 15–27 June. This is the 11th session of a 2-week intensive program in the preparation of biological materials as electron microscope specimens, electron microscopy, and interpretation of results. Designed for doctoral level investigators who wish to use the electron microscope in their research, but who have little or no experience in the field. Advanced graduate students will be considered. Limited to 12 students. (Prof. Clifford Youse, Center for Continuing Education, Northeastern University, 360 Huntington Ave., Boston 02115)

X-ray Diffraction Theory and Practice, Chicago, Ill., 16–20 June (elementary) and 23–27 June (advanced). The elementary course will include the study of physics of x-rays, elementary crystallography, elements of x-ray diffraction theory, techniques of x-ray diffraction analysis, procedures and interpretation of x-ray powder diagrams, elementary indexing procedures, identification of unknown substances, and precision lattice parameter determination. The advanced course will include sessions on the reciprocal lattice concept, development of theory for x-ray intensity, single-crystal techniques, Laue method, the rotating crystal technique, preferred orientation, and quantitative analysis. Tuition for each course is $250, or $400 for both (Prof. Paul Gordon, Metallurgical Engineering Department, Illinois Institute of Technology, Chicago 60616)

Marine Sciences. Courses will be offered at Cape Henlopen Marine Laboratory during the summer of 1969. Marine biology, coastal vegetation, geology of Recent sedimentary environments, and engineer-

ing in a coastal environment will be presented during the first term; marine biology, physical oceanography, marine botany, and tidal marsh studies will be presented during the second term. These courses will be appropriate for graduate students, undergraduates, and teachers. (Dr. Harry W. Wells, Department of Biological Sciences, Marine Laboratories, University of Delaware, Newark 19711)

Experimental Pathology, Cambridge, Mass., 16–27 June. Is intended for M.D.'s and Ph.D.'s in the biomedical sciences who desire to obtain a broad survey of the field of experimental pathology, or to refresh their knowledge in specified aspects of the field. Applications will also be considered from experienced technical personnel without doctoral degrees sponsored by their professional institutions. Registration limited to 25 full participants ($250) and 25 associate participants ($150), to be chosen by a faculty committee on the basis of background and experience. (Dr. F. Homburger, Bio-Research Institute, Inc., 9 Commercial Ave., Cambridge 02141)

Bio-Medical Telemetry, San Diego, Calif., 25–28 June. Is designed to introduce physicians, scientists, and engineers to this field; to present enough information for them to incorporate telemetry in their own research and to provide sufficient background in electronics for them to select equipment and recognize proper performance. Demonstrations, displays (including instrumented experimental animals), motion pictures, and slides will be used to make these diverse matters more graphic. Fee: $125 for professionals; $60 for graduate students. *Deadline for applications: 2 June.* (Mrs. Pat Austin, University Extension, P.O. Box 109, La Jolla, Calif. 92037)

National Meetings

May

3. American Soc. for **Clinical Nutrition**, Atlantic City, N.J. (A. B. Eisenstein, 818 S. Meramec Ave., St. Louis, Mo. 63105)

3. American College of **Psychiatrists**, Bal Harbour, Fla. (M. Sabshin, P.O. Box 6998, Chicago, Ill. 60680)

4–5. American Soc. for **Clinical Investigation**, Atlantic City, N.J. (D. H. Nelson, Latter-Day Saints Hospital, Salt Lake City, Utah 84103)

4–6. American Soc. for **Adolescent Psychiatry**, Miami Beach, Fla. (H. D. Staples, 24 Green Valley Rd., Wallingford, Pa. 19086)

4–7. American Inst. of **Chemical Engineers**, 65th natl. mtg., Cleveland Ohio. (The Institute, 345 E. 47 St., New York 10017)

4–7. American **Mining** Congr., Pittsburgh, Pa. (The Congress, 1100 Ring Building, Washington, D.C. 20036)

4–8. American Soc. of **Brewing Chemists**, Baltimore, Md. (Executive Secretary, The Society, 501 N. Walnut St., Madison, Wis.)

4–8. Soc. of **Plastics Engineers**, 27th, Chicago, Ill. (Director, Member Activities, The Society, 65 Prospect St., Stamford, Conn.

