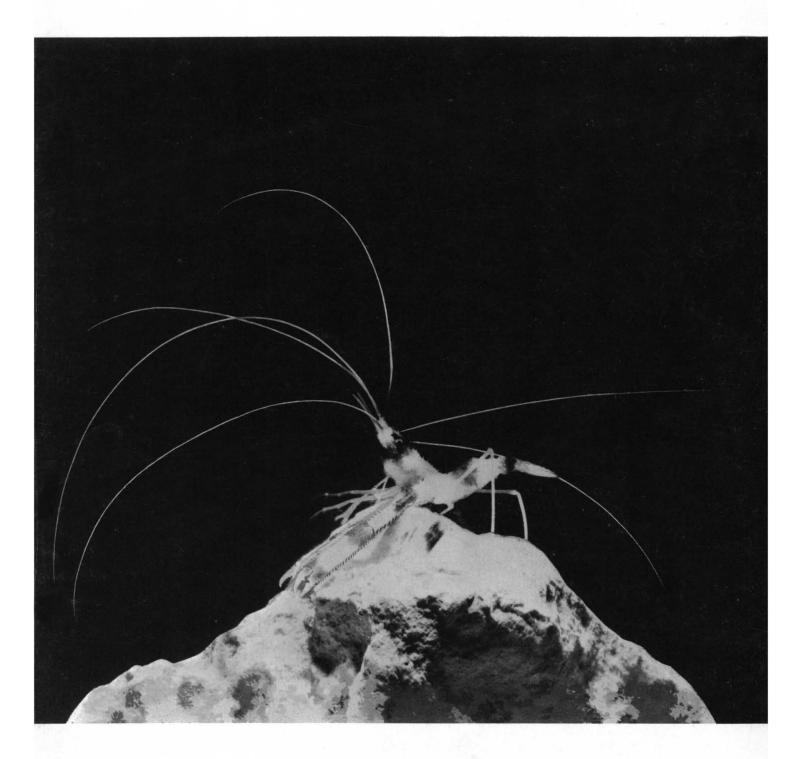


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Proceedings Issue

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Another important point: our MM-1 Focused Mesh Particle Multiplier forms a surprisingly compact, compatible, *complete system* when combined with our PAD-1 Fast Precision Pre-amplifier-Amplifier-Discriminator and our HV-2 High Voltage Power Supply. A brief description of all three components of this system comes next.

MM-1 Focused Mesh Particle Multiplier (Patented)

This is a high-gain, twenty-stage structure about one fourth as long as typical multipliers (we show it above in its actual size: 2" diameter by $1\frac{1}{4}$ " long). The MM-1 is also bakeable (max. 400° C in vacuum), lightweight ($2\frac{1}{2}$ oz.), rugged (has func-

tioned in missiles in flight), and has a fast output rise time. It comes complete with integral voltage divider chain.

PAD-1 Fast Precision

Pre-amplifier-Amplifier-Discriminator

PAD-1 is a transistorized, charge-sensitive, low-noise device with a signal delay time of less than 15 nanoseconds and an output pulse of four volts at 50 ohms with a rise time of less than 5 nanoseconds. The discriminator has exceptionally low jitter for timing applications. The unit is compact (only 4" long by 2" wide by $1\frac{1}{2}$ " high) for mounting in close proximity to the MM-1.

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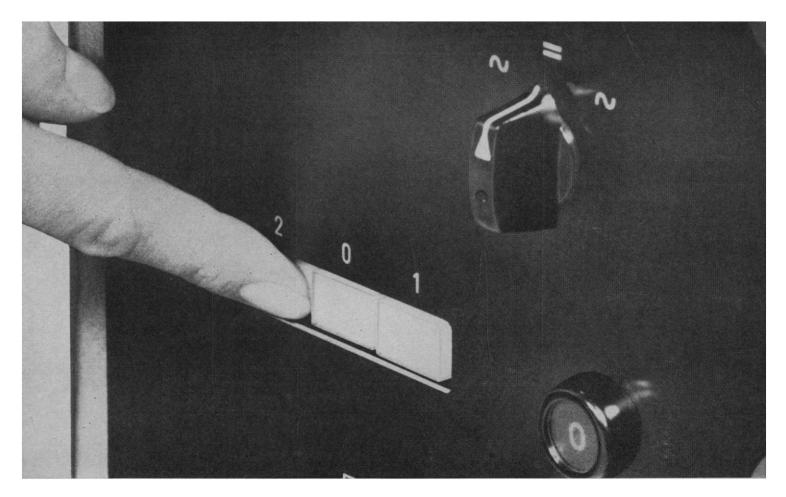
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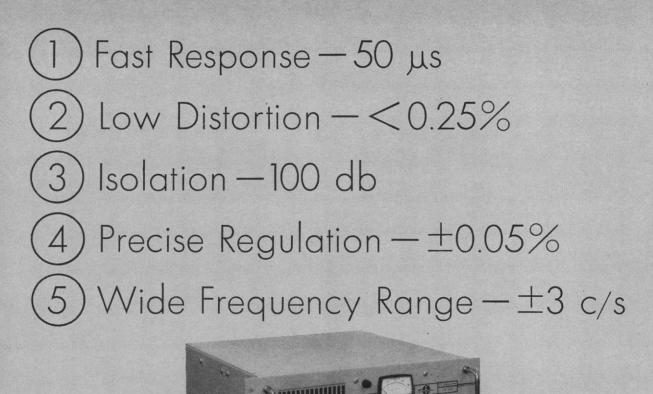
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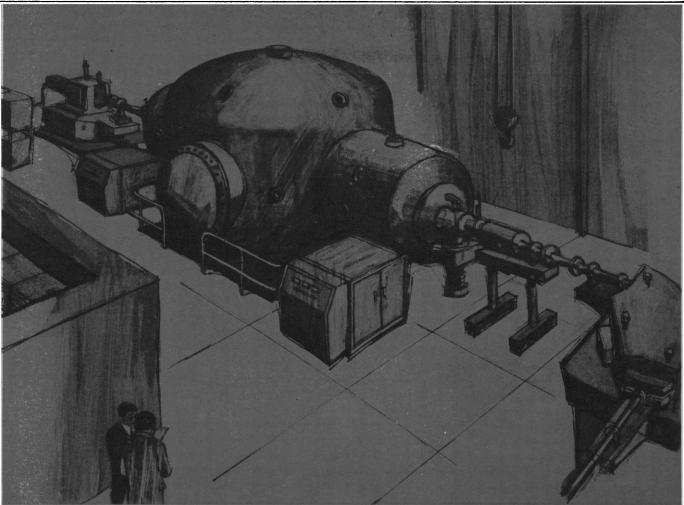
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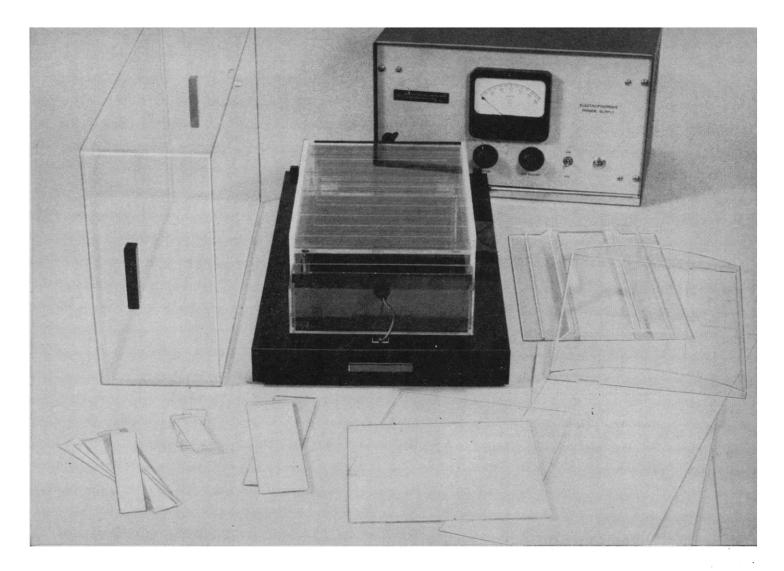
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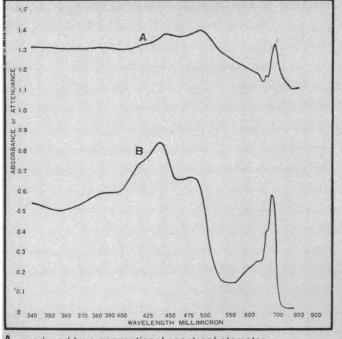
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An important feature is the double detection system, utilizing two large end-on photomultiplier tubes located in close proximity to the sample and reference cells. This configuration increases greatly the fraction of light incident upon the photomultiplier, permitting the analysis of highly turbid media.

An equally important feature is a microspectrophotometric attachment (shown mounted on instrument) that utilizes reflecting optics, and has its own separate detector and baseline adjusting system. This accessory provides unique capabilities, e.g., it permits scanning a single red blood cell as it is moved across a light beam of fixed wavelength, or recording the absorption of a portion of a cell as the wavelength is varied. Compare These Absorption Spectra of a Suspension of Chlorella Cells

Shimadzu MPS-50 with microspectrophotometric attachment

FEATURES:

- Baseline compensation over the entire range (190 mμ to 2500 mμ) by easily adjustable potentiometers
- Makes possible the measurement of high absorbance values (A = 0 5)
- Records difference spectra on an expanded absorbance scale (A = 0.2)
- Accessories are available for microspectrophotometry, derivative spectrophotometry, chromatogram scanning, double-beam fluorometry, absolute turbidimetry, photometric titration, flow dichromism, etc.

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The Shimadzu Model MPS-50 Spectrophotometer is distributed exclusively in North America by the American Instrument Co., Inc. To arrange for a demonstration and/or demonstration sample analysis contact the Analytical Instruments Applications Laboratory at Aminco.

Write Aminco to receive literature describing the MPS-50 in full detail.



AMERICAN INSTRUMENT CO., INC.

8030 Georgia Avenue, Silver Spring, Maryland 20910

SCIENCE, VOL. 155

he 400-toot bolex

So many people have told us that our Rex-4 16mm camera takes such great pictures, we hated to see them stop shooting. Even if it was just to reload.

That's why we decided to create the 400-foot Bolex.

We simply designed the Rex-5 so that it accommodated our 400-foot magazine. And we did it without upsetting a hair of the precision'and versatility of the traditional Bolex 16.

In fact, we made 400-foot cameras more manageable.

Our magazine is lighter and adds very little bulk or weight to the camera.

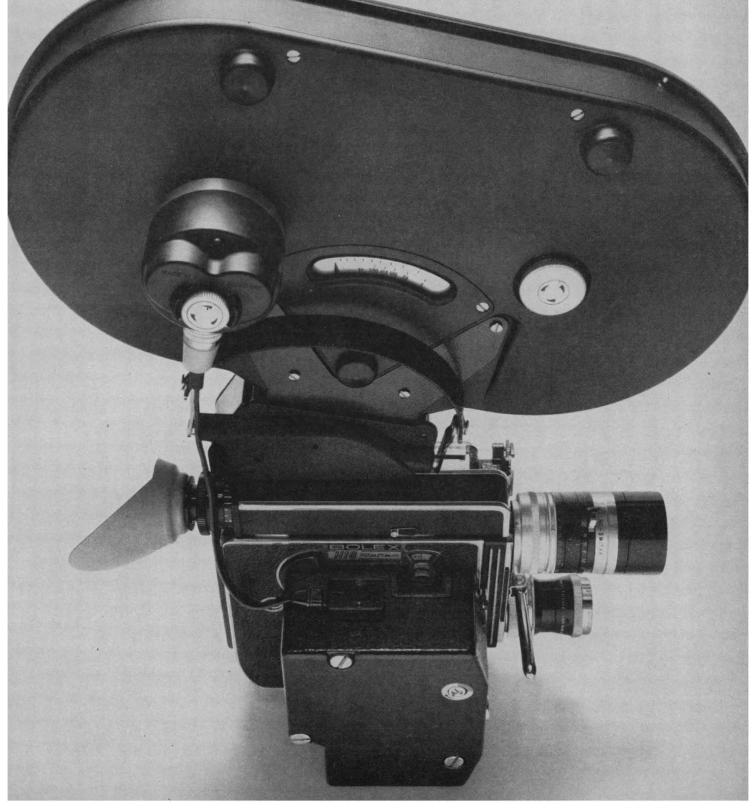
Our separate interchangeable take-up motor lets you carry

three or four extra magazines without breaking your back. (It also lets you buy them without denting your wallet.) Our electric grip makes "hand-held" filming easier on the hands.

The 400-foot Bolex comes equipped with a sync-sound motor and lightweight rechargeable power pack. You can also build it into the most complete system you can buy. With prime lenses from 10mm to 150mm. Macrotelephotos. A full range of zooms, including automatic zoom. And anything else you can think of. (You can even use it as a 100-footer.)

Think about it. With the 400-foot Bolex, you might even plan to film your next spectacular non-stop.

For free 16 page Industrial or Medical Bulletin and 16mm Bolex catalogue, write Paillard Inc., 1900 Lower Road, Linden, New Jersey 07036.



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DIGITAL started time-sharing some time ago. With the PDP-6. Hardware and software. PDP-10 is our second step.

PDP-10

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When the PDP-10 hardware arrives in September (five versions, five software packages, upwards compatible, truly modular), it will be more than cabinets filled with electronics. It will be a working, problem-solving, 36-bit word, 1 μ sec, expandable, scientifically oriented computing system with memory from 8 to 262 thousand words.

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Disc swapping. Batch processing. And in the hardware, 365 powerful instructions. 16 general purpose registers. 7 fully nested interrupt levels. 16 accumulators. 15 index registers. High speed multiplexer channels. 64 programmed operators. Modular mnemonics. Flexible I/O bus structure. Programmed priority-interrupt system. All 16 Boolean operations, each in four modes.

PDP-10 is big. Powerful. In the several million dollar class just a few years ago. But it's little, too. Little enough for a scientist to put the system on-line with his experiment as his personal research tool. Little enough for a physics department with time-sharing needs. And little in price, too. Nearest competitor wants 50% more. Write.



