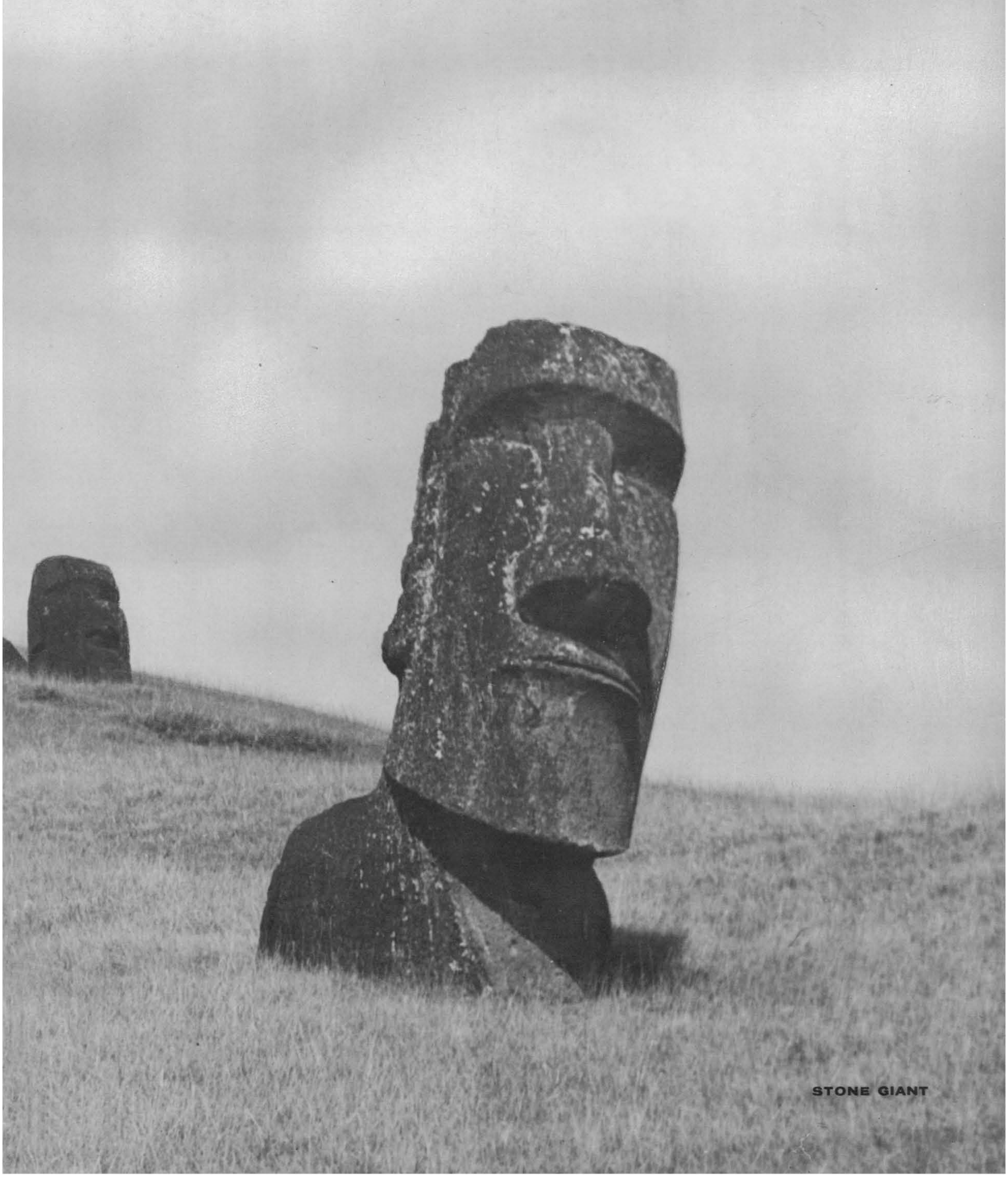
SCIENCE

19 August 1966

Vol. 153, No. 3738

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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19 August 1966
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SCIENCE

SCIENCE is published weekly on Friday and on the fourth Tuesday in November by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C. Annual subscriptions $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢, except **Guide to Scientific Instruments,** which is [illegible]. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for change of address, giving new and old address and zip numbers. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER

Statues of prehistoric origin on the volcanic slopes of Easter Island range in height from 12 to 25 feet. The forms were carved out of volcanic rock with stone hand tools and then placed erect on stone platforms near the sea. Their historical significance is still undetermined. See page 821. [Courtesy of Chilean Embassy, Washington, D.C.]

"Low-level counting"

You can now buy the instruments that experts developed for their own demanding research.

An assemblage of experts doing research in low-level counting techniques needed (but could not find) instruments that met their exacting requirements. So, as you just might surmise, they solved their problems over the years by developing several rather distinctive low-level counters—*not* to develop instrumentation for the sake of developing instrumentation (or even for the sake of selling it), but only as functional, reliable means to ends. And then, inevitably, as they used this equipment in their own research programs, they de-bugged it. Result: user-designed, user-perfected, user-seasoned, low-level counters which can do what no existing instruments can do. Now as other workers see these counters working in our laboratories, we get, with increasing frequency, requests for duplicate copies. Accordingly, we are now making these counters available (not reluctantly, it should be noted) to others with similarly exacting requirements. For the specifics, read on.