4–9. **Electrochemical** Soc., New York, N.Y. (The Society, 30 E. 42 St., New York 10017)

5–8. **Aerospace Dynamic Balancing**, 2nd symp., San Francisco, Calif. (G. E. Henning, Boeing Co., P.O. Box 3868, Mail Stop 85-93, Seattle, Wash. 98124)

5–6. **Theory of Computing** Symp., Marina del Ray, Calif. (M. A. Harrison, Dept. of Computer Science, Univ. of California, Berkeley 94720)

5–7. Instrumentation Soc. of America, **Aerospace Instrumentation** Symp., Las Vegas, Nev. (E. K. Merewether, Computer Operations, Wyle Systems, 128 Maryland St., El Segundo, Calif.)

5–7. American **Gynecological** Soc., New Orleans, La. (D. J. Lund, Univ. of Rochester Medical Center, 260 Crittenden Blvd., Rochester, N.Y. 14620)

5–7. **Practical Applications of Radioisotopes to Industry**, Pullman, Wash. (R. M. Chatters, Washington State Univ., Pullman 99163)

5–8. Society of **Aeronautical Weight Engineers**, 28th, San Francisco, Calif. (C. R. Pullen, Aerospace Corp., P.O. Box 95085, El Segundo, Calif. 90045)

5–8. **Aerospace Medical** Assoc., 40th, San Francisco, Calif. (D. I. Fryer, British Embassy, 3100 Massachusetts Ave., NW, Washington, D.C. 20008)

5–8. **Metal Powder** Industrial Federation and American **Powder Metallurgy**, Inst., 25th, New York, N.Y. (P. K. Johnson, Metal Powder Industries Federation, 201 E. 42 St., New York 10017)

5–8. **Radiation Biology of the Fetal and Juvenile Mammal** Symp., Richland, Wash. (M. R. Sikov, Biology Dept., Battelle-Northwest, P.O. Box 999, Richland 99352)

5–9. American **Psychiatric** Assoc., 125th, Bal Harbour, Fla. (Public Information Officer, 1700 18th St., NW, Washington, D.C. 20009)

6–7. Conference on **Waste Management and Disposal for the Food Processing Industry**, University Park, Pa. (J. O. Keller Conf. Center, Pennsylvania State Univ., University Park 16802)

6–8. **Frequency Control** Symp., Atlantic City, N.J. (Director, Electronic Components Lab., U.S. Army Electronics Command, Fort Monmouth, N.J. 07703)

6–8. **Industrial Waste** Conf., Lafayette, Ind. (D. E. Bloodgood, Sanitary Engineering, Purdue Univ., Lafayette 47907)

6–8. **Microfilm** Assoc., 18th natl., Boston, Mass. (G. D. Hoffman, Eastman Kodak Co., 343 State St., Rochester, N.Y. 14650)