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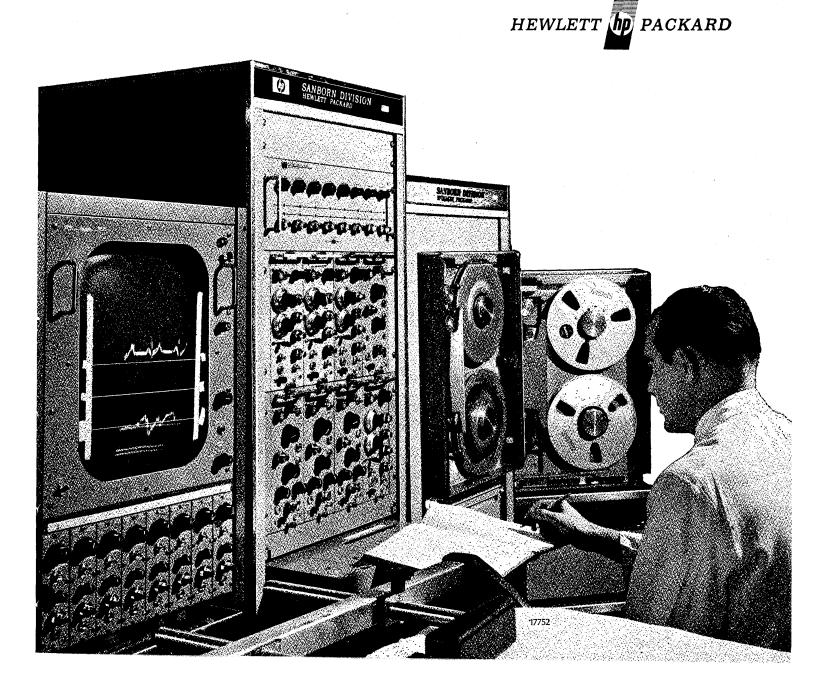
Think what you may want to measure <u>tomorrow</u>

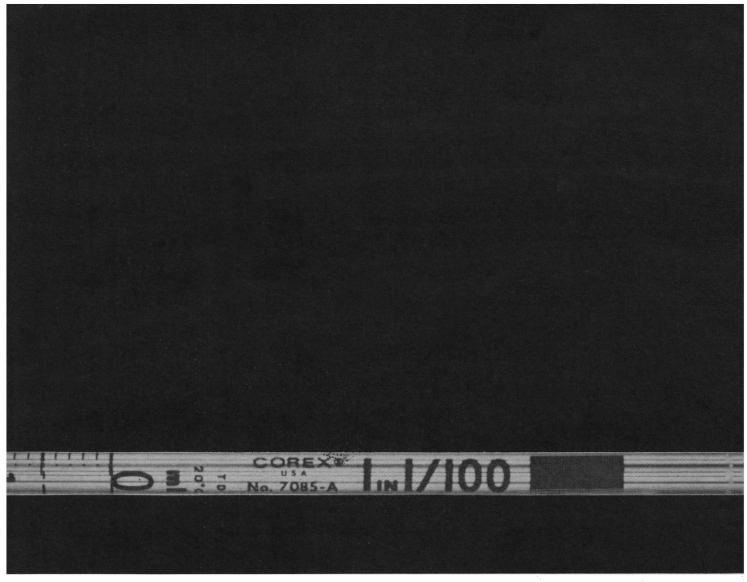
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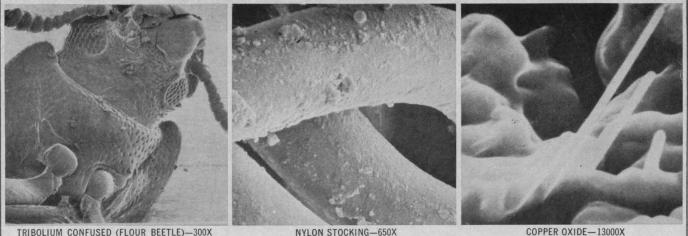
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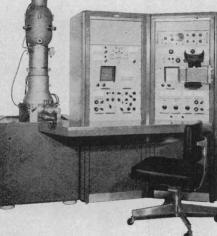
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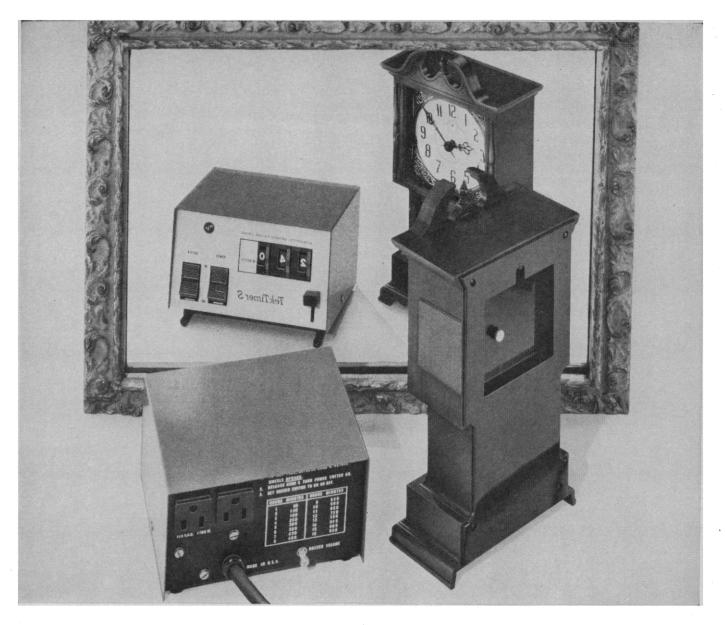
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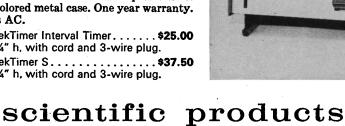
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quality, vibration-free photomicrographic negatives, prints and projection slides, as well as movies, in color or black-and-white.

It has a built-in electric eye system which virtually eliminates the uncertainties of exposure determination, reducing the entire operation to an almost automatic procedure.

The "eye," a sensitive CdS cell, measures the aggregate light passing through the specimen. It is coupled to the shutter speed selector ring and a meter needle. As the ring is rotated, the needle moves. The correct setting is indicated when the needle is centered, at which point the exposure is made.

The EFM accepts Nikon F and Nikkormat camera bodies, and the Nikon M-35 camera back. It can be adapted for use with other 35mm cameras, as well. Three large-format camera backs are also available: a Graflok back

which accepts 4 x 5 film pack and sheet film holders, a 120 roll film back for 21/4 x 31/4, and the Polaroid M-100 back for making instant 31/4 x 41/4 photomicrographs.

Another unique and ingenious accessory for the EFM, known as the EFM Bicam Adapter, permits two 35mm camera bodies or two M-35 camera backs to be mounted in tandem. One may be loaded with color and the other with black-and-white, or with any other two emulsion types desired. A rotating, internal prism reflects the image rays into one camera body or the other, permitting both to be exposed in guick succession with minimum lapse of time.

The EFM is also applicable to cine-photomicrography. It is equipped with interchangeable relay lenses for the various formats. A finder telescope is furnished for focusing and orienting the specimen image in the picture area.

For complete details, write: Nikon Inc., Instrument Division, Subsidiary of Ehrenreich Photo-Optical Industries, Inc. Garden City, N.Y. 11533

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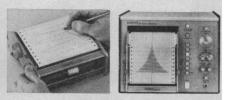
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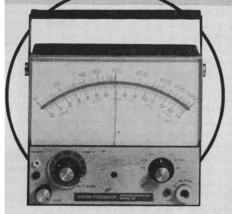
Continuous millivolt readings are taken without polarity switching, range selection or scale interpolation. Polarity indication is automatic.

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Digital Output: 8-4-2-1 binary-coded decimal true and complementary; 5 v nominal level; 4 bit code indicates function, sign, over or under range. Input for computation inhibit



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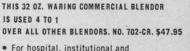
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SCIENCE, VOL. 155



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17 FEBRUARY 1967

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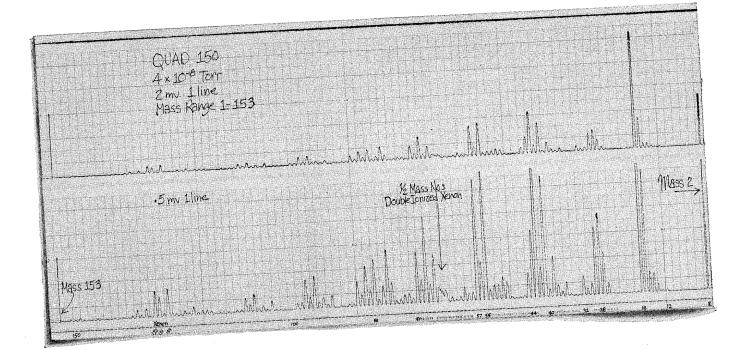
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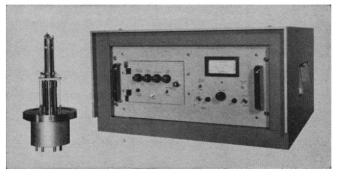
* Resolution is defined as two peaks, one mass unit apart, and of equal height, and with a valley between them with a depth of 90% of the neight of the peaks.

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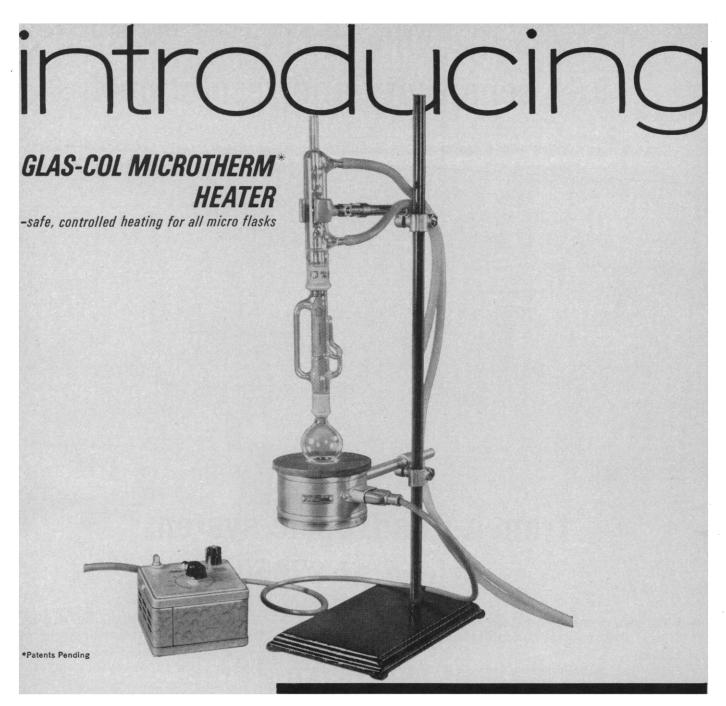
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17 FEBRUARY 1967



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SCIENCE, VOL. 155

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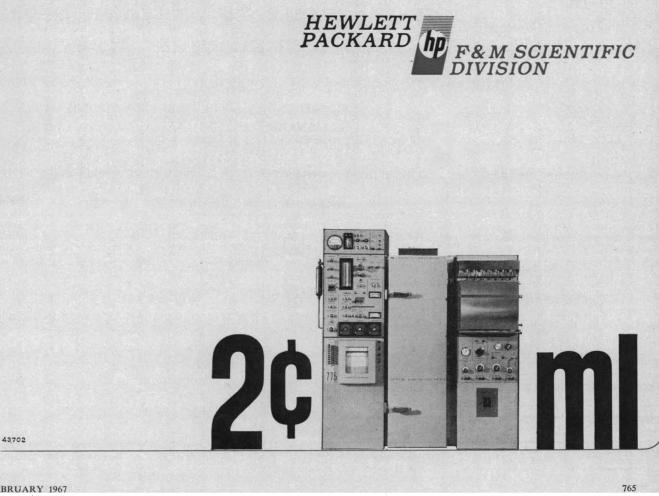
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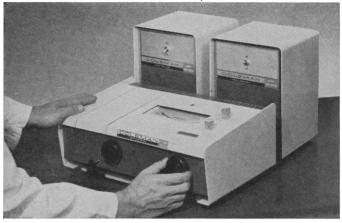
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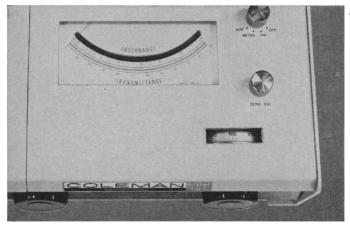
17 FEBRUARY 1967

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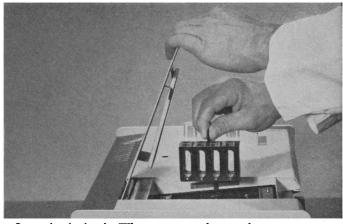


New Coleman Model 101 Hitachi Spectrophotometer covers the range from 220 to 900 m μ , where 95% of all analytical spectrophotometric data is obtained. Its photometric accuracy and stray light characteristics are the equal of instruments costing twice as much.

