SCIENCE

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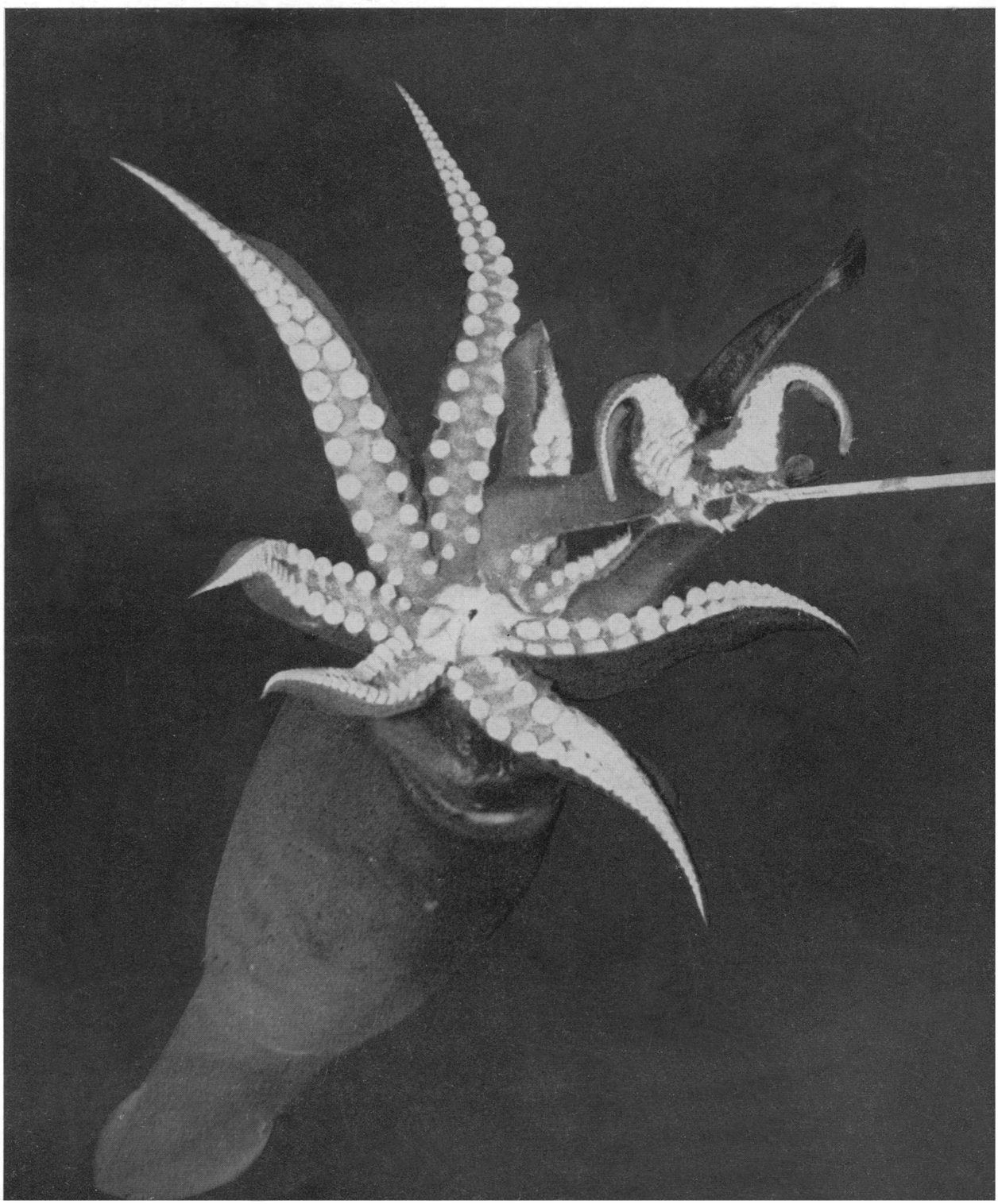
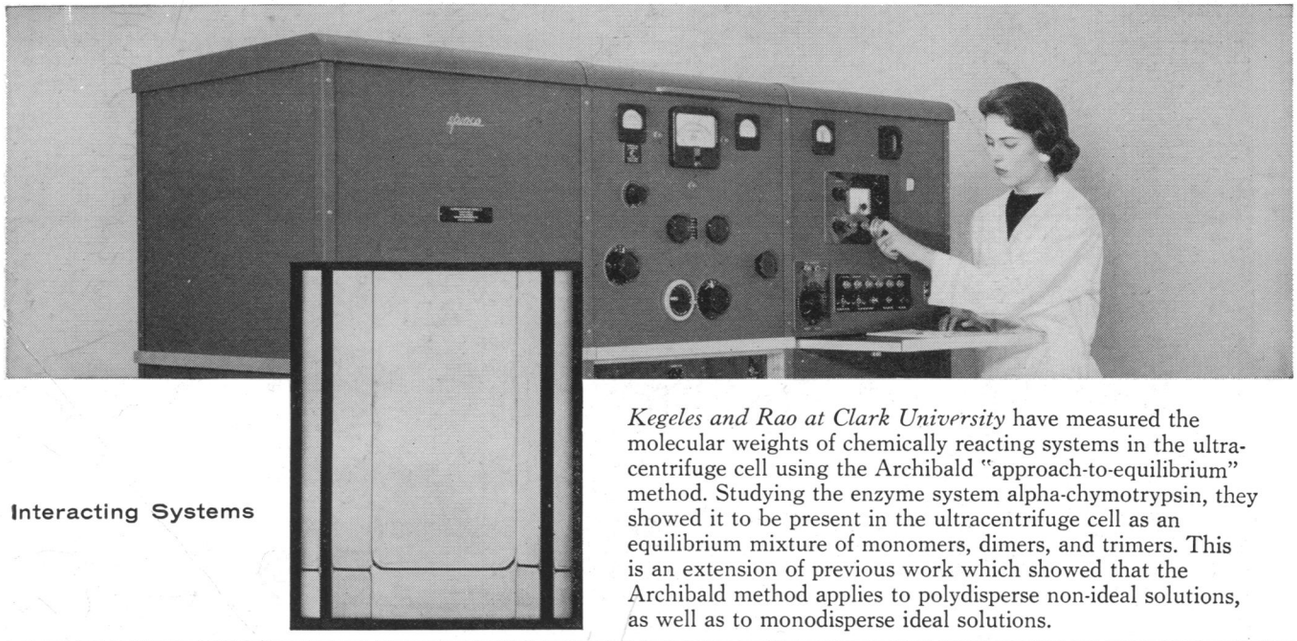
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