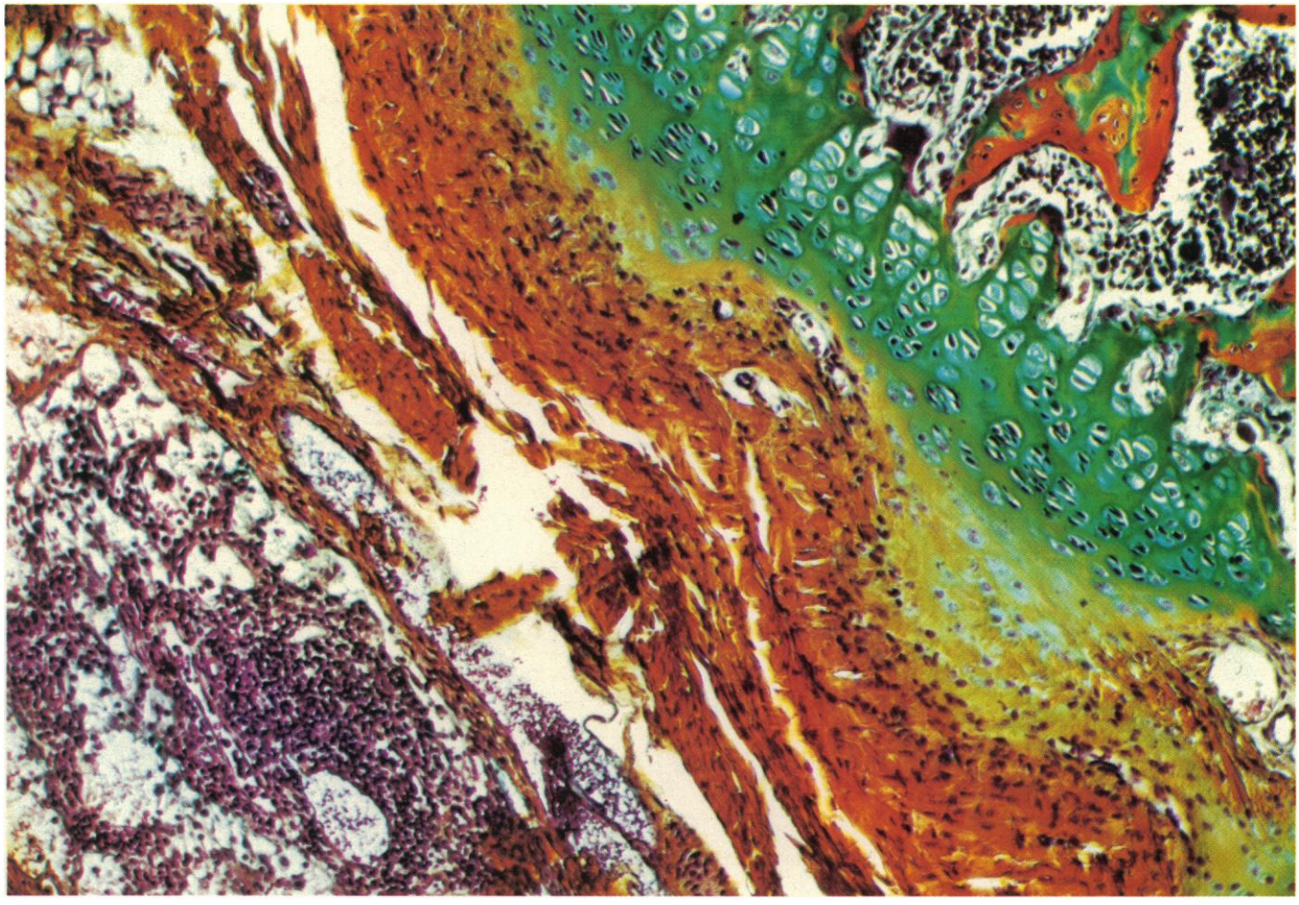
7–9. American Assoc. of **Genito-Urinary Surgeons**, Pebble Beach, Calif. (H. M. Spence, 4105 Live Oak St., Dallas, Tex. 75221)

7–10. American Assoc. for **Child Care in Hospitals**, Ann Arbor, Mich. (D. E. Lidgard, University Hospital, Univ. of Michigan Medical Center, Ann Arbor 48104)

7–10. Association of **University Radiologists**, San Francisco, Calif. (A. Gottschalk, 950 E. 59 St., Chicago, Ill. 60037)

8–10. **Breast Cancer**, natl. conf., Washington, D.C. (R. N. Grant, The Conference, 219 E. 42 St., New York 10017)

8–10. American Assoc. for the **History of Medicine**, Baltimore, Md. (C. W. Bode-



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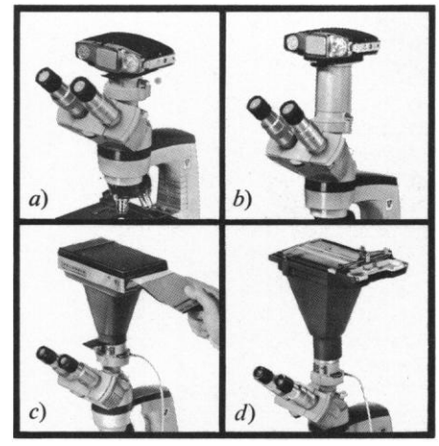

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mer, Biomedical History Dept., Univ. of Washington Medical School, Seattle 98105)

8–9. **Military History**, 3rd symp., U.S. Air Force Academy, Colo. (Lt. Col. W. Geffen, Dept. of History, U.S. Air Force Academy, Colo. 80840)

9–10. **Arthritis** Seminar, Roanoke, Va. (R. H. Brumfield, Jr., P.O. Box 1531, Roanoke, 24007)

9–10. American Natl. **Red Cross**, 2nd research symp., Washington, D.C. (G. A. Jamieson, American Natl. Red Cross, Washington, D.C. 20006)

11–14. **Fluid Controls** Inst., Inc., Sea Island, Ga. (P.O. Box 1485, Pompano Beach, Fla. 33061)

11–15. Institute of **Food Technologists**, 29th, Chicago, Ill. (C. L. Willey, 221 N. Lasalle St., Chicago 60601)

12–14. American Soc. for **Gastrointestinal Endoscopy**, Washington, D.C. (V. M. Smith, 301 St. Paul Pl., Baltimore, Md. 21202)

12–14. Workshop on **Computer Stimulation of Microbial Processes**, Clemson, S.C. (Office of Industrial and Municipal Relations, College of Engineering, 109 Riggs Hall, Clemson 29631)

12–15. Seminar on **Physical and Chemical Properties of Woodpulp Fibers**, Appleton, Wis. (Technical Assoc. of the Pulp and Paper Industry, 360 Lexington Ave., New York. N.Y.)