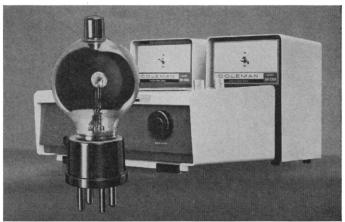


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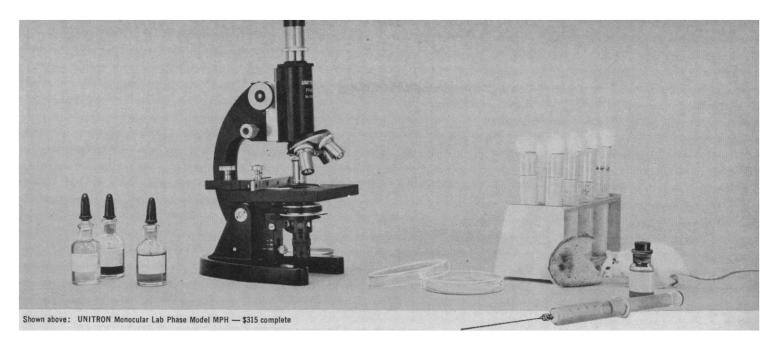
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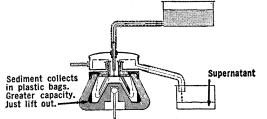


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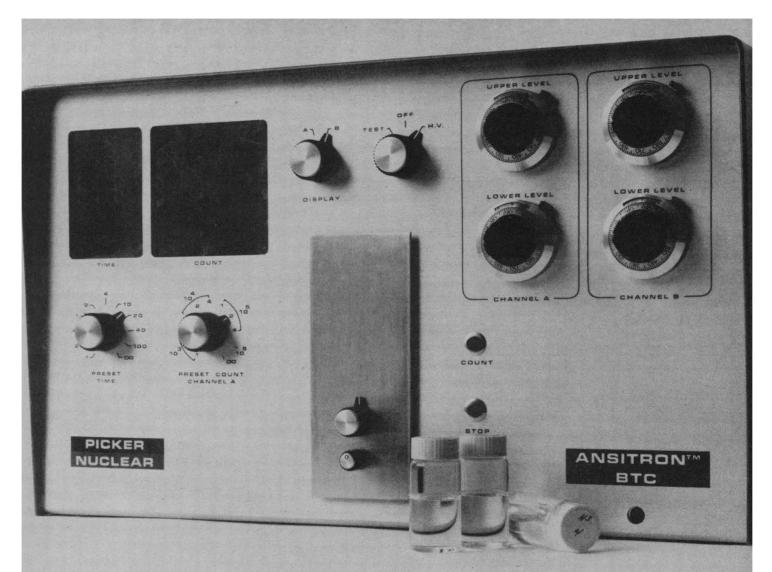
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SCIENCE, VOL. 155



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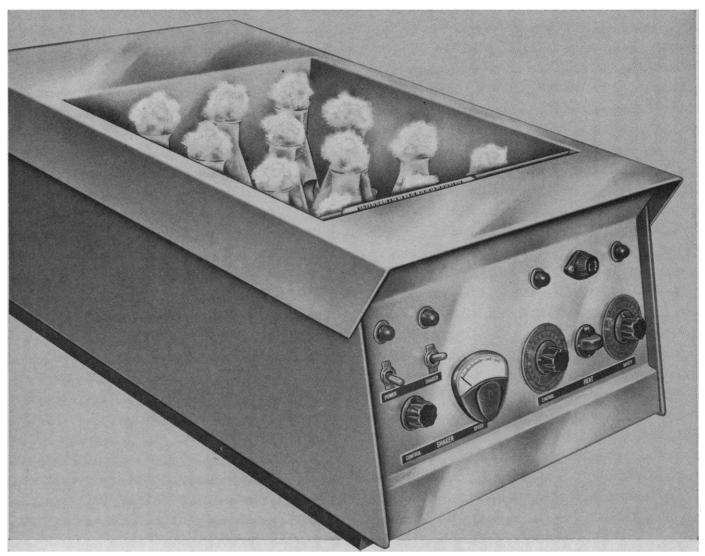
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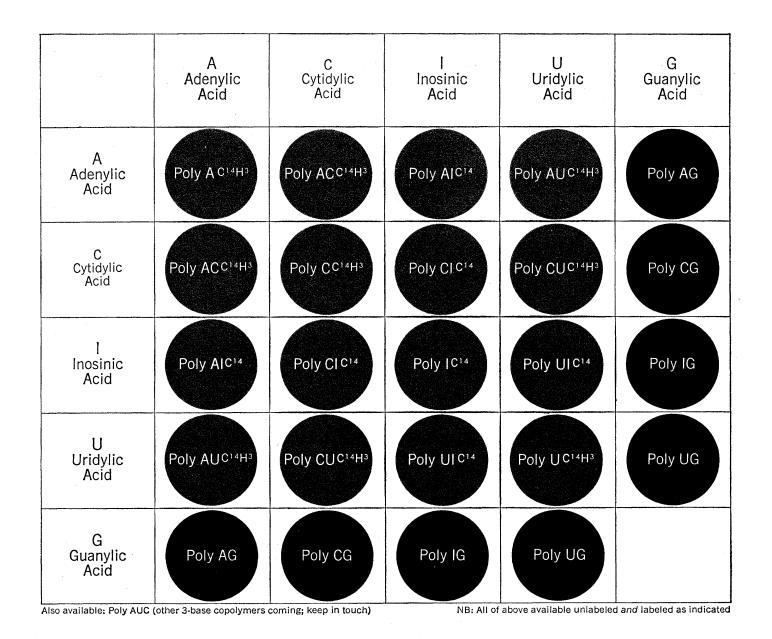


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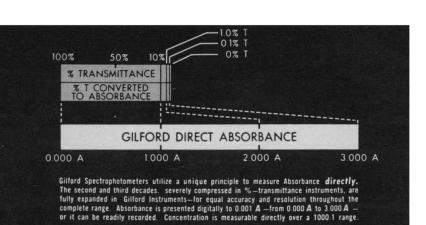
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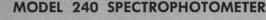
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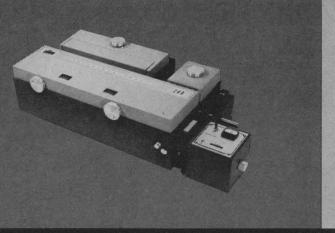
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8) The entire spirit of the contracts is now so ambiguous that people have a terrible time determining whether what they are doing is compatible with them. This is quite independent of effort or time reporting, and even though one may have found it convenient for 10 years to operate in this ambiguity, things have progressed to a point where it cannot be tolerated anymore.

Various people are struck in different ways by the above points, and give them different emphases, but I believe they are all worth mentioning. Furthermore, they involve much more than the immediate problem of effort and time reports. They involve the nature and extent of government subsidies to universities in the foreseeable future. There is no doubt that if the universities of this country are to continue at the same level of achievement and intellectual productivity as in the past 10 years, then there will have to be a large financial contribution to their budgets from tax money. It does not follow, however, that this should imply a corresponding loss of intellectual and political freedom, although we may well be forced to reconsider the very basic structure of the present means of channeling tax money into the universities. This, of course, can be done by dialogue, and I don't see anyone needing to accuse anyone else of treason or sinister designs for suggesting the need for such considerations.

The need does exist, and it is urgent. The situation has evolved to the point where professors who refuse to sign a meaningless document, which is nothing but double-talk, are pressured by their administrations for financial reasons. As Palais wrote to the coordinator of sponsored research at Brandeis: "We are greatly disturbed by the fact that the Universities have allowed themselves to be maneuvered into a position where their professors can be blackmailed into an action contrary to their institutions' traditions and to their own best interests. We now feel that we must fill out these effort reports, retroactively and for the immediate future, in order to protect Brandeis from the possibility of having to pay back large sums which it has received from the government and already disbursed or committed. We wish to make it clear that this is done under strong protest, and as a temporary measure to protect the University's financial interests. It does not imply on our part an acquiescence to the principle of effort reporting." At Berkeley, the chairman of the department of mathematics, Leon Henkin, refused to fill out the forms, and stated: "When the University or supporting agencies require preposterous forms to be completed, it inevitably weakens the respect with which their serious policies are treated."

Various math departments are seriously considering substantial curtailments of their activities because of the obnoxious accounting practices now imposed. The problem obviously transcends the present crisis provoked by the revision of A-21, dated March 1965. But if the only choice given to us is to curtail, or lose past freedoms, then let us curtail.

SERGE LANG

Department of Mathematics, Columbia University, New York 10027

The Genesis of Creativity

Students are the best judges of an instructor's ability to present the subject matter in a clear and interesting manner as Denenberg has suggested (23 Dec., p. 1504). But is lucidity of presentation a sufficient or even a necessary condition for the development of creativity?

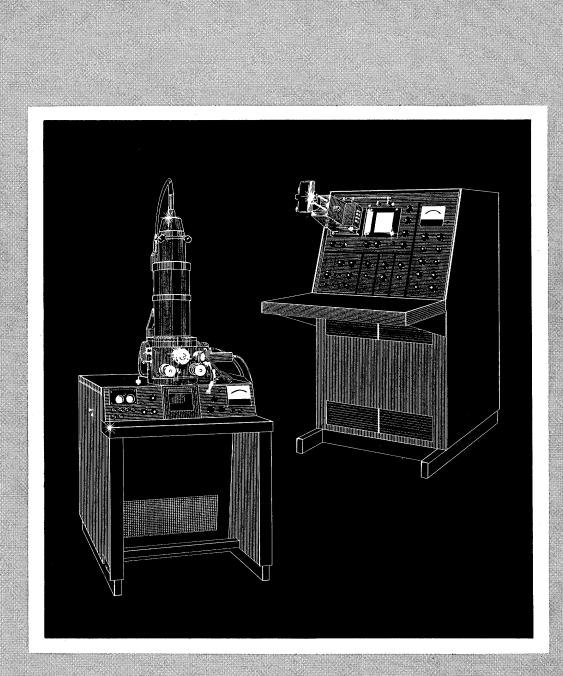
The primary function of a scientist is to solve problems, not merely to recognize relationships that have been elucidated by others. Too frequently students bemoan the effort they must exert in a given course and in the process they postulate an inverse proportionality between the pedagogical skill of their instructor and the magnitude of the effort they must expend to learn a subject. Actually, it is by this very expenditure of effort that students develop the ability to solve problems.

The ideal teacher is one who can stimulate the student to make this effort. He will know when to leave certain concepts unemphasized and then assign problems whose solution requires a comprehension of these concepts.

The question remains, however, whether his contribution to the intellectual development of his students will be appreciated, or even recognized by them. "The undisturbed oyster produces no pearl," but is the oyster aware of this?

GEORGE J. BEICHL

Department of Chemistry, Saint Joseph's College, Philadelphia 31, Pennsylvania

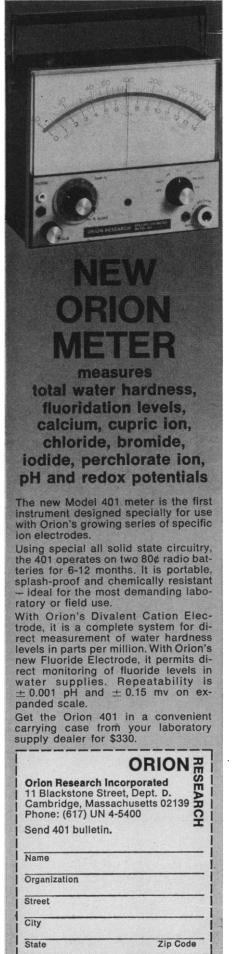


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Benefactor for Science in the Liberal Arts Colleges

Wolfle's editorial (12 Aug., p. 697) notes this foundation's long interest in the liberal arts colleges, and his thoughtful and succinct analysis has led us to a review and projection of Research Corporation's activities directed specifically toward aiding science programs in the liberal arts colleges during the decade of the sixties.

Since 1960, when the foundation began its broad program of grants to strengthen science departments, grantee institutions have acquired additional faculty and research equipment, achieving both numerical and qualitative gains in the sciences. Many of the colleges have been able to attract faculty of high caliber and to provide new opportunities for research and creative scholarship. Some reports indicate an infusion of research-orientation into academic departments other than the sciences following the spur of these grants.

In the period 1960-66, grants of \$3.4 million have been made for science departments in about 80 liberal arts colleges, and project grants of slightly over \$1 million were made to 172 liberal arts colleges. In the next 3 years, at the cost of invading its limited resources, the foundation has budgeted about \$2.6 million for further contributions to the science departments of the liberal arts colleges. Thus, in this decade, about \$7 million will be committed by the foundation in the conviction that strong science is an integral aspect of a vigorous liberal education, and that the liberal arts colleges are vital to higher education in this country. With others now turning to this area, Research Corporation looks to the seventies as a decade of new challenges.

CHARLES H. SCHAUER Research Corporation, 405 Lexington Avenue, New York 10017

History's Grant Swingers

The enchanting adventures of Grant Swinger described by Greenberg (News and Comment, 16 Dec., p. 1424) are an injustice to the scientist who has been an asset to science. Promoters of scientific enterprise should not be looked upon askance. Francis Bacon had a grand scheme for scientific research. A recent biographer of Galileo [L. Geymonat, Galileo Galilei (McGraw-Hill, New York, 1965)] calls him the Tom Paine of science. Count Rumford may have been a scoundrel in other affairs but he was a grant swinger, a promoter of science. George Ellery Hale never met ridicule in promoting the construction of large telescopes. On the basis of the success of their projects, most scientists are grant swingers; only a very small percentage of research comes to a successful conclusion. That many institutions are blessed with people who know how to acquire grants is a discredit neither to the institution nor the person. If the projects are faulty from the start, it is the disbursing agency and the review boards who are to blame.

MORRIS GORAN

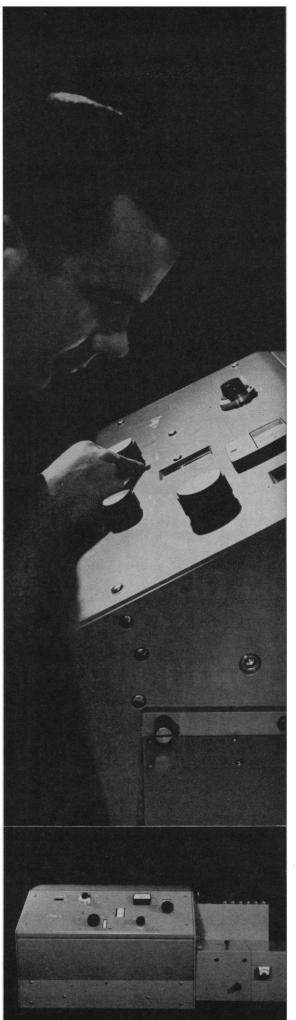
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Reprints Unlimited

In a recent editorial (7 Oct., p. 74) Abelson commented on the services made available commercially by the Institute for Scientific Information, which publishes, among other things, *Current Contents*, to which I subscribe (out of my own pocket) and which provides extremely useful information about the existence of work of possible interest to me. By this means I can keep a comprehensive current bibliography, and I send for reprints only when I expect to have frequent and continuing occasion to consult the works in question.

I also personally pay for reprints of my own publications (as do many of my European colleagues), although postage is generally met by the university. The title of a recent article of mine appeared in Current Contents and shortly after, reprint requests began to arrive in far larger numbers than I had expected. A particular error in my address occurred in two-thirds of the request cards and it was the identical error which appeared with the citation of my article in the ISI list. Also, half of the reprint requests came from medical schools or hospitals, despite the fact that the paper concerned observations on a marine invertebrate, which suggests that the writers had not seen the original paper, but were only using such key words in the title as "histochemical," "monoamines" or "nervous system" as sufficient clues to warrant sending for a reprint. I am not

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1802-H Second Street Berkeley, California 94710 TH 3-0220, Cable LABIND trying to single out any group as worse than another in making indiscriminate reprint requests, and no doubt some of those researching in medical centers are doing broadly-based comparative work. Moreover, small libraries don't carry many journals, and reprints are especially useful to some people for this reason. But how does one identify those who are really interested when no information comes on the card? I honestly want to send reprints to those who are going to use them, but I can't afford to supply everyone who thinks he might just possibly be interested. Has anyone else solved this problem? MARY E. CLARK

Department of Zoology, University of Newcastle upon Tyne, Newcastle upon Tyne, England

Progress in Academic Freedoms

In "Academic freedom: lessons from the crisis at St. John's," (16 Dec., p. 1428) Carter states: "In October 1965, the AAUP chapter [American Association of University Professors], though it was later to fall under the domination of administration sympathizers. . . ."