New Methods Extend the Usefulness of the Ultracentrifuge

Recent studies by research scientists have further increased the uses of the Analytical Ultracentrifuge for measuring molecular weights and purity of viruses, enzymes, proteins, polymers and a variety of organic and inorganic molecules. Here are four new developments as reported in the technical literature.



Interacting Systems

Kegeles and Rao at Clark University have measured the molecular weights of chemically reacting systems in the ultracentrifuge cell using the Archibald "approach-to-equilibrium" method. Studying the enzyme system alpha-chymotrypsin, they showed it to be present in the ultracentrifuge cell as an equilibrium mixture of monomers, dimers, and trimers. This is an extension of previous work which showed that the Archibald method applies to polydisperse non-ideal solutions, as well as to monodisperse ideal solutions.

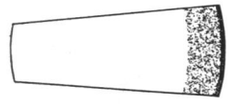
Improved Accuracy

Trautman, at New York's Rockefeller Institute for Medical Research, showed that the accuracy of the Archibald method can be improved by more precisely locating the position of the meniscus on the ultracentrifuge photographic plate. He made a detailed study of the optical fine structure at the meniscus, and used a special optical aligning procedure with a mirror in the ultracentrifuge cell.

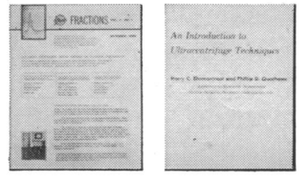
Simplified Measurements

At Stockholm's Nobel Medical Institute, Ehrenberg reports a simplified approach-to-equilibrium method which makes measurements from the schlieren curve easier. He runs the ultracentrifuge fast enough for a peak to begin forming at the meniscus so that the schlieren curve is parallel with the baseline and no extrapolation is necessary. His measurements of molecular weight and diffusion constants agree closely with those by other methods.