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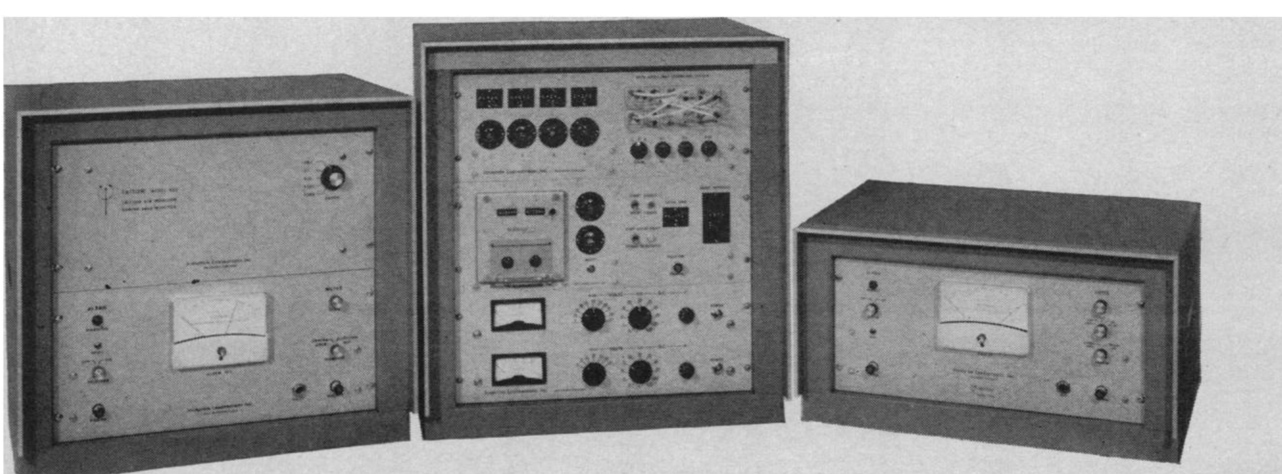
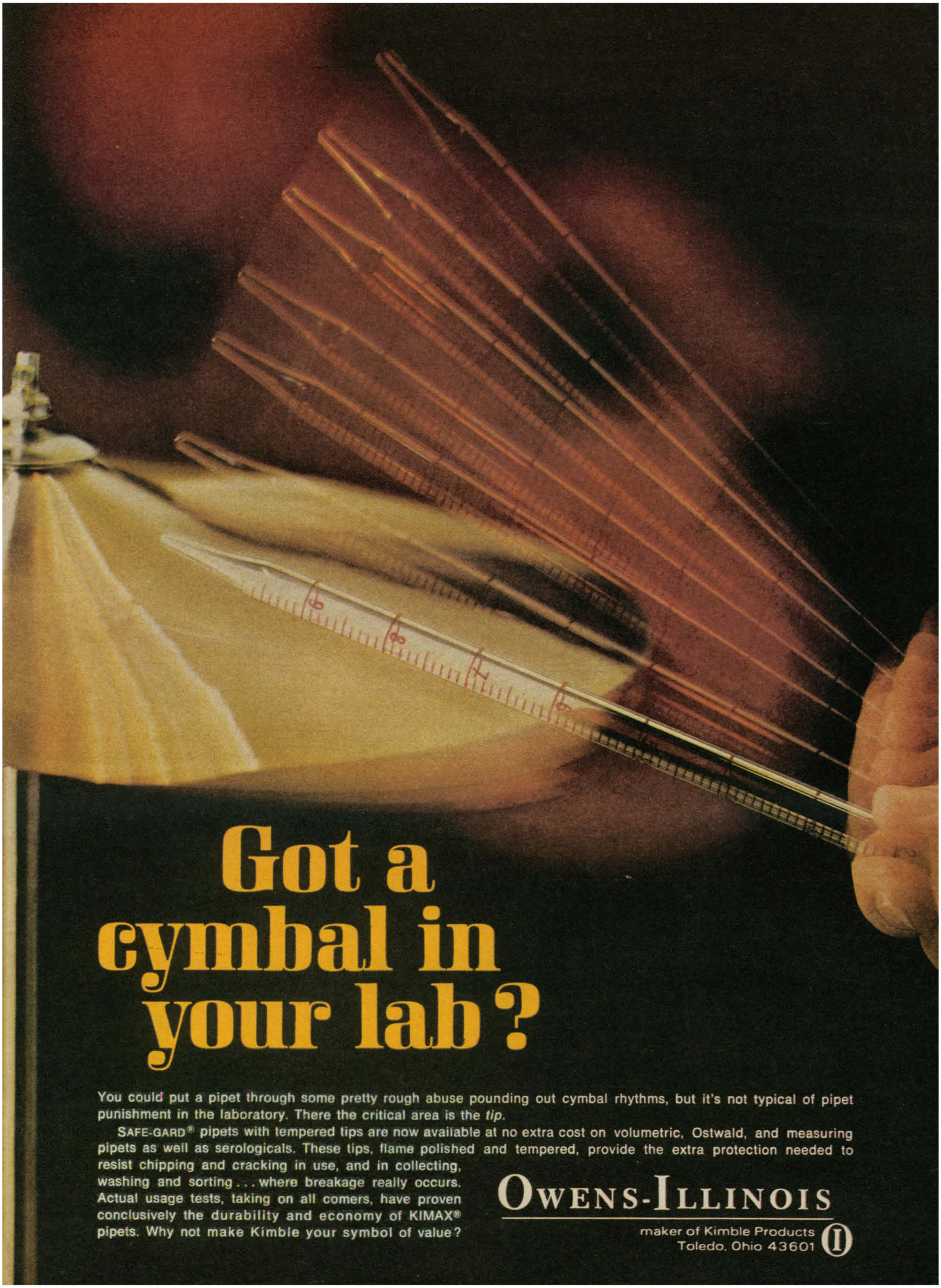