As president of the AAUP chapter at St. John's University, I disagree with the implications of the statement. When the 1965–66 executive committee of the AAUP chapter at St. John's resigned at the 2 February 1966 meeting, a new group of officers was elected in accordance with the national and local AAUP constitution. Furthermore, a new executive committee was elected at the June 1966 meeting for the academic year 1966–67.

Some of these elected officers were hardly what one might term "administration sympathizers." There were then and are now many shades of opinion as to the action taken by the board of trustees of St. John's, not to mention some of the administration policies prior to December 1965. Merely to agree with the administration of an institution when such agreement is justified does not imply that one is an "administration sympathizer." On the other hand, to indicate justifiable disagreement with an administration policy or procedure does not imply that one is "anti-administration."

When the February 1966 meeting took place, there were over 250 faculty members of the AAUP chapter at St. John's and, except for those who were also members of the United Federa-



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tion of College Teachers, many members of the AAUP were opposed to the chapter's "political maneuvers" at St. John's. For example, not a single general membership meeting of the AAUP was called from October 1965 to February 1966. During this time, one need not review what happened at St. John's. However, though opposed to administrative policies, many AAUP chapter members are working to improve the situation by participating in the University Senate (since March 1966), departmental committees, and other university committees.

ANTHONY H. SARNO Department of Mathematics, St. John's University. Jamaica, New York 11432

Readers of Carter's article may be interested in the policy statement, adopted in October 1966, by the Federation of Regional Accrediting Commissions of Higher Education for the guidance of the regional commissions in their work of evaluating colleges and universities:

"By academic tradition and by philosophical principle an institution of higher learning is committed to the pursuit of truth and to its communication to others.

To carry out this essential commitment calls for institutional integrity in the way a college or university manages its affairs-specifies its goals, selects and retains its faculty, admits students, establishes curricula, determines programs of research, fixes its fields of service.

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The maintenance and exercise of such institutional integrity postulates and requires appropriate autonomy and freedom.

Put positively this is the freedom to examine data, to question assumptions, to be guided by evidence, to teach what one knows-to be a learner and a scholar. Put negatively this is a freedom from unwarranted harassment which hinders or prevents a college or university from getting on with its essential work.

A college or university must be managed well and remain solvent, but it is not a business nor industry. It must be concerned with the needs of its community and state and country, but an institution of higher learning is not a political party nor a social service. It must be morally responsible, but even when church related, it is not a religion nor a church.

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17 FEBRUARY 1967

A college or university is an institution of higher learning. Those within it have as a first concern evidence and truth rather than particular judgments of institutional benefactors, concerns of churchmen, public opinion, social pressure, or political proscription.

Relating to this general concern and corresponding to intellectual and academic freedom are correlative responsibilities. On the part of trustees and administrators there is the obligation to protect faculty and students from inappropriate pressures or destructive harassments.

On the part of the faculty there is the obligation to distinguish personal conviction from proven conclusions and to present relevant data fairly to students because this same freedom asserts their rights to know the facts.

On the part of students there is the obligation to sift and to question, to be actively involved in the life of the institution but involved as learners at appropriate levels. The determination and exercise of proper responsibilities will be related to the students' status as undergraduate, professional, or graduate students.

Intellectual freedom does not rule out commitment; rather it makes it possible and personal. Freedom does not require neutrality on the part of the individual nor the educational institution—certainly not towards the task of inquiry and learning, nor toward the value systems which may guide them as persons or as schools.

Hence institutions may hold to a particular political, social, or religious philosophy as may individual faculty members or students. But to be true to what they profess academically, individuals and institutions must remain intellectually free and allow others the same freedom to pursue truth and to distinguish the pursuit of it from a commitment to it.

All concerned with the good of colleges and universities will seek for ways to support their institutional integrity and the exercise of their appropriate autonomy and freedom. In particular, the Federation and the regional commissions, which have a particular responsibility to look at an institution in its totality, will always give serious attention to this aspect and quality of institutional life so necessary for its wellbeing and vitality."

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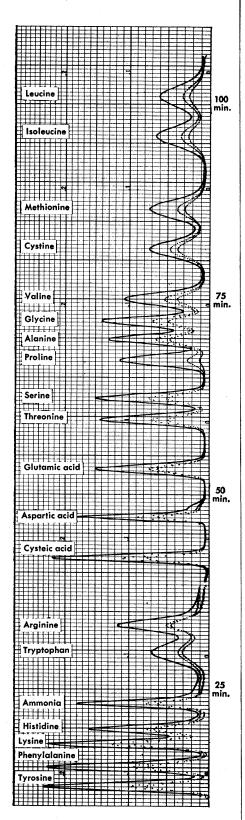
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Summer Research Subsidies

Wolfle's editorial (12 Aug., p. 697) pointed out the difficulties that "undernourished small colleges" have in obtaining financial assistance for improving their staffs and facilities. As a teacher in one of the lowest categories of "college" (a California junior college), I would like to add that there is even more difficulty encountered by a junior college teacher who desires to do research. The school district from which I write has loudly proclaimed its antagonism to "federal aid," thereby curtailing many programs. Likewise, it is apparently opposed to research by the faculty (it refuses to reply to questions on the subject, and it rejected a sabbatical leave for research). As Wolfle said, "... the administrators of some small colleges were uninterested in faculty research. Some were even hostile." Perhaps this attitude is to be expected when there is not a single Ph.D. in the administration of the entire school district under discussion.

If the latter are any criteria, then it would seem advantageous to institute financial support for research during summers only. If a teacher could be given a year's leave, he might apply for NSF grants for scientific research, but my state education office has not answered two letters requesting information about such a leave. Further, a junior college with emphasis entirely on teaching is not considered an "appropriate" institution for purposes of research association. Perhaps NSF Senior Postdoctoral or Science Faculty Fellowships could be used, but, "It is not . . . the purpose of these fellowships to provide support for research projects as such." Inquiries to the National Research Council, National Academy of Sciences, and the Research Corporation have all been fruitless.

Since there are undoubtedly many worthwhile research projects in progress or envisioned, it seems senseless not to have some source of support available. Therefore, I recommend that some agency establish a "consecutive summers" support plan for those teachers who have no other time or help for their research. Such a plan may be a part of the "Research in Washington: plans afoot for advanced study center" (23 Dec., p. 1530) project, but that is in the far future.

CHARLES G. DANFORTH Glendale College, Glendale, California 91208

The Original "Krow"

It was with a singular sense of honor that I read the recent suggestion (Letters, 6 Jan.) that my work be used as a model for evaluating research productivity ("Krow" units: a new evaluation). As I hope to complete my thesis this year, the sought-after standard for research output should soon be universally available.

GRANT KROW Frick Chemical Laboratory, Princeton University, Princeton, New Jersey

Wanted: Seasonal Naturalists

The opinions of Calder (Letters, 2 Dec.) on the National Park Service were very similar to those I formed while spending three summers as a seasonal naturalist. I am not certain that the desire to do, or competence in scientific research is a prerequisite to a successful park naturalist. That progress in the naturalist programs has lagged behind progress in other fields of biology and geology may be due to the quality of personnel available for employment -particularly the seasonal naturalist. The job does not appeal to high school and college teachers primarily because of the GS-4 salary scale and the general lack of facilities for married individuals with families. If the parks are to be staffed with high-quality summer personnel, they must be graduate and undergraduate students. But talented students in "field biology" are attracted to other summer programs and the experimental or "laboratory biologist" seems to consider such experience outside his field and of little value.

I agree with Calder that the colleges and universities need to encourage students to consider this sort of experience. For anyone eventually intending to teach, whether as a "field or laboratory" specialist, experience as a seasonal naturalist is easily worth the sacrifices. On the other hand, the NPS needs to introduce a program which keeps college students aware of the employment opportunities by advertising on college bulletin boards for their seasonal personnel. If the schools don't encourage such employment and the NPS doesn't advertise it, how can we be assured that our national heritage will be in the hands of our best personnel?

JOHN E. BUTLER Department of Zoology, University of Kansas, Lawrence 66044

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European Discontent with the "Technology Gap"

When Charles de Gaulle began his anti-American campaign, leaders of other Western European states were slow to join. Recently, however, a focus for common discontent has appeared in the slogan "technology gap." In many fields, Europe's technology is at least equal to that of the United States, but in some highly visible areas, such as aerospace, electronics, and computers, America is preeminent. European leaders feel that the technology gap is growing, and some foresee an "underdeveloped continent" dependent upon the United States.

Many factors contribute to American success, but in Europe two are emphasized. The large U.S. market encourages investments, such as the \$130 million that RCA poured into color television, and the U.S. devotes a greater fraction of its large gross national product to research and development than Western Europe does.

Less talked about are other differences between us. One is a matter of education. In Germany only 8 percent of college-age youths enter universities, while in the United States 40 percent do so. This contrast contributes to a difference in managerial skill. Middle levels of American management are more competent than their European counterparts.

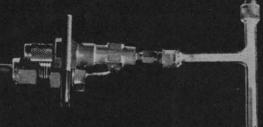
Some of the most important factors in the technology gap are differences in social attitudes. An illustration was provided me by an official of a large European-based oil company that operates laboratories on both sides of the Atlantic. The company had discovered that the cost of performing comparable work on the two continents was the same despite much higher salaries being paid in the United States. The man's explanation was this: in Europe scientists directed the work of technicians while in the United States scientists personally made the measurements. Moreover, in America top scientists were willing to eat cafeteria-style. In Europe, a leisurely lunch must be served, on a white tablecloth.

In a consideration of the technology gap, developments in Japan are relevant. For more than a decade the Japanese have achieved the fastest economic growth of any major nation (about 10 percent per year). Japan has become strong in the production of electronics devices, optical instruments, steel, and chemicals. Today Japan is the leading shipbuilder, and the Japanese have been pioneering in the construction of gigantic oil tankers and bulk carriers. Japan has become a leading exporter of steel, despite the fact that it must import iron ore from overseas and much of its coking coal from West Virginia. Japan did not discover or develop any principal plastic material, yet today it is second only to the United States in the production of plastics. In achieving this progress Japan utilized foreign R & D, purchasing technical knowhow and encouraging the establishment of foreign-owned subsidiaries.

In part, the Japanese success is due to a willingness—even an eagerness—to work. In part, it is due to a policy of using and improving on the best ideas of others. Another important factor is educational policy. The Japanese educate a larger proportion of their youth than the Europeans do. More than 80 percent of the top industrial managers in Japan have a university education, as compared with 30 percent in Britain.

European politicians are looking for easy ways to fill the technology gap. They talk of forming a European Technological Community, but this will not suffice. They should consider an additional course—study of and improvement on the best elements of Japanese and American procedures. —PHILIP H. ABELSON THIS G.C. COLUMN-DETECTOR ASSEMBLY LIFTS RIGHT OUT OF THE OVEN FOR COLUMN CHANGES AND LEAK CHECKS

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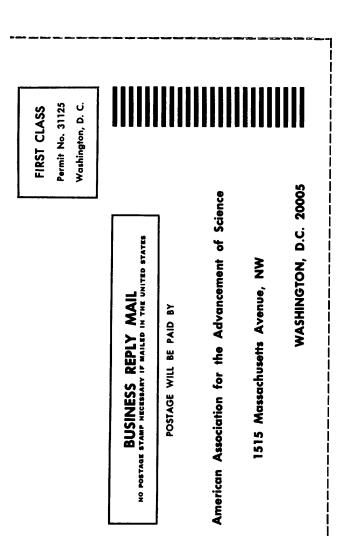
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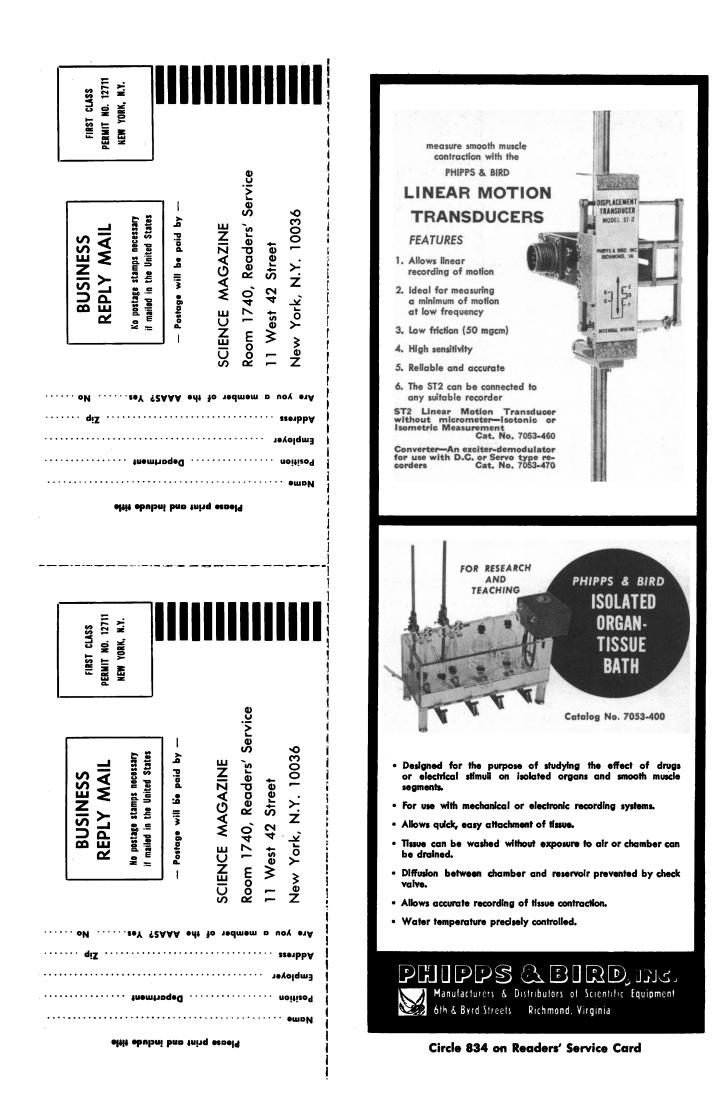
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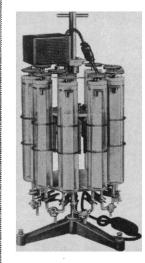
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lagen and elastin with especial attention to involvement of aldehyde components in such processes. The symposium was summarized by P. Person who concluded that the dental profession was coming to realize that the mouth was too important for it to rely solely upon its own efforts for advances and new knowledge, and that this meeting represented an attempt to recruit new research colleagues from other disciplines in all the sciences.