12–15. Mid-America Symp. on **Spectroscopy**, 20th, Chicago, Ill. (Illinois Inst. of Technology Research Inst., 10 W. 35 St., Chicago, 60616)

12–15. American **Urological** Assoc., Inc., San Francisco, Calif. (W. P. Didusch, 1120 N. Charles St., Baltimore, Md.)

12–16. American **Industrial Hygiene** Conf., Denver, Colo. (The Association, 14125 Prevost, Detroit, Mich. 48227)

12–16. Soc. of **Photographic Scientists and Engineers**, Los Angeles, Calif. (The Society, 1330 Massachusetts Ave., NW, Washington, D.C. 20005)

12–17. American Assoc. on **Mental Deficiency**, San Francisco, Calif. (J. J. Noone, 5201 Connecticut Ave., NW, Washington, D.C. 20015)

13–16. Society for **Experimental Stress Analysis**, Philadelphia, Pa. (P. Monchamp, 21 Bridge Sq., Westport, Conn. 06880)

14–16. Spring Joint **Computer** Conf., Boston, Mass. (A. Levine, 105 Newbury St., Boston 02116)

14–16. American **Helicopter** Soc., 25th, natl. forum, Washington, D.C. (K. C. Mard, Sikorsky Aircraft, North Main St., Stratford, Conn. 06497)

14–17. American **Gastroenterological** Assoc., Washington, D.C. (D. Cayer, 2240 Cloverdale Ave., Winston-Salem, N.C. 27103)

14–17. Society of **Technical Writers and Publishers**, 16th, Washington, D.C. (C. T. Youngblood, Suite 421, 1010 Vermont Ave., NW, Washington, D.C. 20005)

15–16. Southern **Textile Research** Conf., Hilton Head Island, S.C. (G. F. Walz, Proximity Print Works, Greensboro, N.C. 27405)

16. Symp. on **Oil Pollution of the Sea**, Cambridge, Mass. (J. A. Fay, Room 30246, Massachusetts Inst. of Technology, Cambridge 02139)

16–17. **Nature and Function of Peroxisomes**, New York, N.Y. (J. F. Hoff, Dept. of Chemistry, Queens College, Flushing, N.Y. 11367)

18–19. Council of **Biology Editors**, Cambridge, Mass. (R. E. Gordon, Dean's Office, College of Science, Univ. of Notre Dame, Notre Dame, Ind. 46556)

18–21. Institute of Electronic and Electrical Engineers **Power Industry Computer Applications** Conf., Denver, Colo. (W. D. Trudgen, General Electric Co., 2255 W. Desert Cove Rd., Phoenix, Ariz. 85029)

18–21. **Radiation Research** Soc., 17th, Cincinnati, Ohio. (F. Smith, Biology Dept. American Univ., Washington, D.C. 20016)

18–21. American **Thoracic** Soc., Miami Beach, Fla. (Executive Secretary, 1790 Broadway, New York 10019)

18–22. National **Tuberculosis** Assoc., 65th, Miami Beach, Fla. (J. E. Perkins, 1790 Broadway, New York 10019)

18–23. Conf. on **Mass Spectrometry and Applied Topics**, 17th, Dallas, Tex. (J. M. McCrea, c/o Applied Research Lab., U.S. Steel Corp., Monroeville, Pa. 15146)

19–20. **Rolamite Technology** Seminar, Chicago, Ill. (J. Weidman, III, Director of Public Relations, Hamilton Watch Co., Lancaster, Pa. 17604)

19–21. **Aerospace Electronics** Conf., Dayton, Ohio. (J. E. Singer, 5704 Coach & Four Dr. East, Kettering, Ohio 45440)

19–21. **Interdisciplinary** Conf., 1st, Houston, Tex. (M. A. Wright, Humble Oil and Refining Company, Box 2180, Houston 77001)