Rapid Equilibrium



Van Holde and Baldwin at the University of Wisconsin have used short liquid columns to achieve complete sedimentation equilibrium in a fraction of the time previously required. Using liquid columns of only 3 mm, they report equilibrium with sucrose in 3½ hours, and with a 1 mm column in only 30 minutes. In addition, the authors report that measurements during approach-to-equilibrium permit calculation of a diffusion coefficient.



If you are not familiar with the Ultracentrifuge, we will be happy to send you copies of "An Introduction to Ultracentrifuge Techniques" and the latest issue of "Fractions", a periodical sent to owners of Spinco ultracentrifuges, electrophoresis-diffusion instruments and amino acid analyzers. Write Spinco Division, Beckman Instruments, Inc., Stanford Industrial Park, Palo Alto 5, California.

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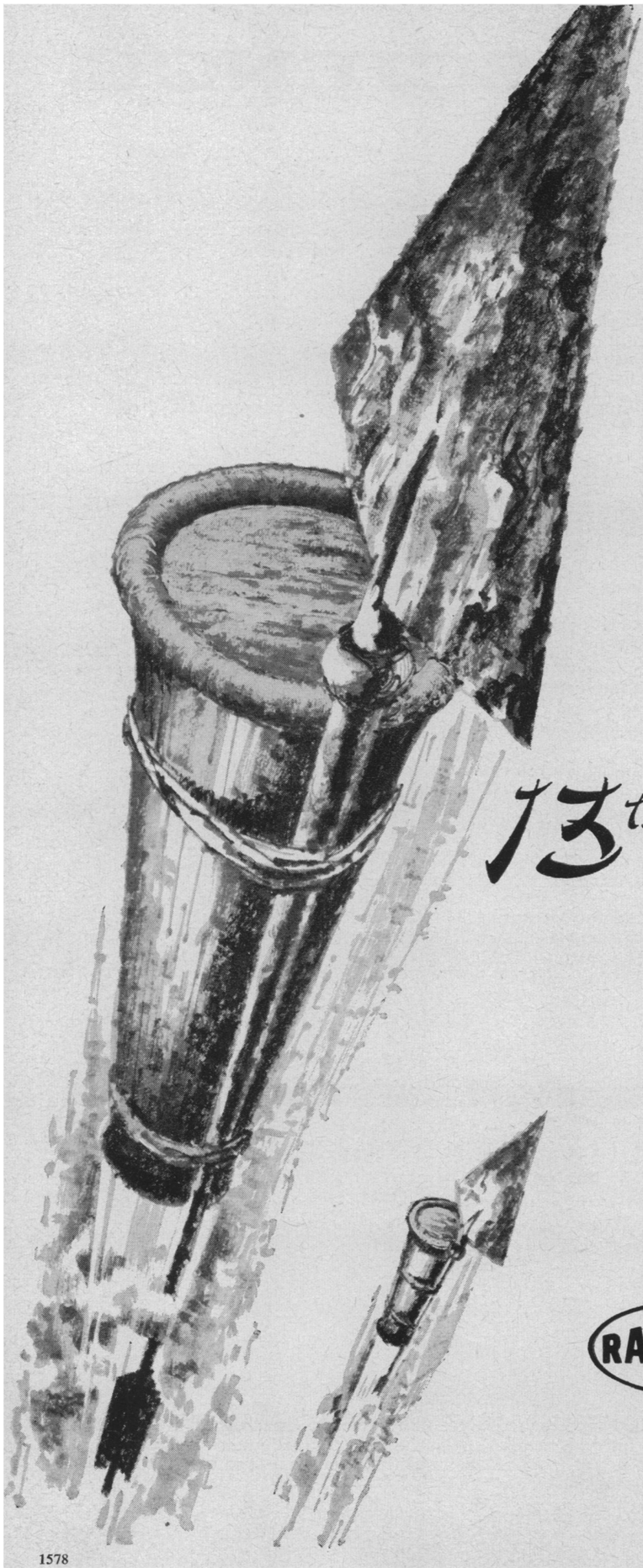
Cover

Photograph of oceanic squid at a depth of 700 meters. This picture was taken automatically as the squid pulled on a baited hook (lower center) attached to a deep-sea camera. Such photographs have given information about the distribution of squid with depth. This squid is about 3 feet long. [A. S. Laughton, National Institute of Oceanography, Wormley, Surrey, England]



Flames swept across the open plains as the Mongol hordes ran in terror from the "arrows of flying fire". When the smoke had cleared the Chinese had won the battle of Pienking with the first rocket.