JOHNSTON LABORATORIES, INC., 3617 Woodland Avenue, Baltimore, Maryland 21215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Washington Academy of Sciences Invited Address: Speaker: P. M. S. Blackett, Nobel laureate in physics, president of the Royal Society, "The Ever-Widening Gap."

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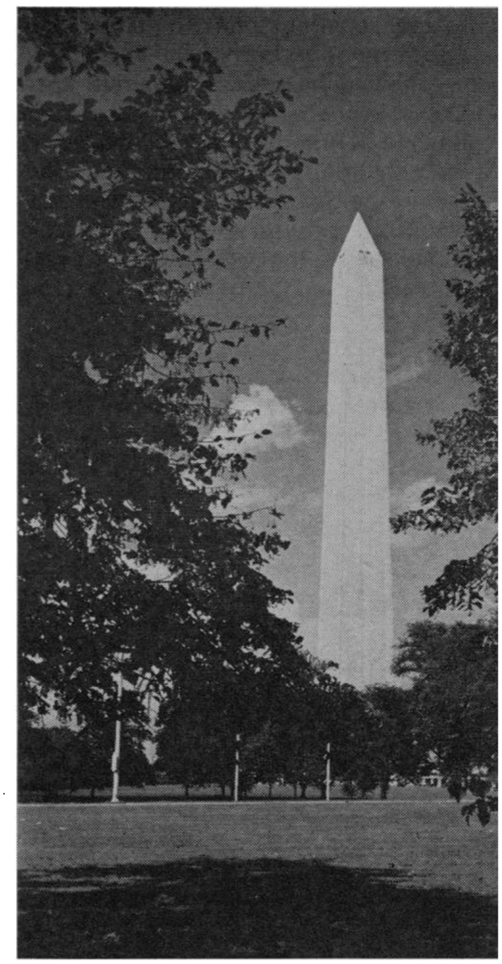

J. Stinchcomb

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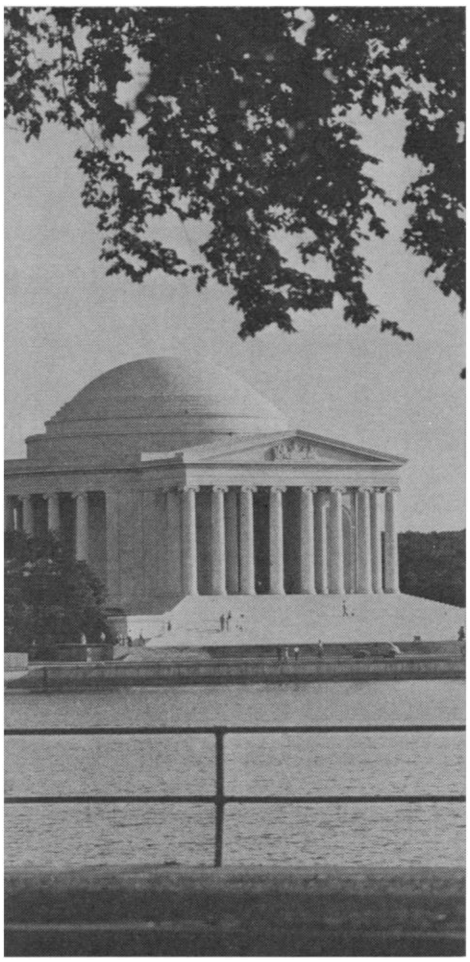

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For more details on all of the above facilities and services, and for a list of the headquarters of each participating society and section, see the 22 July issue of Science, page 437.