19–21. **New Dimensions in Legal and Ethical Concepts for Human Research**, New York, N.Y. (I. Ladimer, Mt. Sinai Medical School, Fifth Ave. and 100 St., New York 10029)

19–23. Western **Anesthesiology** Conf., Salt Lake City, Utah. (J. Stringham, 11 S. 5th E., Salt Lake City 84106)

19–30. Selected **Applications of Computers in Engineering**, Ann Arbor, Mich. (Engineering Summer Conf., Univ. of. Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

19–30. **Numerical Methods, Optimization Techniques, and Process Simulation for Engineeers**, Ann Arbor, Mich. (Engineers Summer Conf., Univ. of Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

20. Association for the Advancement of **Psychoanalysis**, New York, N.Y. (M. Lee, Public Relations Committee, The Association, 329 E. 62 St., New York 10021)

21–23. Symp. on **Electron, Ion, and Laser Beam Technology**, Gaithersburg, Md. (L. Marton, Natl. Bureau of Standards, Washington, D.C. 20234)

21–24. **Acute Medicine**, 3rd symp., Pittsburgh, Pa. (Postgraduate Medical Program, Univ. of Pittsburgh, 1188 Scaife Hall, Pittsburgh 15213)

22–23. IEEE Workshop on **Applied Magnetics**, Washington, D.C. (O. Kiltie, Ballastran Corp., Executive Blvd., Fort Wayne, Ind. 46808)

22–23. **Diseases in Nature Transmissible to Man**, 19th southwestern conf., San Antonio, Tex. (S. S. Kalter, P.O. Box 2296, San Antonio 78206)

24–26. National **Tuberculosis and Respiratory Disease** Assoc., Miami Beach, Fla. (J. E. Perkins, The Association, 1740 Broadway, New York 10019)

25–27. **Drug Information** Assoc., Detroit, Mich. (J. J. Harris, Public and Professional Relations Committee, c/o Schering Labs, 1011 Morris Ave., Union, N.J. 07083)

25–29. National Conf. on **Social Welfare**, 96th, New York, N.Y. (B. B. Shepherd, The Conference, 22 West Gay St., Columbus, Ohio 43215)

26–27. **Rheumatoid Factors**, New York, N.Y. (H. Bartfeld, St. Vincent's Hospital, 153 W. 11 St., New York 10011)

26–28. Symp. on Advances in Instrumentation for **Air Pollution Control**, Cincinnati, Ohio. (A. P. Altshuller, Natl. Air Pollution Control Administration, 5710 Wooster Pike, Cincinnati 45227)

26–28. IEEE Conf. on **Laser Engineering and Applications**, Washington, D.C. (W. B. Bridges, Hughes Research Labs., 3011 Malibu Canyon Rd., Malibu, Calif. 90265)

26–28. Advanced **Marine Vehicle and Propulsion** Mtg., Seattle, Wash. (C. T. Ray, Advanced Marine Systems, Boeing Co., P.O. Box 3999, Mail Stop 32-51, Seattle, Wash. 98124)

26–28. American **Ophthalmological** Soc., Hot Springs, Va. (S. D. McPherson, Jr., 1110 W. Main St., Durham, N.C. 27701)

29–1. Congress on Medical and Related Aspects of **Motor Vehicle Accidents**, New York, N.Y. (Secretariat, Internatl. Assoc. for Accident and Traffic Medicine, 520 First Ave., New York 10016)

International and Foreign Meetings

May

26–30. **Spectroscopy**, 15th intern. colloquium, Madrid, Spain. (Secretary, XV Colloquium Spectroscopium Internationale, Serrano 119, Madrid 6)

27–31. International Assoc. of **Thalassotherapy**, 14th, Eforie Nord, Roumania. (Prof. Binculescu, Strada Transilvaniei 47, Bucharest, Roumania)

27–1. German Congr. for **Medical Continuation Studies**, 18th, Berlin. (Kongressgesellschaft fur Artliche Fortbildung, Klingsortstr. 21, Berlin 41)

28–7. **Pro Aqua** Congr., 4th, Basel, Switzerland. (O. Jaag, % Secretariat Pro Aqua, Basel 21)

29–3. International Assoc. for **Accident and Traffic Medicine**, 3rd, New York, N.Y. (M. Helpern, % Office of Chief Medical Examiner, 520 First Ave., New York 10016)