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HAROLD S. BLACK, LAMME MEDALIST

A MAN WINS A MEDAL...AND STRENGTHENS A PHILOSOPHY

The search for the "hitherto unattainable" sometimes ends in strange places.

For years Bell Laboratories engineer Harold S. Black pondered a problem: how to rid amplifiers of the distortion which unhappily accumulated as signal-transmission paths were made longer and amplifiers were added. There had been many approaches but all had failed to provide a practical answer.

Then one day in 1927 the answer came—not in a research laboratory, but as he traveled to work on the Lackawanna Ferry. On a newspaper, Mr. Black jotted down those first exciting calculations.

Years later, his *negative feedback principle* had revolutionized the art of signal amplification. It is a principal reason why telephone and TV networks can now blanket the country, the transoceanic cable is a reality, and military radar and missile-control systems are models of precision.

For this pioneer achievement, and for numerous other contributions to communications since then (some 60 U. S. patents are already credited to him), Mr. Black received the 1957 Lamme Medal from the American Institute of Electrical Engineers. He demonstrated that the seemingly "unattainable" often *can* be achieved, and thus strengthened a philosophy that is shared by all true researchers.

He is one of many Bell Telephone Laboratories scientists and engineers who have felt the challenge of telephony and have risen to it, ranging deeply into science and technology. Numerous medals and awards have thus been won. Two of these have been Nobel Prizes, a distinction without equal in any other industrial concern.

Much remains to be done. To create the communication systems of the future, we must probe deeper still for new knowledge of Nature's laws. We must continue to develop new techniques in switching, transmission and instrumentation for every kind of information-bearing signal. As never before, communications offer an inspiring challenge to creative men.

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WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

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Risk and Benefit

In any legislation affecting public health the possible risks must be considered in relation to the possible benefits, and when the risks cannot be determined with certainty, reasonable and well-informed men may disagree about the best course to be followed. One approach is to avoid risk, however slight, entirely. This is the course that has been followed for food additives since the Delaney proviso of the Amendment of the Food, Drug, and Cosmetic Act of 1958 went into effect. The proviso states that "no additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal . . . ."

Secretary Flemming of the Department of Health, Education, and Welfare, acting under this amendment, barred the sale of cranberries that had been sprayed with aminotriazole, and of fowl that had been treated with stilbestrol. He now proposes that the same proviso be extended to the companion bills pending before the House and Senate (H.R. 7624 and S. 2197), which will "authorize the use of suitable color additives in or on foods, drugs, and cosmetics, in accordance with regulations prescribing the conditions (including maximum tolerances) under which such additives may be safely used."

In support of his recommendation Flemming cites several sources, among them the statement by the Food Protection Committee of the National Academy of Sciences–National Research Council that extrapolation from the levels of carcinogens (cancer-inducing substances) in the diets of animals to safe levels for man is "currently impossible," and the conclusion in a review by G. Burroughs Mider of the National Cancer Institute that "No one at this time can tell how much or how little of carcinogen would be required to produce cancer in any human being, or how long it would take the cancer to develop."

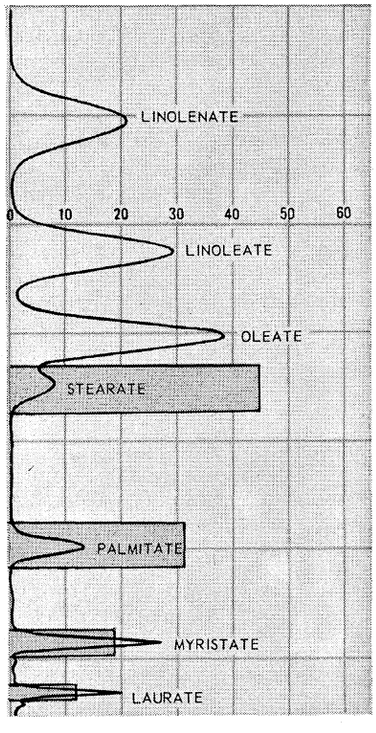
What the Secretary is advocating in effect is that at present he be given no administrative discretion for permitting the use of possible carcinogens as food additives under any conditions and at any concentrations.