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*All rooms are subject to a 4% District transient room tax.
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(Individual requesting reservation) (Please print or type)

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- ☐ The **ANSITRON**[T] **II** liquid scintillation counter
- ☐ The **LIQUIMAT**® liquid scintillation counter
- ☐ The **SCINTI/FLOW** monitor system

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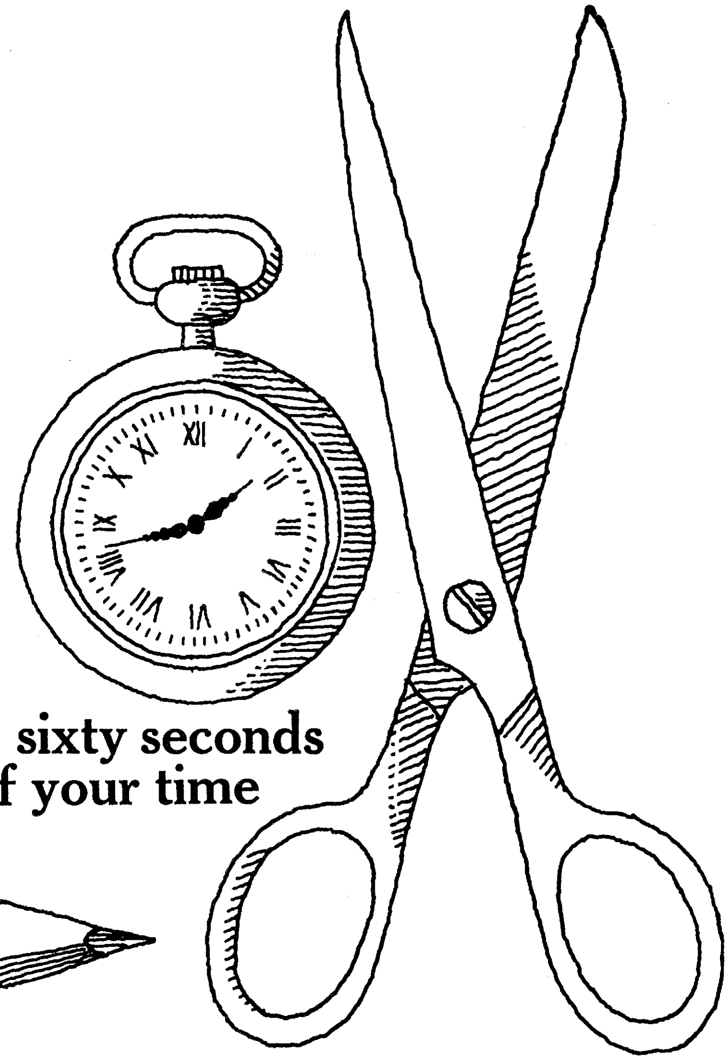

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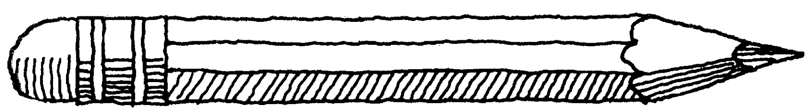

will give you the story on Picker's newly expanded line of liquid scintillation counters.

Picker Nuclear has an exceptionally diverse line of instruments for radio-tracer studies of every kind. But the *special* news here is this: the line has now been expanded to include the well-respected ANSITRON liquid scintillation counter for beta work, and a unique flow monitor system for liquid or gas streams. These instruments are now available only from Picker Nuclear. And Picker Nuclear will service them—*as it will every ANSITRON instrument sold previously in the United States and Canada.*

Ansitron[T] II liquid scintillation counter

The ANSITRON is clearly the unit of choice when the goal is maximum simplicity in beta counting. One example (of several): the availability of "β-Set" plug-in discriminators which provide preset control settings for commonly used isotopes and mixtures. When inserted, these "β-Set" modules automatically set upper and lower discriminator levels. This assures precise duplication of settings for repetitive experiments and effectively eliminates a source of human error. Other design features include: logarithmic spectrum shaping, cpm computation and automatic external standardization. (With Picker service everywhere.)

Liquimat® liquid scintillation counter

Picker's LIQUIMAT liquid scintillation counter is the preferred instrument if your current or future plans include both beta and gamma work. The LIQUIMAT is the *only* available liquid scintillation counter that provides a single integrated system for beta and/or gamma counting. This instrument also includes: logarithmic spectrum shaping, cpm computation and automatic external standardization. And Picker service everywhere.

The Scinti/Flow monitor system

This unique system permits the continuous assay of beta radiation in flowing gas or liquid streams. And it is *not* limited to aqueous solutions: materials in organic solvent systems can be continuously monitored. Other features: cross contribution subtraction provides virtually complete dual isotope separation; external standard enables quenching evaluation; logarithmic amplification simplifies control operation; compact design requires minimum laboratory space. And now too, Picker service everywhere.

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PICKER nuclear

Weaver is overly optimistic in his opinion that "the only useful judgment concerning university teachers comes from their immediate working colleagues."

It is very likely that no teacher is the best possible one for all his students and that no teacher is totally ineffective for all the students he teaches. Between these extremes, however, it should be possible to devise a comprehensive scheme of evaluation that can be accepted ultimately by a reasonable proportion of those interested in developing such a measure. . . . I would give greater weight than Weaver to students' judgments. . . .