29–19. General Assembly of Pan-American Inst. of **Geography and History**, Washington, D.C. (C. A. Forray Rojas, Ex-Arzobispado 29, Mexico, D.F. Mexico)

June

1–12. Symposium on **Non-Destructive Testing of Concrete and Timber**, London, England. (Institution of Civil Engineers, Great George St., London, S.W.1)

2–6. International Symp. on **Yeasts**, Delft and The Hague, Netherlands. (L. Rodrigues de Miranda, Organizing Committee, Julianalaan 67A, Delft)

3–13. International Conf. on **Arid Lands in a Changing World**, Tucson, Ariz. (International Arid Lands Conf., % Dept. of Geochronology, Univ. of Arizona, Tucson 85721)

4–6. **Automated Analysis,** intern. congr., Chicago, Ill. (J. E. Golin, Technicon Corp., Ardsley, N.Y. 10502)

4–7. Union of Textile **Chemists and Colorists,** 21st congr., Baden-Baden, Germany. (The Union, Rohsbacherstr. 78, Heidelberg, Germany)

5. European Federation of International College of **Surgeons,** London, England. (F. P. Fitzgerald, 129 Harley St., London, W.1)

5–7. **Mineralogical** Assoc. of Canada, Montreal, P.Q. (J. Beland, Dept. of Geology, Univ. of Montreal, Montreal)

5–11. **Forensic Sciences,** 5th intern., Toronto, Ont., Canada. (L. Ball, Center of Forensic Sciences, Dept. of Attorney General, 8 Jarvis Street, Toronto 2)

6–9. Canadian **Pediatric** Soc., Montreal, P.Q. (J. H. V., Marchessault, 14 Green Ave., St. Lambert, Quebec City, P.Q.)

8–14. Canadian **Medical** Assoc., 102nd, Toronto, Ont., Canada. (The Association, 170 St. George Street, Toronto, Canada)

9–11. International **Communications** Conf., Boulder, Colo. (M. Nesenbergs, Environmental Science Services Administration, Inst. for Telecommunication Sciences, R614, Boulder 80302)

9–12. International **Food** Congr. and Exhibition, 7th, Madrid, Spain. (L. Naranon, % Federacion Nacional de Almacenistas de Alimentacion, Paseo del Prado 18–20, Planta 11, Madrid)

9–13. **Clean Air** Congr. and Exhibition, Dusseldorf, Germany. (V. Deutscher, Postfach 1139, 4 Dusseldorf 1)

9–14. Canadian Assoc. of **Pathologists,** Toronto, Ont., Canada. (D. W. Penner, Winnipeg General Hospital, Winnipeg 3, Manitoba)

10–20. International **Marine and Shipping** Conf., London, England. (Inst. of Marine Engineers, 76 Mark Lane, London, E.C.3)

11–13. Canadian Federation of **Biological Societies** (Canadian Physiological Soc., Pharmacological Soc. of Canada, Canadian Assoc. of Anatomists, Canadian Biochemical Soc.), 12th, Edmonton, Alberta. (A. H. Neufeld, Univ. of Western Ontario, London, Ont., Canada)

11–14. Canadian **Psychiatric** Assoc., 19th, Toronto, Ont. (W. A. Blair, 225 Lisgar St., Ottawa, Ont.)

14–20. Canadian Assoc. of **Gastroenterology,** 8th, Toronto, Ont. (The Association, 426 170 St. George St., Toronto 5)

15–18. **Chemical** Inst. of Canada, 19th, Montreal, P.Q. (The Institute, 151 Slater St., Ottawa 4, Ont.)

15–20. Canadian **Anaesthetists** Soc., 20th, Toronto, Ont. (E. R. Campbell, 178 St. George St., Toronto 5)

15–20. International **Data Processing** Conf., Montreal, Canada. (M. Rafferty, Data Process Managing Assoc., 505 Busse Highway, Park Ridge, Ill. 60068)

15–22. World **Medical** Assoc., 23rd, Paris, France. (M. Poumailloux, Domus Medica, 60 Blvd. de Labour-Maubourg, Paris 15)

16–18. **Thermophysics** Conf., 4th, San Francisco, Calif. (E. R. Streed, Vehicle Systems Design Branch, NASA Ames Research Center, N244-6, Moffett Field, Calif. 94035)

16–21. Triennial Congr. of Intern. Federation of **Automatic Control,** Warsaw, Poland. (Organizing Committee, Ul Czackiego 3/5, P.O. Box 903, Warsaw 1)

BOOKS RECEIVED

(*Continued from page 417*)

Anopheline Mosquitoes of Malaya and Borneo. J. A. Reid. Government of Malaysia, 1968 (available from Embassy for Malaysia, Washington, D.C.). xiv + 520 pp., illus. Cloth, $15; paper, $10. Studies from the Institute for Medical Research, No. 31.