Last week the Panel on Food Additives of the President's Science Advisory Committee took issue with this position. (Excerpts from the panel's report appear on page 1596. The panel points out that for many carcinogens there is evidence for the existence of a level of ingestion at which no carcinogenesis occurs during the lives of the animals tested and that dose-response curves have been worked out which allow prediction of the probability of cancer induction from a given dose. The panel also cites evidence to show that a dose-response relationship holds in certain human cancers.

On the basis of this and other evidence, the panel differs sharply from Secretary Flemming in recommending (i) that administrative discretion is essential now, rather than in the future, for deciding whether or not the use of certain possibly carcinogenic compounds as food additives should be prohibited; and (ii) that if such discretion does not now exist, the law should be modified. The panel proposes that an advisory board be appointed to assist the Secretary in evaluating the scientific evidence.

If the panel's recommendations are followed, it will be possible to consider each case on its merits—on the basis of risk relative to benefit—rather than to condemn all without the exercise of scientific judgment.—G.DuS.

A NEW APPROACH TO PRECISE MEASUREMENT OF RADIOACTIVITY IN GAS CHROMATOGRAPHY



Typical gas chromatogram trace showing mass peaks of fatty acid methyl esters. Superimposed on the mass trace, the bar graph indicates no radioactivity in any of the unsaturates.

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New Products

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither Science *nor the writer assumes responsibility for the accuracy of the information. All inquiries concerning items listed should be addressed to the manufacturer. Include the department number in your inquiry.*

■ POLYETHYLENE CLOSURES for test and centrifuge tubes feature outer skirt that performs a number of functions, including prevention of chipping of lipped tubes, prevention of contamination by dust, prevention of throwdown of the closure into the tube when centrifuging. Sizes are available to fit all tubes of American manufacture. (Aloe Scientific, Dept. Sci.552, 5655 Kingsbury Blvd., St. Louis 12, Mo.)

■ ATTENUATORS are offered in six waveguide sizes from 2.6 to 18 kMcy/sec with nominal attenuations of 10 or 20 db. Attenuation accuracy is said to average better than ±0.4 db from nominal with variation across the band less than 0.5 db from the mean. Standing-wave ratios are 1.05 to 1. Attenuation is a function of coupling-hole array. (Hewlett-Packard Co., Dept. Sci555, 275 Page Mill Rd., Palo Alto, Calif.)

■ STRIP-CHART RECORDER has a claimed sensitivity of 0.05 percent and accuracy ±0.2 percent. Range of 5 mv to 100 volts is covered in ten steps or by vernier for continuous span-voltage adjustment. Input resistance is 200,000 ohm/volt through 10 volts and 2 megohms on higher ranges. Full-scale response times as short as 0.25 sec are available. Six chart speeds range from 2 to 60 in./min. (F. L. Moseley Co., Dept. Sci559, 409 N. Fair Oaks Ave., Pasadena, Calif.)

■ CABLE-FAULT LOCATOR is a portable bridge that locates open conductors, shorts, grounds, high-resistance faults, crosses, and split pairs in insulated cable. A transistorized 100 cy/sec tone source provides excitation, and a high-gain tuned amplifier is used for null detection. (Whitney Blake Co., Dept. Sci562, New Haven 14, Conn.)

■ HYDROGEN ANALYZER is of hot-extraction type with operating temperature of 1200°C. Outgassing of a crucible is eliminated by use of an inert blank-free susceptor. Samples can be loaded and removed, one at a time, without breaking the vacuum. Extraction time is 3 to 10 min. (Laboratory Equipment Corp., Dept. Sci565, St. Joseph, Mich.)