The respective presiding officers at the sessions were A. A. Dahlberg, M. L. Moss, B. Eichel, M. B. Engel, and M. U. Nylen. The meeting was supported in part by a grant from the Warner-Lambert Research Institute and American Chicle Research Department. PHILIP PERSON

Veterans Administration Hospital, Brooklyn, New York

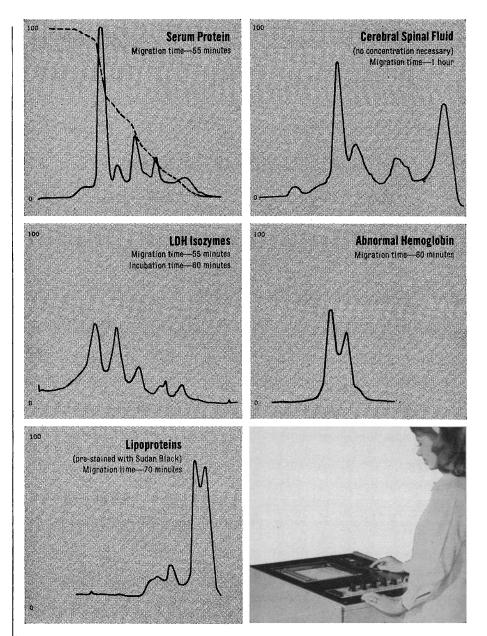
Pharmaceutical Sciences (Np)

Section Np held eight sessions which included 26 contributed papers, one symposium, the vice-presidential address, and the distinguished lecture.

There were 11 contributed papers in the general area of hospital pharmacy. W. L. Guess (University of Texas) discussed the use of cell culture in investigating the subtle toxicity of certain plastic components used in the manufacture of polyvinyls for potential use as packaging material for foods, drugs, and devices used as supportive therapy in the treatment of disease. His group demonstrated that toxic effects of certain compounds could be demonstrated on cells in culture, whereas the usual animal tests indicated that these substances were relatively nontoxic; they concluded that there was a great need for further research into the relationships between various levels of toxicity evaluation to potential harm in the human subject.

George Archambault (pharmacy liaison officer to the Office of the Surgean General) discussed (i) the dangers in making comparisons in reported pharmacy costs without adequate definitions of what constitutes the cost and work load elements, (ii) the showing of values in specific reports when properly used, and (iii) the presentation of a 10year drug and workload cost analysis of a chain of hospitals.

A. G. Isack (U.S. Public Health Service) discussed the opportunities for the advancement of quality through Medicare and indicated that Congress



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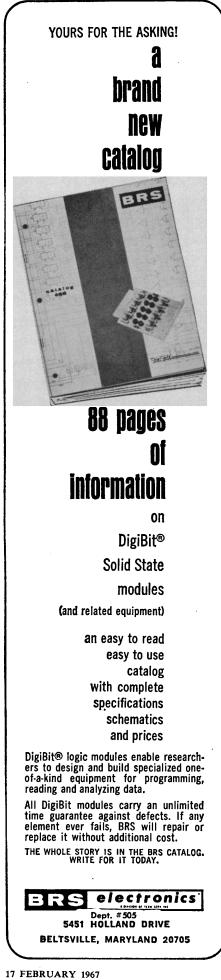
17 FEBRUARY 1967



has given and will continue to give new incentives to move with the mainstream of modern medical care through the efforts of governmental and voluntary agencies working as a team, and that the main result of the health insurance program for the aged will be a definite and positive effect on health care not only for the aged but also for the entire population.

André Archambault presented the vice-presidential address entitled "Pharmaceutical education: a dual challenge." He stressed the need for all pharmaceutical scientists and all pharmacists to do more thinking and more research with the problems that emerge from the professional and social changes which affect pharmacy and which may therefore influence pharmaceutical education. He emphasized that it was not only the challenge of the educator to prepare the graduates in the pharmaceutical sciences for the future, but also to help them to identify the specifics of quantity, quality, and content of what should be taught, and, in particular, of what they should learn, and that the responsibilities of the health workers do not only consist of providing professional services to the patient but also involve the problems and interests of the whole community and even the future of mankind.

Fifteen contributed papers in the areas of pharmacology, physical pharmacy, pharmaceutical chemistry, and clinical pharmacology were presented during the sixth session. L. H. Block and P. P. Lamy (University of Maryland) reported that the effect of polymers on the transfer rate was postulated to be the result of viscosity, an interaction with drugs, or a change in interfacial properties: data suggested that the substantial increase in viscosity, after the addition of macromolecules, plays a dominant role in the depression of drug transfer within the gastrointestinal tract fluid. R. L. Powell and J. P. Buckley (University of Pittsburgh) reported that phenformin HCl protected experimental animals subjected to chronic exposure to an altitude of 29,000 feet. They suggested that the compound may not only be of value in situations of exposure to low oxygen tension at high altitudes but also in many clinical conditions where the disease state leads to oxygen deficiency. F. T. Galvsh and B. M. Regan (Baxter Laboratories, Inc., Morton Grove, Illinois) reported that 2-(3'benzamidopropyl)-l-cyclohexyl-2-thiopseudourea HCl is a potent, local an-



esthetic extremely effective on topical application with a higher therapeutic index than local anesthetics currently in use. D. Gorde and R. A. Heiser (Squibb Institute for Medical Research) reported on the clinical effectiveness of intraoral bandages as a surgical or protective dressing on oral surfaces after surgical procedures.

A. Grollman (University of Texas Southwestern Medical School, Dallas) presented the Section Np distinguished lecture on hypertension. He discussed the role of the kidney in maintaining a normal blood pressure and the importance of the kidney in preventing the development of hypertension. He indicated that cardiovascular hypertension is currently one of the major causes of death in the United States and although the cause may be listed as congestive heart failure or cerebral accident, the actual cause of death is chronic hypertension.

The last session was the symposium entitled "Therapeutic incompatibilities involved in drug dosage" arranged by W. J. Kinnard, Jr. (University of Pittsburgh). J. D. McEvilla (University of Pittsburgh) discussed recent surveys on the incidence of adverse drug reactions and noted the need for more exact measurements of the problem. J. R. Gillett (National Heart Institute) discussed in detail actions of drugs on various enzyme systems within the body and the mechanisms by which one drug can either potentiate or inhibit the pharmacological or therapeutic activity of another drug. K. H. Beyer (Merck, Sharp & Dohme Research Laboratories) discussed the importance of preclinical predictiveness of abnormal drug interaction, and emphasized the importance of altering drug dosages when one compound has been demonstrated to potentiate the action of a second compound on laboratory animals. He specifically emphasized the actions of the thiazide diuretics on electrolyte metabolism and the control of the congestive heart failure patient with digitalis drugs. L. E. Cluff (University of Florida) discussed the adverse reactions occurring at the Johns Hopkins Medical Center and indicated that these occur mainly in those patients who were receiving large numbers of therapeutic agents (12 to 22 different compounds).

The officers and representatives of the sponsoring societies met to elect new officers and to formulate the 1967 meeting in New York. Curtis Waldon (Brooklyn College of Pharmacy) is

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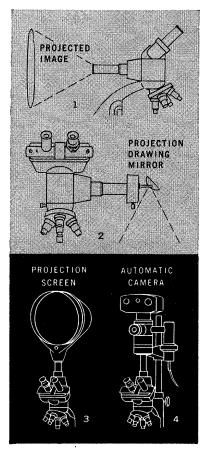
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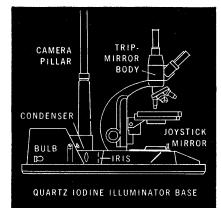




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15 WAITE COURT, MALDEN, MASS. 02148 • (617) 324-6666 IN CANADA: 1570 MIDLAND AVE., SCARBOROUGH, ONTARIO • (416) 751-4360 the new vice president and chairman of Section Np for 1967; and W. L. Guess (University of Texas) was elected committeeman-at-large.

Luncheon and dinner were sponsored by E. R. Squibb & Sons and McKesson & Robbins, respectively.

JOSEPH P. BUCKLEY University of Pittsburgh, Pittsburgh, Pennsylvania

Agriculture (O)

Agriculture and the Quality of Our Environment

The thirty-five papers presented in the symposium on "Agriculture and the Quality of Our Environment" were nearly equally divided among three aspects of environmental quality. A large number of papers were presented on the effects of environmental pollution on the soil, on crops, and on livestock. The deleterious effects on plants of polluted air from industrial firms has been known for more than a century. The crops affected include almost the entire range from cereal grains and grasses to vegetables, orchard trees, and forests. Among the important chemicals causing the injury are chlorine, sulfur dioxide, ethylene, and ozone. Animals too have suffered from the effects of toxic gases and particularly from the contamination of feed crops with fluorides. Two papers were presented on the potential and actual effects of radioactive fallout on plants and animals. The existing and recommended controls to prevent or minimize the injury to agriculture from environmental pollutants were discussed.

On the other hand, another group of papers presented the evidence or lack of it which indicated the extent to which agricultural contributes to environmental quality. The positive contributions of agriculture in the form of a plentiful and varied food supply, in the ornamentals that decorate our homes and parks, and in the beautiful national forests and recreational parks were pointed out. The dust storms of the past resulting from poor soil conservation practices were recalled. The present-day problems growing out of the widespread use of pesticides were thoroughly presented. The extent to which fertilizers contribute to the excessive nitrate content of the water was debated.

One paper indicated cattle feedlots

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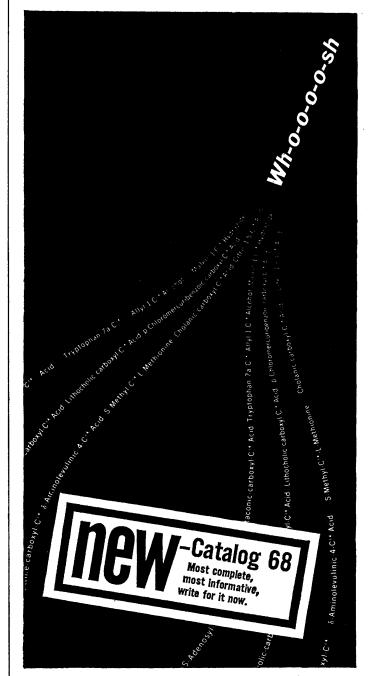


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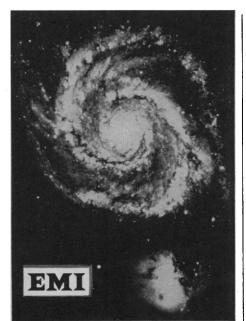
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and other livestock installations as the more important sources of nitrate in water supplies. A session of the symposium concentrated primarily on the disposal of the livestock wastes. The enormity of the problem was emphasized. No satisfactory chemical or bacteriological methods for reducing or disposing of these wastes has been found to date. Incineration produces odor problems. The most generally accepted procedures involve methods of putting the manures back on the land. Soil is considered by several to be the natural and thus far the best filter for animal wastes.

The third type of papers was concerned with the overall problem of environmental pollution, both rural and urban. Air pollution in the cities was discussed in terms of its being a contributor to the respiratory disease complex of humans. The sediment load of the country's streams and rivers was shown to be largely from sheet erosion, some from gully erosion, and an important portion from construction for industry or residences. Data on the salinity contributed by midwest and eastern rivers indicates that these waters collectively carry more salts than the major western rivers even though the salinity problem has been more acute in the West. The role that automobiles play in air and soil pollution was dramatically portrayed by the results of time-lapse photography and analytical data. One speaker stated that the conventional auto engine must be modified beyond what appears presently feasible if the pollution effects are to be controlled. The impact of pollution on recreation and commercial fishing in lakes, estuaries and coastal marine waters was presented. The need was expressed for experimental cities in order to try out new ideas of pollution control and other aspects of urban planning.

The attendance at the seven halfday sessions averaged more than 100. N. C. Brady (Cornell University) arranged the program.

NED D. BAYLEY U.S. Department of Agriculture, Beltsville, Maryland

Industrial Science (P)

Operations Research in Branches of the Government

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ment Sciences, in cosponsorship with Section P, held several symposia. According to this symposium (27 December 1966), operations research, systems analysis, and multidisciplinary problem solving have carried the approaches into the nondefense agencies of the Federal Government. This extension of operations research techniques to other areas of public expenditure promises new surprises, both in substance and method.

In the nondefense agencies of the Executive Branch of the federal government, there is an emerging but dispersed investment in operations research. The Legislative Branch is providing further impetus in the form of initiating bills to give financial support to the application of systems analysis to pressing public problems. Although the Judiciary has gone on record as indicating a desire to use these techniques, developments are still at a primitive stage, with emphasis on court calendaring being predominant. Finally, state governments are becoming aware of the need for operations research, and have been able to initiate some work as a result of the availability of federal planning grants. Because so much of the action program of the Federal Government is actually administered at state, county, and local levels, it becomes increasingly apparent that analyses of federal programs and development of measures of effectiveness will require innovation beyond that which characterizes defense and industrial studies.

Prospects and Problems for Improved Health Systems in the United States

A great deal of introductory research has been conducted on systems analysis of health programs in the United States. The time is now ripe for an early synthesis. The speakers in this session (29 December 1966) proceeded rapidly from an exciting description of a production line physical examination procedure for a West Coast health plan to a consideration of ways in which health systems could be better studied. In the third year of operation of the health plan, some 100,000 health records had been generated and a large volume of the diagnostic work was being performed automatically. Questions of information processing and procedures for clinical decision-making represented great fields for new discoveries. The concluding paper described the pro-

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Edited by Charles Herbert Best, Professor and Lately Head of the Department of Physiology; Director of the Banting-Best Department of Medical Research, University of Toronto and Norman Burke Taylor, Lately Professor of the History of Medicine and Medical Literature, University of Western Ontario, London, Canada; formerly Professor of Physiology, University of Toronto.

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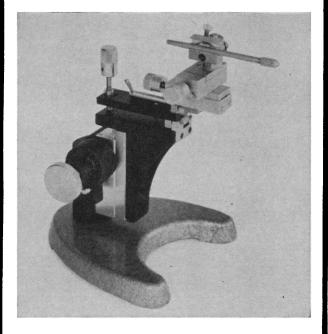
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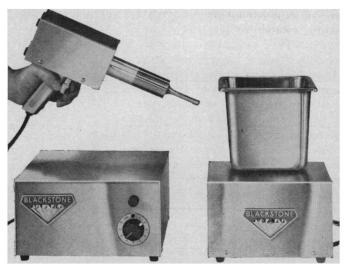
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gram planning activities of The Surgeon General in determining resource allocations strategies for the improvement of health levels in the United States.