LEVON KABASAKALIAN
65 Sun Haven Drive,
New Rochelle, New York 10801

. . . It seems fruitless to discuss sources of evaluating teachers without establishing criteria for judging a good teacher. Having taught at various levels for 22 years, I am convinced that there are four basic criteria for good teachers.

1) Competence in subject field. A good teacher should be proficient not only in the subject matter he teaches, but also in related subjects, regarding teaching not as a routine duty but as a challenge requiring constant revitalization. He must be alert and diligent in searching both old and new knowledge.

2) Clarity of verbal communication. Instructions must be presented in such a way that the majority of students in the class comprehend and respond. Scholars with difficulty in verbal presentation can be great masters for a few graduate students though they may not be good teachers for most undergraduates. A seriously devoted teacher can improve his deficiencies in verbal communication.

3) Dedication to the educating process. The genuinely dedicated teacher recognizes that good teaching inspires results which sometimes don't become apparent for years, even decades, yet he finds such long-range opportunities continually challenging.

4) Love for students. Disinterest in one's pupils is not characteristic of good teachers who realize that their concern for individual students is an essential of teaching and the cultivation of wholesome citizens. Even in large classes, frequent contacts should be arranged to emphasize the personal relationship between teacher and students.

In summary, the first two criteria are objective and can be learned by any devoted teachers; the last two are subjective and must be acquired by self-discipline. Only when a teacher meets these criteria to a marked degree can he then be considered a good teacher. . . .

JOSEPH C. LEE
Department of Anatomy, School of Medicine, State University of New York at Buffalo, Buffalo 14214

The First Computers

Luther Carter, in his article on "Campus computers" (News and Comment, 25 Feb., p. 969), repeats a common error about the early history of computers, in saying that "the first computers were conceived and built at universities."

In the present context, I assume the term "computer" refers to the typical modern computer which differs from those of an older vintage in several ways. Probably the outstanding differences are in the programmed control and in the use of fast binary components.

In point of fact, there were in daily operation several computers with these characteristics some years prior to any completed in a university. The use of binary logic (with the excess-three code, now familiar to computer technology) was introduced in a computer designed by me and built at the Bell Telephone Laboratories in the period 1937–1939. It was demonstrated by remote control from Hanover, New Hampshire, at a meeting of the Mathematical Society in September 1940. . . .

The first operating computer in a university might be said to be the Harvard Mark I, of 1944. This machine was a decimal rather than a binary device and employed IBM mechanical drum accumulators. The first university-originated binary computers would, I think, be the Mark II and the ENIAC, both of about 1946. . . .

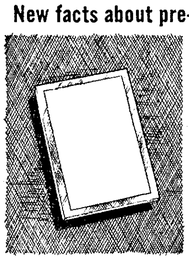
I should mention, too, that Konrad Zuse in Germany also made use of binary elements prior to the university-originated computers.

Perhaps, in view of the work of many pioneers like Aiken, Mauchly, Eckert, Williams, Andrews, Booth, and hundreds of others, it is unfair to name any particular computer as "first," but in recognition of the con-

The facts have changed!

Three new pre-coated systems for Thin Layer Chromatography have lowered cost, raised quality, widened its application.

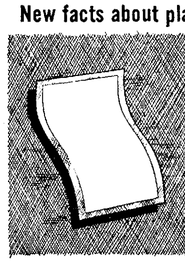
New facts about pre-coated glass



The new E. Merck, A. G. (Darmstadt) Pre-Coated Glass Plate is the finest, most versatile pre-coated TLC system ever developed. Yet a 20 x 20 cm. plate costs as little as 68¢ (in quantity) — about half as much as previously available glass systems. And it offers 5 notable advantages:

- glass only 1 mm. thick —easier to store, easier to cut into strips
- a sorbent layer (Silica Gel F 254) 250 microns in thickness—the same as you get with your own coating apparatus—offering higher capacity than thinner pre-coated systems currently available
- the hardest coating yet developed—meaning plates that are abrasion-proof under normal conditions—guaranteed to arrive in good condition—may be stacked one on top of another
- the best separating characteristics of any pre-coated system now available—equivalent to the plate you make yourself
- unique organic binder—may be used with corrosive sprays (including sulphuric and perchloric acids) and charring techniques —cannot be eluted by organic solvents—does not interfere with stains

New facts about plastic foils



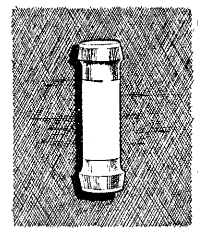
Although it is the most elegant TLC system in existence, use of the pre-coated plastic foil has been extremely limited due to its relatively high cost and narrow range of applications. Now Brinkmann introduces the MN Polygram pre-coated foil, far more versatile but costing about 30% less.

The MN Polygram foil features a dry layer with significantly higher capacity than that of previously available coated foils.

Four different types of coating are available: silica gel with starch binder, silica gel with starch binder and fluorescent indicator, cellulose powder without binder, and cellulose powder without binder but with fluorescent indicator. Each type comes in both 20 x 20 and 5 x 20 cm sizes.