Another Look at Atlantis. And Fifteen Other Essays. Willy Ley. Doubleday, Garden City, N.Y., 1969. x + 230 pp., illus. $5.95.

Applied Mathematics for Engineering and Science. Waris Shere and Garden Love. Prentice-Hall, Englewood Cliffs, N.J., 1969. xvi + 672 pp., illus. $10.95. Prentice-Hall Series in Technical Mathematics.

Aromatic Character and Aromaticity. G. M. Badger. Cambridge University Press, New York, 1969. viii + 136 pp., illus. Cloth, $6; paper, $1.95. Cambridge Chemistry Textbook Series.

Around the World. A View from Space. Rand McNally, Chicago, 1969. 128 pp., illus. $4.95.

Background Studies in Science Policy. Projections of R & D Manpower and Expenditure. R. W. Jackson, D. W. Henderson, and B. Leung. Science Council of Canada, Ottawa, 1969 (available from the Queen's Printer, Ottawa). x + 86 pp., illus. Paper, $1.25. Special Study No. 6.

Basic Equations and Special Functions of Mathematical Physics. V. Ya. Arsenin. Translated from the Russian edition by S. Chomet. S. Doniach, English Transl. Ed. Iliffe, London; Elsevier, New York, 1969. viii + 364 pp., illus. $13.50.

Battelle Rencontres. 1967 Lectures in Mathematics and Physics. Cecile M. DeWitt and John A. Wheeler, Eds. Benjamin, New York, 1968. xviii + 558 pp., illus. $14.50.

The Behavior and Physiology of Pinnipeds. R. J. Harrison, Richard C. Hubbard, Richard S. Peterson, Charles E. Rice, and Ronald J. Schusterman, Eds. Appleton-Century-Crofts, New York, 1968 xvi + 412 pp., illus. $12.

Bibliography of New Guinea Entomology. J. L. Gressit and J. J. H. Szent-Ivany. Entomology Department, Bernice P. Bishop Museum, Honolulu, 1968. 674 pp. Cloth, $12.50; paper, $11.50. Pacific Insects Monograph 18.

Bibliography of the History of Technology. Eugene S. Ferguson. Society for the History of Technology, Cleveland; M.I.T. Press, Cambridge, 1968. xx + 348 pp. $12.50. Society for the History of Technology Monograph Series, No. 5.

The Biology of Marine Mammals. Harold T. Anderson, Ed. Academic Press, New York, 1969. xiv + 514 pp., illus. $21.50.

The Biosynthesis of Deoxyribose. Peter Reichard. Wiley, New York, 1968. x + 82 pp., illus. $7.95. Ciba Lectures in Microbial Biochemistry.

Body Composition in Animals and Man. Proceedings of a symposium, Columbia, Mo., 1967. National Acad. of Sciences, Washington, D.C., 1968. viii + 524 pp., illus. $13. NAS Publication 1598.

Boolean Methods in Operations Research and Related Areas. Peter L. Hammer (Ivănescu) and Sergiu Rudeanu.

Springer-Verlag, New York, 1968. xvi + 332 pp., illus. $11.50. Econometrics and Operations Research, vol. 7.

Bureaucracy in Education. James G. Anderson. Johns Hopkins Press, Baltimore, 1968. xxii + 218 pp., illus. $7.

Calculus II. Albert A. Blank with the assistance of Florence L. Elder and Clarence W. Leeds III. Houghton Mifflin, Boston, 1969. x + 294 pp., illus. $6.25.

Calculus with Analytic Geometry. Paul K. Rees and Fred W. Sparks. McGraw-Hill, New York, 1969. xiv + 626 pp., illus. $10.95.

Cell Structure. An Introduction to Biological Electron Microscopy. Peter G. Toner and Katharine E. Carr. Williams and Wilkins, Baltimore, 1968. xii + 192 pp., illus. $10.75.