W. E. CUSHEN National Bureau of Standards, Washington, D.C.

Quantitative Studies in Research and Development Management

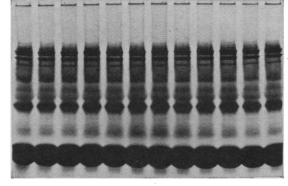
This session (29 December 1966) consisted of presentations by four outstanding research workers who are concerned with representative types of problems of a quantitative nature facing the R&D manager.

The application of quantitative techniques and methods of analysis to management problems has been an accepted practice for many years now. Virtually every major industrial organization and most components of the U.S. government have operations research or management science activities to do just this job for various levels of management. Most forward looking managers use this type of assistance as inputs to their decisionmaking activities.

In the area of research and development management, however, it has only recently been seriously suggested that similar quantitative techniques might be available to assist the manager in making decisions. Much has been written and discussed about R&D management since World War II, but most of this has been of a general qualitative nature, placing the field in the category of an art.

However, it is the opinion of an increasing number of managers, scientists, engineers, and analysts that quantitative techniques should prove to be of assistance to the manager in making his decisions. Many of the decisions that the manager must make can certainly be expressed in quantitative terms-indeed they must be. Do we support a particular project or don't we? If so, how long should it be supported? At how much money? How many people? These questions require quantitative answers. Quantitative techniques should be applicable to guide the decision makers. The fact that the problems are very complex and not yet completely understood should not preclude the use of models and perhaps simulations as a guide.

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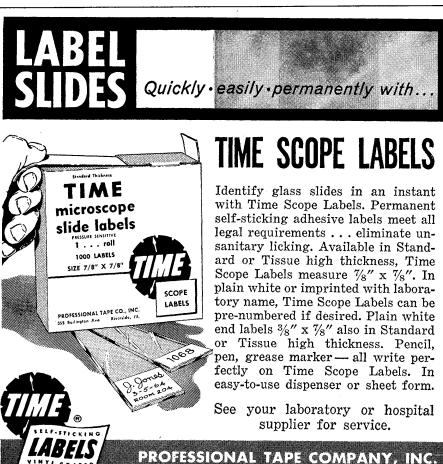
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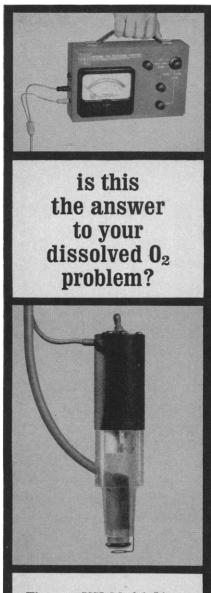
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YELLOW SPRINGS INSTRUMENT CO. YELLOW SPRINGS, OHIO 45387 ment of research and development programs to which analytical scientific methods might well be applicable. There are a considerable number which are currently under study by various investigators.

Burton V. Dean (Case Institute of Technology) discussed the use of mathematical models in helping to allocate R&D funds. Models were discussed which assist in the selection of technical alternatives, the funding of system component development, and the allocation of costs across systems.

Richard S. Rosenbloom (Harvard University) and W. J. Abernathy (University of California, Los Angeles) discussed the economics of parallel and sequential strategies in R&D. They pointed out that it is common in technological development to identify and explore several approaches to a particular objective so that the best approach may be chosen. The outcome of any approach is uncertain; hence it is difficult to choose the best approach at an early date. To deal with this uncertainty, Rosenbloom and Abernathy suggest that two or more approaches to the identified objective may be continued in parallel until a clear choice between approaches can be made, that is, a parallel strategy. Such a strategy can serve the functions of providing better information for a decision, maintaining options, or hedging against the occurrence of an unsatisfactory outcome.

Herman D. Lerner (Bethesda, Maryland) discussed and appraised several recent important studies concerned with communication among research scientists. He pointed out that much of the data used in these studies are inconclusive, that much of the results are inapplicable to the design of information systems, and that little has been done with regard to theoretical advances into the nature of this type of communication.

Professor Edward B. Roberts of M.I.T. discussed the dynamics of R&D organizations. Several feedback models were suggested which approximate the R&D process in a laboratory. Managerial actions taken to solve one problem may have much greater impact on other facets of the laboratory's operation. Empirical data from a government laboratory are currently being gathered to use in the development of these models.

MARSHALL C. YOVITS Ohio State University, Columbus



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Education (Q)

The pervading interrelationships between the biological sciences, agriculture, and renewable natural resources were emphasized during the symposium (27 December 1966) sponsored by the Commission on Education in Agriculture and Natural Resources of the Division of Biology and Agriculture of the National Research Council and Section Q. Undergraduate biological education for the future agricultural scientists should differ little from that for the biology major, according to P. B. Siegel (Virginia Polytechnic Institute). However, rigid core curricula for all agricultural undergraduates, including those who will terminate with the B.S., should not exceed two years, and in Land-Grant universities might appropriately not exceed one year. Introductory biology should illustrate both unity and diversity, and be founded on concepts in chemistry, physics, and mathematics.

Agricultural scientists should be involved in planning and, indeed, in teaching, biology core programs.

Agricultural faculty members frequently argue that biology professors should utilize economic rather than exotic "mountain-top and seashore" species more frequently to illustrate principles (George A. Gries, University of Arizona). It is difficult to predict which will be the most important economic species in the future. However, all students should be exposed to certain biological concepts which may have long-term implications for food production.

Agricultural students might be motivated by one-unit courses, taught concurrently with courses in the biological and physical sciences and mathematics, during which the concepts under study in these courses could be related to agriculture.

The field of "conservation," more appropriately termed "renewable natural resources management," is changing rapidly (L. S. Hamilton, Cornell University). However, many resource professionals are not able to grasp the dimensions of contemporary resource management problems. Too frequently, graduates of baccalaureate programs are performing technicianlevel tasks; making management recommendations and decisions inappropriate for the present day and are products of curricula that are excessively specialized and are guided by



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outmoded professional accreditation and employment policies. Hamilton proposes a broad, basic three-year program for all undergraduates in renewable natural resources, with specialization in forestry and other resource fields coming during the fourth year.

Among the contributed papers of special interest was a report by J. S. Carlson (University of California, Riverside) on an experiment involving second grade pupils. He sought to investigate and resolve the disagreement as to the relative importance of direct experience and verbal instruction in teaching the concept of conservation of substance. He found the concept to be teachable and that when pupils were expected to answer questions with comment including reasons for their answers, instruction involving high verbal levels seemed more effective than low verbal levels. Direct experience and demonstrations were equally effective at both verbal levels.

Of particular interest to those concerned about assistance to foreign education was the work of Francis E. Dart (University of Oregon). In his study of the intellectual background accompanying science courses in Nepal at elementary school levels he found that a dual interpretation of nature was common and that knowledge about natural phenomena was confined to a closed body of unvarying facts. A general lack of familiarity with methods of abstraction and abstract representation assumed by most elementary science courses was noted. The implications suggested included the necessity for the introduction of pre-science teaching in the elementary school and the proposal that science be presented as a "second culture" complementary to that already present rather than a replacement for it.

E. A. Madlon and Warren Wong (IBM Corporation) described an updating educational program in science for mature, experienced scientists in managerial positions. There was general acceptance of the value of such a program taught by college personnel when: the teaching was modified to fit the population involved; special training methods were used; lecture notes were presented to the students in advance, and there was a de-emphasis on competitive grading.

David Vitrogan (Yeshiva University) described the development of a series of twenty units of instruction with space science as a unifying theme. The course was produced with the idea



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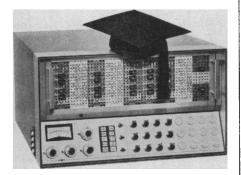
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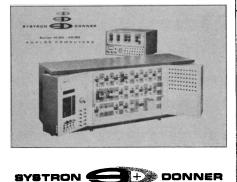


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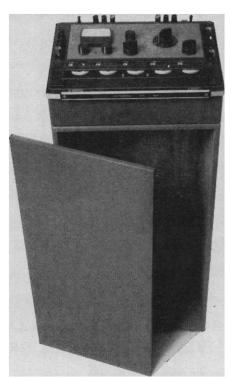
During a symposium on perspectives of research in the natural sciences before Section Q-Education and the American Educational Research Association, John A. Easley, Jr. (University of Illinois, Urbana) stated that the use of statistics in educational research has sometimes been a defense that masks the study of interesting and significant phenomena. He stressed the fact that influential statistics has a limited range of applicability in the natural sciences; perhaps it is stressed unduly in educational research to the detriment of more naturalistic views of classroom events. He noted the need for more informal analyses of the pehnomena under study.

Richard E. Schutz (Southwest Regional Laboratory, Los Angeles) on the other hand accented the experimental and self-correcting aspects of natural science, suggesting strongly that we would do well in the field of educational research to attempt emulation of these attributes. He points out that educational research is seldom experimental, and it should be with respect to its methodology, content, and process.

FREDERIC B. DUTTON Michigan State University, East Lansing

Teacher Education for the Eighties

The 29 December afternoon session of Section Q stressed teacher education. Clarence Boeck, in the vice-presidential address, expressed concern over the quality of current undergraduate science instruction. Rarely does a university professor or teaching assistant, according to the literature and the public press, break through to excite a student's curiosity and to incite him to self-initiated study. Corrective measures are in order. Boeck would have behavioral scientists develop measures of teaching effectiveness and schemes for projecting the personality and insight of productive teacher-scholars. Inservice training activities for college teachers of introductory and intermediate level courses have great possibilities for sharing the artistry of teaching, and the sciences of concept building and measurement. Beyond this, committees



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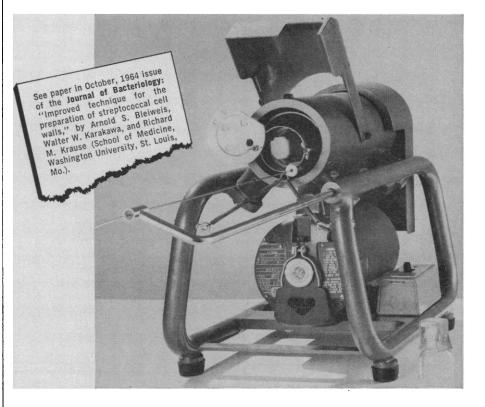
on academic promotion should recognize that creativity is as much a part of course design and implementation as it is of research and publication. Effective teaching and effective research are not necessarily counterparts of each other. The future of higher education demands that attention be given to examining the behavior patterns, individualistic as they are, of eminent teacher-scholars. Good teaching, the speaker insisted, is a learned behavior.

James Rutledge, widely known for his Academy Conference activities, stressed the evolutionary character of secondary school science teacher education programs. Innovations in a program envisioned for 1980 will probably be research participation experiences in science, in-service activities sponsored by the school systems, the use of intensive microteaching opportunities early in the professional program, teacher internships or extended student teaching assignments, and courses which stress the method and structure of science. According to Rutledge, students may expect to have large blocks of time allocated to the study of the humanities and social studies, to the sciences in breadth as well as in depth, and to professional studies-educational foundations, adolescent psychology, learning theory and practice, and instructional methods and materials. The 1980 approach will be characterized by attention to the need for interpreting science, for developing a strategy for scientific discovery, and for devising a strategy for teaching. The rapidly evolving culture demands a mastery of generalized skill. Instruction in specifics, by this argument, may be minimized as the real problem is the creative application of knowledge to a variety of situations.

Speaking on the point of teacher education in science for the 1980 elementary school, Willard Jacobson (chairman-elect of the Section) used a different line of reasoning. Social mobility, the exponential growth of knowledge, the promised technological advances, a promised sense of commitment to the individual, a computer-based educational technology, a higher level of support for public education, and a required science sequence through the first two years of the community college, he argued, act to impose a different set of conditions on the professional school emphasizing teacher education. Its students will be better prepared and more highly se-

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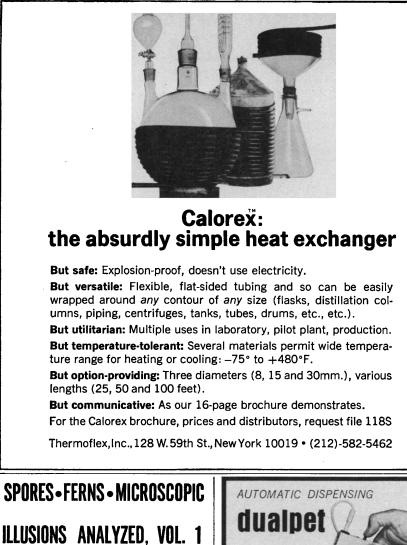
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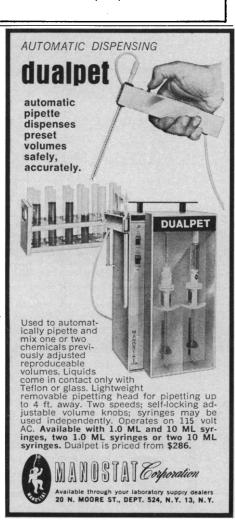
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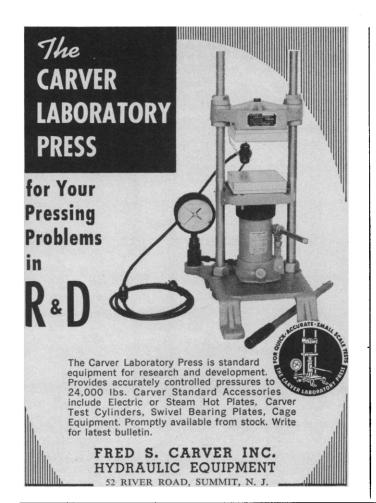
lected. Its programs will include opportunities for team teaching, for continuing experience with children, for studies in the taxonomy of science information retrieval, for significant experiences with the processes of scientific inquiry, for study of the relationships between science and society, for opportunities to master several styles of teaching, for careful observation of the developmental tasks and characteristics of children, for practice in diagnosing educational difficulties and supervised remediation procedures, and for study of the great number of programmed materials and visual assists available through television consoles. By this model, Jacobson projects a different role for the elementary teacher. Relieved through educational technology of the necessity for conducting drill sessions of prerequisite materials, the "Mrs. Ideal Future"-1980 model teacher-will spend much time in helping children expand their horizons. She will have had the benefit of critiquing her own video recordings, of using the teaching simulator, and of engaging in independent study. The future elementary science teacher education program will be directed toward developing strategies for teaching, a detailed knowledge of alternatives, and practice in the identification of instructional problems. In-service opportunities will be far different from the sterile university classroom; they may be teacher-organized and boardsupported; they will surely be at the forefront of teacher needs for the next century.