Where a binder is used, starch has been selected because previously used binders (such as polyvinyl alcohol) have a substantial negative effect on the adsorption characteristics, especially when non-polar solvents are employed. Starch, however, is normally satisfactory except with highly aqueous systems, in which case the foils must be handled with care.

The Chromatotube—a new fact in itself



Chromatotubes are round glass tubes (12.5 x 2.5 cm) coated with sorbent on the inside. Since one end is closed, they are also self-contained developing tanks. After spotting, the open end is immersed in an auxiliary solvent tube sealed to the side by a plastic ring.

Special binders are not required and all conventional solvents and staining reagents may be employed. After separation, the tube can be eluted overnight and reused after activation.

Providing the most reliable, reproducible Rf values, Chromatotubes are probably the best TLC system for maintenance of uniform standards. The developing distance of 10 cm is marked so that the Rf is read at a glance. Thus the Chromatotube is ideal for mass analyses as in production control, clinical testing, and teaching procedures involving numerous students. At a relatively low cost each student has a complete chromatographic assembly.

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BRINKMANN INSTRUMENTS

CANTIAGUE ROAD, WESTBURY, N.Y. 11590/ED 4-7500 tinuity of circuit logic from 1937 down to the present time, it seems that the early "relay" computers should be included among the pioneers.

GEORGE R. STIBITZ
Department of Physiology, Dartmouth Medical School, Hanover, New Hampshire

Industry Does Retrieve Information

Fry has presented an interesting mathematical expression for the relationships of information and research (Letters, 24 June). He states: "It often takes less time to do it all over again than to find out how someone did it earlier. This is, in fact, common practice in industrial research. . . ." This is far from the case in the pharmaceutical industry. The economic consequence of spending millions of dollars on a new product, only to learn that it is unpatentable because of the existence of prior art, would be so disastrous that no research group in their right minds would knowingly take such risks. In fact, we devote considerable time and expert attention to literature searching and, from personal experience in both academic and industrial spheres, I would say that the literature is searched more broadly and in greater depth in industry than in the academic world.

In part the difference in searching efficiency in industry is due to the large files that can be searched by computer, particularly in the patent area. Any deficiencies in our literature searching performance are certainly not due to lack of trying.

MAXWELL GORDON
Smith Kline & French Laboratories, Philadelphia, Pennsylvania

New Channels for Grants

Recent discussions about the merits of project research grants over institutional grants have failed to mention one remedy that would overcome the disadvantages of institutional grants. As Gross points out (Letters, 6 May), senior administrators of institutional grants are tempted to divert most of the awarded funds to projects which happen to interest them. Though usually retired from active investigation, they continue naturally to have their favorite ideas about what is important to investigate. They are, moreover, under other pressures to build up this or that department or project in order to please or appease critics of their institutions.

The remedy which I propose resembles a water irrigation system. In such a system, each sluice gate diverts water while allowing other water to pass on to a lower level. In application of this principle, let us imagine agency A capable of disposing of so many funds for research. Suppose that this agency divides its funds into two portions. One portion will continue to support project grants directly applied for by the individual investigators or teams; the other will be awarded to institutions directly. Institution X (for example, a School of Engineering or Medicine), then receives a substantial grant as its share of the funds devoted to institutional grants. Of this institutional grant, the dean (and his associated committee, if he has one), can retain half, but must pass on the other half to the chairmen of the different departments of the benefited school. The chairmen in turn can use half of what they receive, as they see fit, but again must disperse the other half to any applying investigator within the department. If a chairman found no individual applicant within his department, these funds would revert to the next higher level, the dean's committee. This would stimulate the chairman to find and appoint applicants likely to use the funds.

A method such as this would assure original individual investigators of some support in spite of opposition from senior committee members of the institution. At the same time, it would preserve the privileges and responsibilities of administrators in retaining control of major portions of funds. We all know the familiar predicament of original investigators whose applications for funds have been frustrated for years both by local committees at their institutions and national committees of fund-granting agencies. The local committees are usually composed of persons outside the investigator's specialty who are not in a position to judge the value of an investigator's project or his abilities. But the outside committees, composed of scientists in the same field, often include many persons who have drifted out of active investigation themselves, while enjoying committee life. These persons often have clear ideas of where the next advances in their fields will come from and may prove equally frustrating to the original investigator when he applies for funds. Such a man needs some protection from the general conservatism of all committees. At the same time, the taxpayers or other fund-givers are entitled to some protection against waste and wildness, which protection could be provided by allowing administrators to retain control over some, but not all, the funds passing through their hands.

IAN STEVENSON
Department of Psychiatry, University of Virginia School of Medicine, Charlottesville 22901

On Using Inferential Statistics

Statistical tools are of two general kinds: descriptive and inferential. The first type describes the investigator's findings, summarizing raw data into more comprehensible form—numerical, graphic, or tabular. The second type aids the drawing of conclusions as based on the rules of probability.

Findings may be the result of chance fluctuations. An investigator contributes more when he indicates the degree of confidence he has that his data are not the result of chance factors. The use of inferential statistics specifies precisely this degree of confidence. In addition, readers are helped immensely when data are presented clearly. The appropriate use of inferential concepts frequently clarifies data presentation as well as legitimate conclusions.