■ OPTICAL CLARITY METER measures the low-angle forward transmittance of translucent specimens said to correlate well with visual estimates of optical clarity if the acceptance angle is very small. Source and receptor field angles

are held below 0.2 deg. Transmitting specimens are mounted close to the instrument's projection lens either mechanically or by a vacuum-plate assembly. The instrument is designed to be used with the manufacturer's photometric unit. (Gardner Laboratory, Inc., Dept. Sci567, P.O. Box 5728, Bethesda 14, Md.)

■ PORTABLE TIME SOURCE is said to be accurate to approximately ±16 sec/yr. The instrument combines a battery-operated d-c clock with a transistor radio receiver designed to receive time signals broadcast by station WWV at 2, 5, or 10 Mcy/sec. Output of the receiver is fed to a decoder that eliminates all signals except the 1-second tick. The latter is applied to generate a pulse for synchronization of the clock. Output switching function signals are provided at 15, 30, 45, or 60 sec and at multiples of 5 min intervals up to 1 hr. Several months of operation are provided by self-contained batteries. (Zenith Radio Corp., Dept. Sci564, 6001 W. Dickens Ave., Chicago 39, Ill.)

■ STAINLESS-STEEL GAGE BLOCKS have hardness Rockwell C 68 to 70 and are said to resist nicking and burring four times better than steel blocks. Temperature coefficient is 5.75 μin./in. °F. Decimal sizes are available from 0.050 to 4.000 in., fractional sizes from 1/16 to 7/64 in. Accuracies quoted are: grade AA, ±0.000002 in.; grade A+, +0.000005 in., −0.000002 in. (DoAll Co., Dept. Sci560, Des Plaines, Ill.)

■ AUTOMATIC BURETTE FILLER can be used with standard 5-, 10-, 25-, or 50-ml open-top side-filling burettes and with any electrically conductive titrant. Pushing a button on a control box allows titrant to flow into the burette; the flow stops automatically when the titrant reaches a stainless-steel wire sensing probe placed at the zero level. No drains or overflow traps are required. (Coleman Instruments, Inc., Dept. Sci563, 42 Madison St., Maywood, Ill.)

■ SWITCHING TRANSISTOR is a silicon *npn* device said to have an average turn-on time of 4 mμsec while switching 40 watts peak power with an average power dissipation of 250 mw. Operating temperature ranges to 125°C. Parameters include emitter cutoff current varying from an average of 0.01 mμa to a maximum of 1.0 μa and avalanche voltage and collector to emitter voltage varying from 40 to an average of 70 volts. (Raytheon Co., Dept. Sci568, 215 First Ave., Needham Heights, Mass.)

Letters

Aslib

Please permit me to point out an error in your amusing editorial "Claim to fame" [*Science* **131**, 1339 (6 May 1960)]. The abbreviation *Aslib* does not stand for "Association of Scientific Libraries" but stands for "Association of Special Libraries and Information Bureaux" and is therefore an abbreviation of the "pronounceable classic" rather than of the "hybrid" type.

KURT GINGOLD
Central Research Division,
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We Are for Extensive Contacts between Scientists

For almost 30 years I have been working at the Botanical Institute of the U.S.S.R. Academy of Sciences, where I head the department of plant taxonomy and geography.

Our Botanical Institute possesses the world's second-largest collection of plants, consisting of some 5 million herbarium mounts. Botanists from all over the Soviet Union and from many foreign countries come to work at our institute. Not long ago, for instance, several German scientists were here, while now we are playing host to Swedish scholars.

We maintain cordial relations with the famous British botanical garden, Kew Garden, and the Botanical Society of Edinburgh, which has honored me by electing me to honorary membership.

I am happy to note that our contacts with the United States have expanded markedly. We are receiving more and more letters and parcels from research establishments in New York, Missouri, Massachusetts, Iowa, and other states. Recently I received a letter from Leslie A. Garay, curator of the herbarium of Harvard University, thanking us for herbarium material and informing us that he was incorporating the data supplied in a monograph he was writing. For my part, I have just sent a letter of thanks to Dr. Lawrence of Ithaca, who presented me with a very valuable and well-compiled book, *The Taxonomy of Plants,* which we are using in our work. All this is very gratifying. But our exchange with the United States so far is characterized by thousands of herbarium mounts a year, while I recall that before the war it was much more extensive. We can and should expand our contacts.

We exchange plants, sending and receiving them for temporary use in sci-