CRAIG SIPE

George Peabody College for Teachers, Nashville, Tennessee

American Nature Study Society (Q3)

"Broadened Ecological Perspectives for Understanding Man and Nature" was the keynote address by Sanford S. Farness (Michigan State University). Farness emphasized that "we need to achieve and apply a more profound ecological knowledge of man and nature that will make possible higher levels of human life and meaning, and the symbolic expression of these values in the transformed landscapes and settlement patterns of the future." "We need," continued Farness, "to theorize about a higher logic-a higher, multivalued rationalism that can integrate truth, beauty and goodness in concrete environmental forms."



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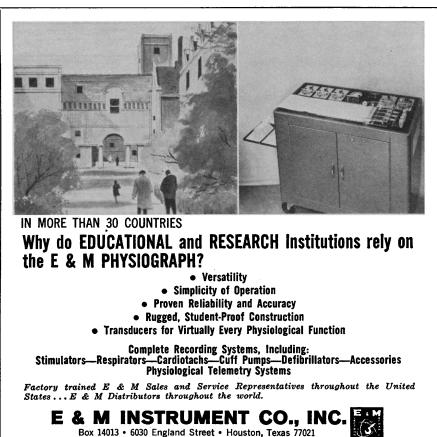
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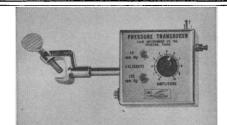
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"Ultimately," Farness said, "the resolution of our environmental needs and problems will be dependent upon new ecological understanding and integration of art, science, and religion. This challenge will require a greatly expanded awareness of man's inner environment, the infinite depths of his interior self, as well as extended grasp of his multi-dimensional external environment. . . . The creative, formative cosmic powers have been neglected." Farness proposed a "new type of multipurpose institution focused upon local ecosystems in scale with the human span of attention [and] . . . maintaining three-dimensional scale models of planning units utilizing a range of audio-visual methods for concrete, pictorial representation of landscape components and relationships." Similar now to nature centers, one could visualize inner-city interpretive centers developed as exponents of what Farness was projecting in his paper. Farness concluded by stating: "Amended and new programs should be devised and institutions should be redesigned so as to encourage adaptive planning of the landscape as a beneficent habitat for all biotic life as well as man. Ecological criteria should be applied to all public laws and programs."

M. Rupert Cutler (Wilderness Society) declared the urgent need for teachers and scientists to make supporting statements at public hearings and to undertake research so that the intent of recent national legislation on wilderness can be firmed.

Herbert S. Hiller (Nature Conservancy) presented an orderly and annotated list of management procedures and tools to enhance the use of natural areas and offset unwitting destruction or degradation of dedicated sites.

Summarizing a four-year project, Carl S. Johnson (Ohio State University) defined constructive procedures which should be helpful to agencies and organizations producing inexpensive conservation publications.

The need for naturalists and teachers to work in the field and to make first-hand observations and discoveries was emphasized by Paul E. Goff (Toledo Metropolitan Park District). Goff asked that many current nature center programs be reexamined in this light. His comments were repeated in other manner by several of the speakers in the ANSS Session III.

John W. Brainerd (Springfield College) presented a masterful demonstration of how slides can be used



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Through a summer project held at Tuskegee Institute and working with Negro teachers and rural disadvantaged children, Robert L. Vogl (Northern Illinois University) showed how the project took on more universal significance when it was placed into a social and environmental perspective. (Vogl was taped subsequently for a Voice of America program to be beamed at African nations facing similar educational situations.) In this same session, William B. Stapp (University of Michigan) reaffirmed the need to correlate school sites with total curriculum implications. A new film, "An Approach to School Site Development," developed under Stapp's direction, was viewed at the ANSS "Lenses on Nature" program.

In cooperation with NABT and the Association of Interpretive Naturalists and the National Park Service, the ANSS field trippers viewed work underway at the Patuxent Wildlife Research Center near Laurel, Maryland. Here they saw research with species closely related to threatened species and quantified studies on effects of pesticides on wildlife, as well as marsh development. The group visited the Rock Creek park complex and the Nature Center.

During the annual luncheon, retiring president Howard E. Weaver (University of Illinois), offered a eulogy to the late C. M. Goethe of Sacramento and described how Goethe aided in getting interpretive programs started in parks as early as 1919. Six past presidents of ANSS were personally awarded wall plaques. Weaver in his talk as retiring officer of ANSS described the "Past, present and future of ANSS." He illustrated many directions for the future of ANSS as one of the science teaching societies affiliated with AAAS.

All of the ANSS sessions were geared to the AAAS meeting theme: "How Man Has Changed His Planet." DOUGLAS E. WADE Northern Illinois University, Oregon

Cooperative Committee on the Teaching of Science and Mathematics (Q7)

Two main themes were discussed during a symposium on "Some Conjectures with Regard to the Future of Science Education" (28 December 1966). The evolution of the business-

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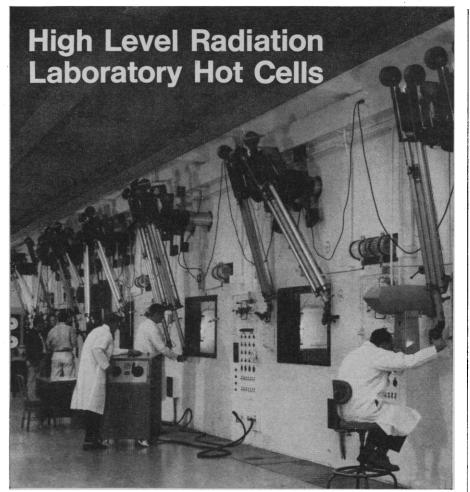
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sponsored compact for educational developments and the rapidly increasing mechanization of library facilities were noted. The primary aim of the typical compact is to improve education for all people. Noting that the educational "hardware" already is on hand to a satisfactory degree, there is great need for a learning technology in which all the component elements are integrated into the operation most suitable for each individual. Application of a systems approach to learning will necessitate unheard-of flexibility and means for tailoring the education process to each individual, and the availability of a host of equipment and auto-tutorial materials in each learning center. However, the plan should free the teacher of noninstructional tasks while he becomes the source of intellectual stimulus guiding the selection of the means and devices which will be most appropriate to the dynamic educational needs of each individual pupil. The handicapped and the homemaker will share in the benefits of these developments, since the new individualized instruction will make use of as many of the senses as are functional within each person and will facilitate home study through such portable means as instructional tapes.

The major upsurge in mechanization of libraries is now in only its third or fourth year, and the immediate future holds promise of startling, widespread development. Through the use of computer tape to produce catalog cards, some libraries are able to assemble complete book catalogs quickly, which may be distributed to others for their reference. This facilitates interlibrary communication, recently improved even further with the coupling of instrumentation for reproduction onto microfilm. Fully operational systems involving total tie-in with computers are expected in several research libraries within a few years. The availability of data collecting and interrogation terminals now makes possible the effective use of a satellite system in which departmental and college units may have direct access to a major centralized library. Successful indexing of documents and otherwise improving the various elements of information retrieval are undergoing rapid change, particularly with regard to the interaction of the researcher and the data.

EMERY L. WILL State University College, Oneonta, New York

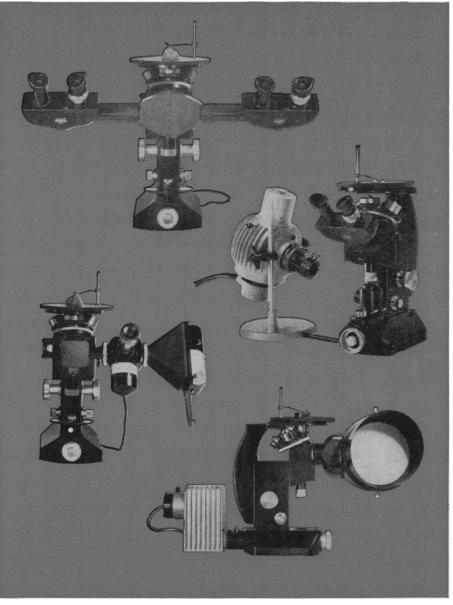
National Science Teachers Association (Q11)

The National Science Teachers Association, independently and in cooperation with the other science teaching societies, presented four sessions-two dealing with teaching problems and two with science content. One of the former, "After BSCS, What?," didn't answer its own question, but participants predicted more historical aspects of biology, more social relevance, and more quantitative handling of data in the high school biology courses of the future. The other teaching program discussed the need for new approaches for laboratory programs for general education science programs in colleges and in the increasing number of junior colleges. A novel approach to the study of human ecology based on social institutions was presented to a joint session by Stanley A. Cain (Assistant Secretary of the Interior). A symposium on oceanography pointed out that the most important biological characteristic of our entire planet is the presence on its surface of liquid water, sketched some aspects of oceanography today, and then discussed the important energy relationships between the oceans and the atmosphere. As Michael Garstang, the speaker on "Fueling the Air-Sea System," said, "Motions of the atmosphere and oceans are sustained not by energy received directly from the sun, but through a complicated exchange process at the air-sea interface. . . . The intermittent bursts of energy supplied to the atmosphere by the ocean are concentrated in organized atmospheric disturbances." Asked by a member of the audience whether-from this line of reasoning-one might consider hurricanes as safety valves for the release of excess of built-up energy, Garstang said that this might be the case and that, should it become possible to dissipate hurricanes in their early stages, the energy which they normally would transfer to other localities would have to "go somewhere," but did not predict where. The discussions by all of the speakers make it clear that oceanography is an interdisciplinary area of study, research, and action and that distinctions between disciplines are meaningless in oceanography.

MARY E. HAWKINS The Science Teacher, Washington, D.C.

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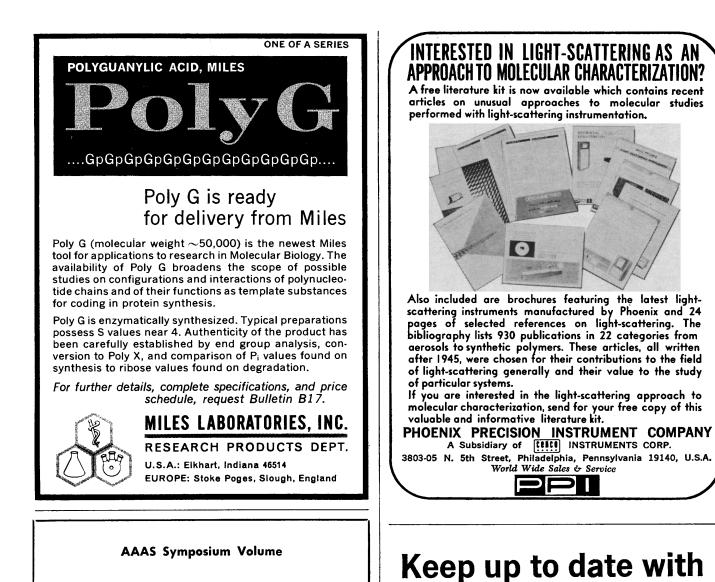
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MAN, CULTURE, AND ANIMALS: The Role of Animals in Human Ecological Adjustments

Editors: Anthony Leeds and Andrew P. Vayda 304 pp., illus., bibliog., indexes, August 1965. Price: \$8.00. AAAS members' cash orders: \$7.00.

The volume is based on a symposium held at the AAAS meeting in Denver, December 1961. It presents case studies of the relationships among human populations, the animals they use for food or foodgetting, the plants significant for maintaining both animals and men, and the socio-cultural usages by which plants, animals, and men are linked in ecosystems.

Anthropologists and geographers discuss animal characteristics, populations dynamics, diets, and other ecosystem variables, including culture. The case material is used for a unique effort to rethink the logic of functional analysis in anthropology in terms of general systems approaches.

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Statistics (U)

Experimental Design in Epidemiology

Experimental epidemiology flourished in the nineteen-thirties and early forties. Since that time, despite the promise of the work of Webster, Topley, Wilson, and others, there has been little experimentation aside from vaccine trials. Three aspects of epidemiologic methodology were covered at this meeting (27 December 1966). The first (L. R. Christensen) reported on experiments in the classic tradition of the thirties, the second (A. R. Feinstein) on difficulties encountered in the observational studies which represent the bulk of current epidemiologic research. The third paper, a mathematical model for an infection-disease process, represents a tool which is just attaining real importance in epidemiologic research.

Ectromelia virus produces in mice an acute, exanthamatous, smallpox virus. The present study (L. R. Christensen, New York University) provides evidence that ectromelia can persist in mouse populations for extended periods without producing obvious disease, and that individuals harboring such "silent" infections can transmit the disease to normal contacts. Of particular interest is the evidence indicating that such silent infections do not transmit from female to female, but will transmit from female to male, and male to female. This phenomenon of silent transmission has undoubtedly been responsible for several spontaneous outbreaks. If a similar situation can exist with the other animal and human pox viruses, the implications are obvious.

The iatrotropic stimulus, which provokes a diseased host to seek medical attention, can be a symptom due to the disease under survey, or can arise from various other causes (Alvan R. Feinstein, Yale University School of Medicine). Although prognosis depends on the stage at which a disease is detected, the variations due to different iatrotropic stimuli are not specifically considered in most contemporary statistical analyses of treatment.

Statistics about the occurrence of diverse diseases are also generally erroneous because they fail to make provision for changes in the iatrotropic stimuli to aniatric diseased hosts, and for a changing dissemination of fashions, criteria, and tests used by doctors to establish diagnosis.



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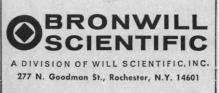


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Two distinct febrile syndromes are associated with dengue virus types 1-4 infections; classic dengue fever and dengue hemorrhagic fever (DHF) (S. B. Halstead and D. Fisher, Yale University). Studies in Southeast Asia have shown that DHF occurs only in areas where multiple dengue types exist and yearly infection rates are high. Patients manifest secondary antibody response. It has been postulated that DHF may be a response to sequential infection with two dengue viruses. A mathematical model based on this postulate, with constant transmission rates gave a good fit to the age specific hospitalization rates for DHF in Bangkok.