In the 22 April issue of *Science* there were 23 reports. Of these, only four used inferential statistics. In two of these four, no statistically significant findings were reported. In a third report, over 20 statistical tests were performed but only one was significant, and this one was relatively unimportant, since the main findings of the authors (Greenberg, Atkins, and Schiffer) was the lack of significant difference in the measures of various bodily regions.

Perhaps the more critical observation is the following: of the 23 reports, 13 could have used inferential statistics—only four did. How "significant" these observations are is a matter for the reader to judge.

GERALD J. DRIESSEN
ARTHUR J. DERBYSHIRE
Department of Otolaryngology, Illinois Eye and Ear Infirmary, University of Illinois at the Medical Center, Chicago, Illinois 60612

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Two masts and a plate available for holding things.

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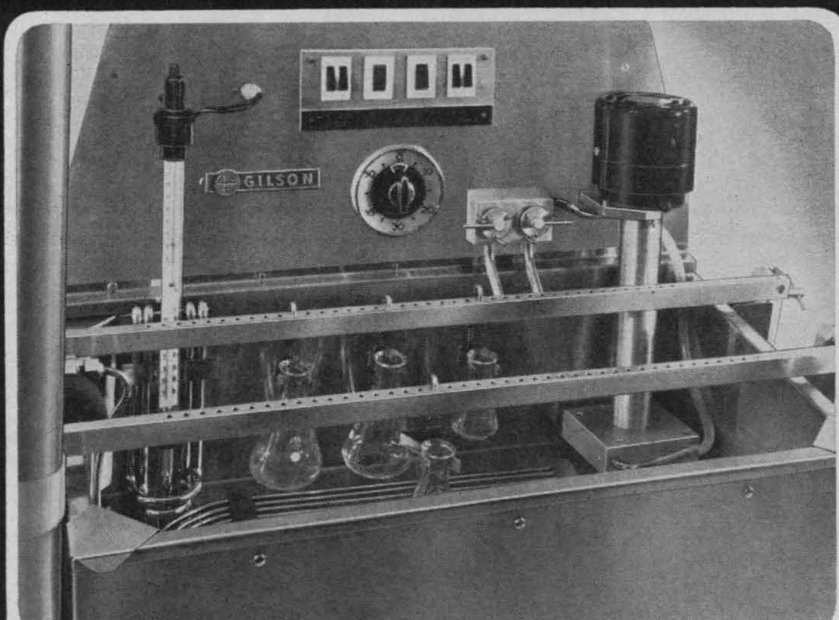