Champ Cristallin et Luminescence. Applications de la Théorie des Groupes à la Luminescence Cristalline. Daniel Curie. Gauthier-Villars, Paris, 1968. viii + 364 pp., illus. Paper, 68 F. Monographies de Chimie Physique.

Chemistry Problems and How To Solve Them. Paul R. Frey. Barnes and Noble, New York, ed. 7, 1969. xvi + 288 pp., illus. Paper, $1.95. College Outline Series.

Circuit Design of Digital Computers. Joseph K. Hawkins. Wiley, New York, 1968. xii + 516 pp., illus. $17.50.

A Classification of the Major Groups of Human and Other Animal Viruses. Burton I. Wilner. Burgess, Minneapolis, ed. 4, 1969. x + 250 pp., illus. $7.50.

Clinical Interpretation of Laboratory Tests. Raymond H. Goodale and Frances K. Widmann. Davis, Philadelphia, ed. 6, 1969. xii + 568 pp., illus. $11.50.

Clinical Toxicology of Commercial Products. Acute Poisoning. Marion N. Gleason, Robert E. Gosselin, Harold C. Hodge, and Roger P. Smith. Williams and Wilkins, Baltimore, ed. 3, 1969. xii + 1539 pp., illus. $24.50.

Comparative Nutrition of Wild Animals. Proceedings of a symposium, London, 1966. M. A. Crawford, Ed. Published for the Zoological Society of London by Academic Press, New York, 1968. xxii + 430 pp., illus. $19.50. Symposia of the Zoological Society of London, No. 21.

Composition of Peripheral Nerves. Ian A. Boyd and Mary R. Davey. Livingstone, Edinburgh, 1968 (U.S. distributor, Williams and Wilkins, Baltimore). viii + 58 pp., illus. + 4 plates. $7.50.

Comprehensive Index of API44-TRC Selected Data on Thermodynamics and Spectroscopy. Thermodynamics Research Center, Texas A & M University, College Station, 1968. xx + 508 pp. Paper, $14. TRC Publication 100.

A Critique of Relativity. Jonas Šepetys. Philosophical Library, New York, 1968. 64 pp., illus. $3.50.

Cultural Chronology of the Gulf of Chiriqui, Panama. Olga Linares de Sapir. Smithsonian Institution Press, Washington, D.C., 1968 (available from the Superintendent of Documents, Washington, D.C.). xvi + 120 pp., illus. + 20 plates. $4.50. Smithsonian Contributions to Anthropology, vol. 8.

Dental Biochemistry. Eugene P. Lazzari, Ed. Lea and Febiger, Philadelphia, 1968: x + 222 pp., illus. $8.50.

Desert Biology. Special Topics on the Physical and Biological Aspects of Arid

Regions. Vol. 1. G. W. Brown, Jr., Ed. Academic Press, New York, 1968. xviii + 638 pp., illus. $29.50.

Diodes, Transistors, and Integrated Circuits for Switching Systems. Robert Lyon-Caen. Translated from the French edition (Paris, 1965) by R. N. McDonough. Academic Press, New York, 1968. xiv + 400 pp., illus. $19.50. Electrical Science Series.

Elements of Biological Science. William T. Keeton. Illustrated by Paula DiSanto Bensadoun. Norton, New York, 1969. xiv + 592 pp. $7.95.

Enzymes—The Agents of Life. David M. Locke. Crown, New York, 1969. viii + 248 pp., illus. $5.95.

Epoxy Resin Technology. Paul F. Bruins, Ed. Interscience (Wiley), New York, 1968. x + 286 pp., illus. $16.50. Polymer Engineering and Technology.

Ergodic Problems of Classical Mechanics. V. I. Arnold and A. Avez. Benjamin, New York, 1968. x + 294 pp., illus. Cloth, $14.75; paper, $6.95. Mathematical Physics Monograph Series.

The Essential Writings of Erasmus Darwin. Desmond King-Hele, Ed. Hillary House, New York, 1969. 224 pp. + 16 plates. $7.

Eternal Quest. The Story of the Great Naturalists. Alexander B. Adams. Putnam, New York, 1969. 512 pp. + 16 plates. $10.95.

Excitons in Molecular Crystals. Theory and Applications. D. P. Craig and S. H. Walmsley. Benjamin, New York, 1968. xiv + 178 pp., illus. $12.95.

Exercise and Altitude. Ernst Jokl and Peter Jokl, Eds. Karger, Basel, 1968. viii + 200 pp., illus. $13.90. Medicine and Sport, vol. 1.

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