LILA M. ELVEBACK

Mayo Clinic, Rochester, Minnesota

Science in General

Sigma Delta Epsilon (X4)

In papers presented at the symposium on cancer and infectious disease by Sigma Delta Epsilon members (27 December 1966) it was reported that a pleomorphic, acid-fast bacterium isolated from partially purified Rous virus produced a disease in chickens consonant with Rous disease. Vaccines and rabbit antisera prepared against the organism protected against challenge with Rous virus.

A similar organism isolated from mouse tumors induced an increase in tumor protection under experimental conditions. This bacterium has filterable forms (PPLO? mycoplasm?) and harbors phages that lyse mycobacteria.

The first indication that chemical carcinogens might affect DNA or RNA was the discovery that the isotopic carbon of an alkyl group of administered methylnitrosamine could be found in an alkyl group attached to the 7-nitrogen atom of guanine of tissue nucleic acid. It has been suggested that reaction of a chemical carcinogen or a metabolite of the carcinogen may react with one or more critical macromolecules to induce neoplasia.

One of the few classes of compounds which has enjoyed clinical usefulness in the field of cancer is that of dihydrofolic reductase inhibitors.

Studies on the parasitic wasp, *Habrobracon*, are being used to broaden the knowledge of the basic mechanisms whereby changes in the cell are induced by ionizing radiation. Studies

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of the mitotic stages show that oxygen and temperature differences resulted in maximum cell damage induced by radiation.

As man resembles the pig in anatomical structures and physiological processes a small pig was desired for medical research. Development of a pig, one-third the size of conventional swine, solely for research, was initiated in 1949 by the Hormel Institute of the University of Minnesota, under the guidance of the late L. M. Winters.

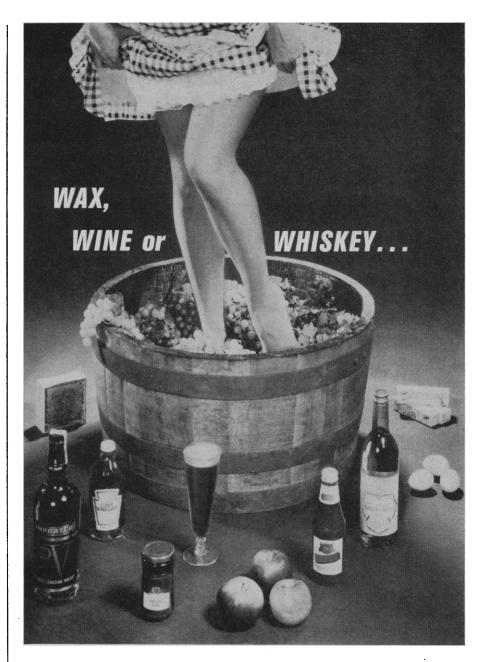
Since 1956 the miniature pig has been useful in studies of subcutaneous granulomas and carcinogens produced by radiation, of pulmonary granulomas produced by beryllium implants, and of neoplasia in the skin produced by chemical agents. AGNES HANSEN

University of Minnesota

A Coffee Hour held in the Hospitality Room (26 December 1966) was attended by over 50 women in science. The first Sigma Delta Epsilon symposium, entitled "Cancer and Infectious Disease" featured research by members and was attended by over 100 men and women. Because of its success the Fraternity has decided to make the symposium an annual event of its national meetings. Plans are already under way for 1967.

The annual luncheon for women in science (attended by 48 women on 27 December) was highlighted by a talk by Margaret Stone (second vice president of the Fraternity) on "What is a Hortorium?" She illustrated her talk with colored slides of plants ranging from the Chamaedorea palm to dainty "upside-down" the orchid which attracts insects to it by a maroon "eye spot." The spot secretes a chemical substance which stuns the insect so that it drops to the pollinia where it receives the pollen subsequently used to pollinate other flowers of this species. The Grand Chapter Meeting was held on 29 December; Irene Corey Diller was installed as National Honorary Member of the Fraternity. Reports on their research were presented for two of the three granteesin-aid in 1966.

The value of the two vice presidents to the Fraternity was demonstrated by the reports of the Chapter Establishment Committee, chaired by the first vice president with the second vice president as one member, and the second vice president's report on her



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SCIENCE MAGAZINE

Room 1740 11 West 42 Street New York, N.Y. 10036 work as coordinator for the Chapter Liaison Officers. Her work has prompted the National Council to create a Chapter Relations Committee to be chaired by the second vice president with the first vice president as one member. Thus, the continuity of these two interrelated committees will be maintained.

HARRIET M. BOYD The Fairfax, 43rd and Locust Streets, Philadelphia, Pennsylvania

Forthcoming Events

March

1-3. Effect of Malnutrition on Mental Development, Learning and Behavior, intern. conf., Cambridge, Mass. (Dept. of Nutrition and Food Science, Massachusetts Inst. of Technology, Cambridge 02139) 1-3. International Particle Accelerator,

I-3. International Particle Accelerator, conf., Washington, D.C. (Office of Technical Activities Board, 345 E. 47 St., New York, 10017)

1-3. Particle Accelerator, natl. conf., American Physical Soc., Washington, D.C. (J. A. Martin, Oak Ridge Natl. Lab., P.O. Box X, 4500S, S-103, Oak Ridge, Tenn. 37830)

2-4. Indian Ocean, symp., New Delhi, India. (N. K. Panikkar, Natl. Inst. of Oceanography, CSIR, Rafi Marg, New Delhi)

2-4. Nuclear Magnetic Resonance, conf., Pittsburgh, Pa. (B. L. Shapiro, Dept. of Chemistry, Illinois Inst. of Technology, Chicago, Ill. 60616)

2-10. Radioactive Dating and Methods of Low-Level Counting, symp., Vienna, Austria. (J. H. Kane, Conference Branch, Atomic Energy Commission, Washington, D.C. 20545)

5-9. International Gas Turbine, conf., Houston, Tex. (Meetings Manager, 345 E. 47 St., New York 10017) 6-7. High Speed Testing: The Rheology

6-7. High Speed Testing: The Rheology of Solids, 6th intern. conf., Boston, Mass. (R. H. Supnik, Plas-Tech Equipment Corp., 4 Mercer Rd., Natick, Mass. 01760)

6-10. Analytical Chemistry and Applied Spectroscopy, conf., Pittsburgh, Pa. (G. L. Carlson, Mellon Inst., 4400 Fifth Ave., Pittsburgh 15213)

6-10. WESTEC, 4th Western Metal and Tool Exposition and Conf., Los Angeles, Calif. (Director of Engineering Conf., 20501 Ford Rd., Dearborn, Mich. 48128)

8-10. Viscoelastic Response of Engineering Materials, mtg., Boston, Mass. (R. H. Supnik, 4 Mercer Rd., Natick, Mass. 01760)

8-22. United Nations Regional Cartographic Conf. for Asia and the Far East, Canberra, Australia. (United Nations, New York, N.Y.)

9-11. National Medicolegal Symp., Miami Beach, Fla. (Miss B. Spies, Law Dept., American Medical Assoc., 535 N. Dearborn St., Chicago, Ill. 60610)

10-11. National Conf. on **Rural Health**, Charlotte, N.C. (B. L. Bible, Secretary, American Medical Assoc., 535 No. Dearborn St., Chicago, Ill. 60610)

10-12. American Assoc. of Pathologists and Bacteriologists, Washington, D.C. (J. Lowell Orbison, School of Medicine and Dentistry, Univ. of Rochester, 260 Crittenden Blvd., Rochester, N.Y.)

13-14. Astronautics, symp., Ottawa, Ont., Canada. (The Secretary, Canadian Aeronautics and Space Inst., 77 Metcalfe St., Ottawa 4, Ont.)

13-15. 32nd North American Wildlife and Natural Resources Conf., San Francisco, Calif. (Wildlife Management Inst., 709 Wire Building, Washington, D.C. 20005)

13-17. International Laboratory Apparatus and Materials Exhibition, London, England. (U.T.P. Exhibitions Ltd., 3 Racquet Ct., Fleet St., London E.C.4)

13-17. Use of Plutonium as a Reactor Fuel, intern. symp.. Brussels, Belgium. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

14-15. American Astronautical Soc. 5th Goddard Memorial Symp., "The Voyage to the Planets," Washington, D.C. (M. B. Lees, General Electric Co., Defense Programs Div., 777 14th St., NW, Washington, D.C. 20005)

14-15. Space, natl. mtg., Los Angeles, Calif. (D. P. Chandler, 3370 Miraloma Ave., Anaheim, Calif. 82803)

14-15. Temperature Measurements Soc., 5th conf., Los Angeles, Calif. (R. A. Finch, Conf. and Exhibit Chairman, Atomics International, P.O. Box 309, Canoga Park, Calif. 91304)

15-17. Instrumentation for the Iron and Steel Industry, Natl. Instrument Soc. of America, 17th conf., Pittsburgh, Pa. (F. J. Barchfeld, Jones & Laughlin Steel Corp., 900 Agnew Rd., Pittsburgh 15230) 16-18. Hydrogeology of the Northeast,

Geological Soc. of America, Boston, Mass. (M. Prinz, Tufts Univ., Medford, Mass.) 16-17. Hypervelocity Techniques, 5th

symp., Denver, Colo. (A. A. Ezra, Research Inst., Univ. of Denver, Denver 80201)

16-19. International Assoc. for **Dental Research**, 45th general mtg., Washington, D.C. (G. H. Rovelstadt, c/o Navy Dental School, Natl. Naval Medical Center, Bethesda, Md. 20014)

17-21. National Science Teachers Assoc., conv., Detroit, Mich. (Executive Secretary, NSTA, 1201 16th St., NW, Washington, D.C. 20036)

19-24. Southeastern Surgical Congress, Bal Harbour, Fla. (A. H. Letton, Executive Secretary, 340 Boulevard N.E., Atlanta, Ga. 30312)

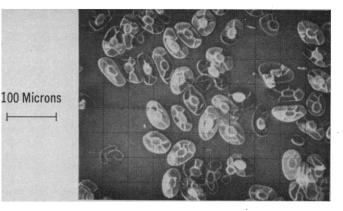
19-26. Canadian-American Medical and Dental Assoc., Vail, Colo. (T. Trapasso, Secretary, 816 Ashmum St., Sault Ste. Marie, Mich. 49783)

20-23. Institute of Electrical & Electronics Engineers, intern. conv., New York, N.Y. (A. B. Giordano, The Institute, 345 E. 47 St., New York 10017)

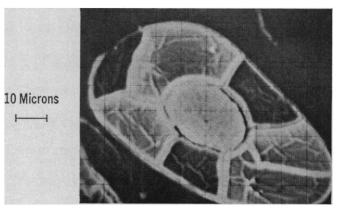
20. Field-Ion Microscopy, mtg., Cambridge, England. (Meetings Officer, Inst. of Physics and Physical Society, 47 Belgrave Sq., London S.W.1, England)

20-22. Physical Electronics, annual conf., Cambridge, Mass. (Research Lab. of

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22-24. Astrogeology, symp., University of Michigan, Ann Arbor, Mich. (E. W. Heinrich, Dept. of Geology and Mineralogy, Univ. of Michigan, Ann Arbor 48104) 22-24. Modern Optics, intern. symp., New York, N.Y. (J. Fox, Polytechnic Inst. of Brooklyn, 333 Jay St., Brooklyn, N.Y. 11201)

23-24. Seismological Soc. of America, Santa Barbara, Calif. (D. Tocher, U.S. Earthquake Mechanism Lab./ESSA, 390 Main St., San Francisco, Calif. 94105)

23-24. Social Facilitation and Imitation Behavior, symp., Miami Univ., Oxford, Ohio. (E. C. Simmel, Dept. of Psychology, Miami Univ., Oxford 45056)

23-25. Institute of Mathematical Statistics, central regional mtg., Columbus, Ohio. (G. E. Nicholson, Jr., Dept. of Statistics, Univ. of North Carolina, Chapel Hill 27515)

23-25. Society of **Toxicology**, Atlanta, Ga. (C. S. Weil, Mellon Inst., 4400 Fifth Ave., Pittsburgh, Pa. 15213)

26-30. Association of American Geographers, 63rd annual mtg., St. Louis, Mo. (Executive Officer, 1146 16th St., NW, Washington, D.C. 20036)

27-30. American **Physical** Soc., Chicago, Ill. (R. G. Sachs, P.O Box 344, Argonne, Ill.)

27-30. Canadian Inst. of Mining and Metallurgy, 69th annual mtg., Ottawa, Ont., Canada. (Secretary, 121 Richmond St. W., Toronto 1, Ont.)

28-30. Engineering Aspects of Magnetohydrodynamics, symp., Stanford, Calif. (R. H. Eustis, Stanford Univ., Stanford 94305)

28-30. Photovoltaic Specialists, 6th IEEE conf., Cocoa Beach, Fla. (F. A. Shirland, Clevite Research Center, 540 E. 105 St., Cleveland, Ohio 44108)

29-30. Building Research Advisory Board, research symp., "Performance Concept of Building," New Orleans, La. (R. W. Spangler, Board, Natl. Research Council-Natl. Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

29-31. Immunologic Approaches to Mechanisms of Cutaneous Disease, New York Univ. Medical Center, New York, N.Y. (Office of Recorder, New York Univ. Post-Graduate Medical School, New York 10016)

29-31. The Origins of Schizophrenia, intern. conf., Rochester, N.Y. (J. Romano, Univ. of Rochester School of Medicine, Rochester 14620)

29-31. Structural Dynamics and Materials, conf., Palm Springs, Calif. (A. Kaplan, 1 Space Park, Redondo Beach, Calif. 90278)

29-1. Microcirculation as Related to Shock, conf., Boston, Mass. (D. Shepro, Boston Univ. Biological Science Center, 2 Cummington St., Boston 02215)

30-31. Transport Properties of Superconductors, Canterbury, England. (Meetings Officer, Inst. of Physics and Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

31-5. American Chemical Soc., San Francisco, Calif. (B. R. Stanerson, American Chemical Soc., 1155 16th St., NW, Washington, D.C. 20036)



Atomism in England From Hariot to Newton

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The Biology of Human Adaptability

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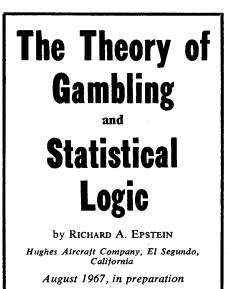
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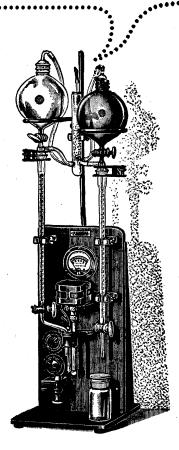
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