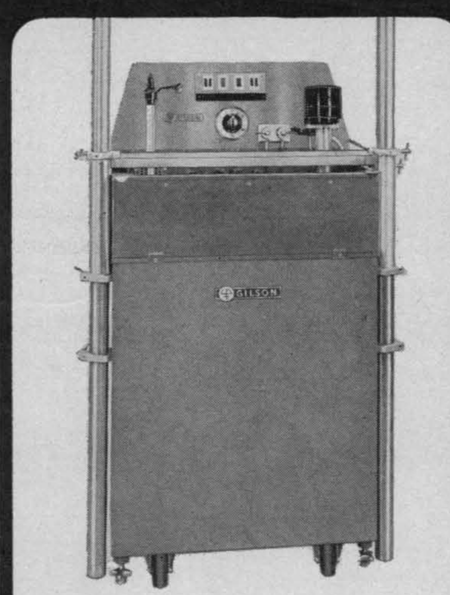

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SCIENCE

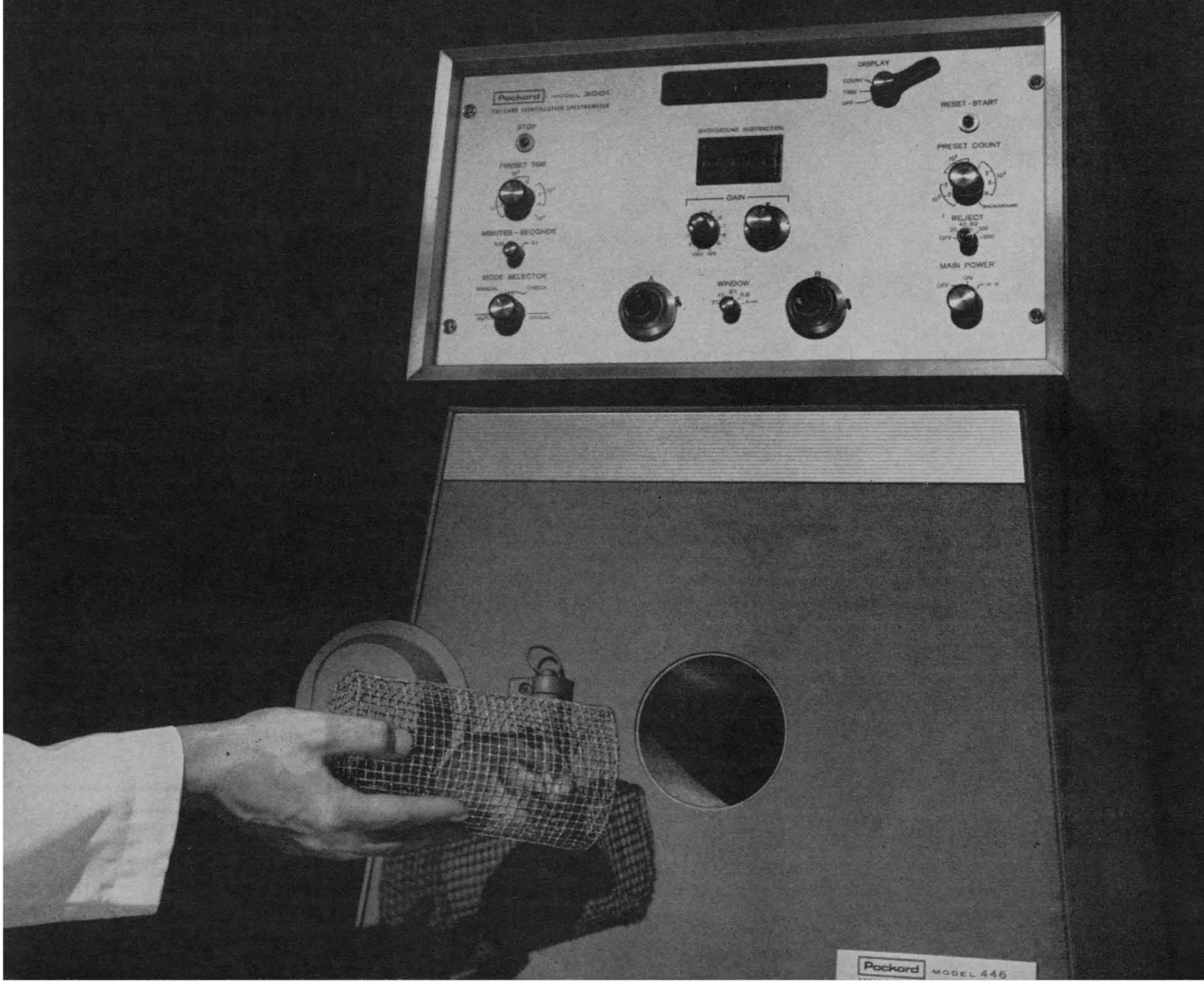
Political Realities and Educational Needs

In September 1965 President Johnson issued an executive order aimed at achieving more even distribution of research funds. Change, however, has been slow. There has been little alteration in the situation outlined by Representative Green of Oregon in 1962: a few states and a few institutions get most of the money. Congressional impatience is increasing. This was evident in recent hearings on geographical distribution, before a subcommittee on Government Operations headed by Senator Harris of Oklahoma (*Science*, 5 August 1966). In his examination of the President's Science Adviser, Senator Harris accused both Dr. Hornig and Dr. Haworth, of NSF, of being patronizing and condescending in their treatment of his committee and of giving Congress the runaround. The bitterness of Senator Harris's attack seems excessive, but a look at the background makes his attitude more understandable.

Leaders of the Establishment have been slow to respond to important shifts in political attitudes arising from changing circumstances. Perhaps the most important is a revised evaluation of the Russians. During the 1950's Ivan was portrayed as a superhuman 12 feet tall. Following the 1962 Cuban confrontation Ivan's stature shrank. Today he is a midget (a dangerous assumption). This revised evaluation has had major effects on Congress. It has been a factor in the slowing of growth of funds for both research and development. It has removed an important restraint that previously kept allocation of R&D funds out of logrolling politics. During the period when we regarded ourselves as mortally pressed by the Russians, the patriotic and politically wise stance was to expand research and development where optimum performance could be obtained. Efforts to change geographical distribution of funds might not have become urgent had not many politicians become convinced that federal research and development funds are a key to economic progress. Politicians are aware of spectacular growth on the Coasts in contrast to stagnation in mid-continent areas that have not received large allocations. The contest for the new high-energy accelerator dramatized the issue. The effort also brought together scientists and politicians in the have-not states, initiating cooperation which in future days, on other battlefields, may bring successes.

Democrats and Republicans from have-not states find it easy to agree on the need for a "better" distribution of R&D funds. Senator Karl Mundt of South Dakota, ranking minority member of the Harris subcommittee, has strongly supported the chairman's position. He reminded the Senate that one state receives more R&D funds than the total received by the lowest 43.

In allocating money for research the granting agencies have compiled a more equitable record than that suggested by the figures cited by Senator Mundt. Nevertheless, the have-not states form a discontented majority. There is a painful contrast between the resources of their universities and those of the schools at the top of the list, and the current grants system serves to increase the disparity. The have-not institutions are especially deficient in modern instrumentation and accordingly can neither compete successfully in research nor educate properly. A new federal aid program responsive to political realities and educational needs is required. It should provide substantial sums, on a per capita basis, for attendance at science courses that meet minimal standards.—PHILIP H. ABELSON



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